

available at www.sciencedirect.comwww.elsevier.com/locate/ecolecon

ANALYSIS

Carbon dioxide emission and income: A temporal analysis of cross-country distributional patterns

Dipankor Coondoo^a, Soumyananda Dinda^{b,*}

^aEconomic Research Unit, Indian Statistical Institute, Kolkata 700108, India

^bS.R. Fatepuria College, Beldanga, Murshidabad, West Bengal, India

ARTICLE INFO

Article history:

Received 6 November 2006

Received in revised form

13 June 2007

Accepted 2 July 2007

Available online 3 August 2007

Keywords:

Cointegration

Distribution

Emission

EKC

Inequality

LR and SCR

ABSTRACT

This paper explores the relationship between the inter-country income inequality and CO₂ emission and temporal shifts in such a relationship. It also examines how the mean per capita CO₂ emission and its distributional inequality are related to the corresponding mean and the distributional inequality of income. The analysis is based on a cross-country panel data set at the level of country-group. Here environmental damage is treated as a *private good* and the technique of Lorenz and specific concentration curve analysis have been used as the basic analytical framework to argue that distributional inequality of income should be an explanatory variable in the *Environmental Kuznets Curve* relationship, along with the mean income level. In the empirical exercise, Johansen's cointegration analysis technique is used to explore existence of statistically significant cointegrating vector(s) relating mean emission and *Specific Concentration Ratio* of emission to mean income level and *Lorenz Ratio* of income, using a set of country-group specific time series data set which covers four country-groups (viz., Africa, America, Asia and Europe) and the World as a whole. The empirical results confirm that the inter-country income inequality has significant effect on the mean emission level and inter-country inequality of emission level for most of the country-groups considered.

© 2007 Elsevier B.V. All rights reserved.

1. Introduction

Usually in the EKC literature environmental quality is specified as a function of level of income, ignoring the role that income distribution may play in the determination of environmental quality. In some recent studies, however, distributional issues have been brought explicitly in the discussion of income–environmental quality relationship (see, e.g., [Torras and Boyce \(1998\)](#) and also [Scruggs \(1998\)](#) for a criticism of Torras and Boyce's conclusion and also [Boyce \(1994\)](#)). Whereas Torras and Boyce followed the public good choice approach to argue that a society's choice of the environmental degradation level would

be determined by the relative strength of different interest groups of the society (as reflected by the distribution patterns of income and social power across interest groups and inequality therein), income distribution may be thought to affect a society's environmental quality demand through other routes as well ([Magnani, 2000](#)). For example, a change in income distribution may bring in a new pattern of consumer demand, fulfillment of which may have important environmental quality implications ([Grossman and Krueger, 1995](#)). A more equitable income distribution may, by contributing to social harmony, also help create public opinion in favour of environmental quality improvement. Wider literacy, greater

* Corresponding author. c/o Dipankor Coondoo, Economic Research Unit, Indian Statistical Institute, 203, B. T. Road, Kolkata 700108, India. Fax: +91 033 2577 8893.

E-mail addresses: dcoondoo@isical.ac.in (D. Coondoo), s_dinda@hotmail.com, sdinda2000@yahoo.co.in (S. Dinda).

political liberty and civil rights may facilitate evolving a more equitable distribution of income and power and hence bring about improvement of environment.¹

Ravallion et al. (2000) discussed the income distribution–environmental quality relationship in a somewhat different context, viz., the effect of poverty reduction on global warming due to carbon dioxide emission. Briefly, they examined whether reducing poverty by raising average income or lowering inequality would exacerbate global warming. The econometric set up of that study was derived by aggregating micro-level emission demand functions and thereby relating country-specific (mean) emission level to per capita income, population size, intra-country income inequality and time. Their main empirical results are as follows: (i) given intra-country income inequality, the income elasticity of per capita emission is positive and declining in per capita income, (ii) given per capita income, elasticity of emission with respect to intra-country income inequality is negative and (iii) the elasticity of emission with respect to population size is positive and declining in intra-country income inequality. Given these, a simulation exercise was done to examine the effect on global emission of transferring income from the richest five countries to the poorest five countries (keeping the intra-country income inequality of both sets of countries unchanged). It was found that poverty reduction, whether achieved through redistribution or growth, would increase global carbon dioxide emission and hence cause global warming. However, by lowering intra-country income inequality levels across board, a reduction of the global emission level could be brought about in the long run. This was made possible by an improvement of the trade off between reducing inequality between countries and controlling emission with growth, roughly when all countries reach the level of present-day middle income countries.

Heerink et al. (2001) also derived the EKC by explicit aggregation of the household emission demand function over households and showed that the aggregate emission demand function would be a function of both mean household income and inter-household income inequality when the household emission demand function was nonlinear in income. In their empirical analysis based on a cross-country cross-sectional data set, they compared the performance of two alternative specifications of the EKC (viz., one having intra-country Lorenz ratio of income as an explanatory variable in addition to per capita mean income and the other not having the first mentioned explanatory variable) for each of eight different environmental damage variables. For six out of these eight environmental damage variables, the effect of income inequality on the level of environmental damage was found negative and statistically significant. The income elasticity of environmental damage was also found to be significantly declining in income for a number of environmental damage variables. On the whole, studies on EKC that have explicitly used income inequality as an explanatory factor by and large suggest that income inequality can be a

determinant of environmental quality. The specific mechanism through which income inequality affects the level of environmental damage is the differential marginal propensities to pollute (MPP) of rich and poor. At the global level, thus, if MPP is higher for poorer countries, one may expect a reduction of inter-country income inequality to lead to a deterioration of the global environmental quality².

The present paper³ seeks to examine the effect of inter-country income inequality on the corresponding all-country mean level of environmental damage, separately for country groups of different continents. Here carbon dioxide emission (henceforth denoted as CO₂ emission or simply emission) has been taken as the environmental damage variable. The choice of CO₂ emission as the environmental damage variable is primarily motivated by the fact that it is perhaps the most important of the green house gases leading to such consequences as *global warming* etc. Like Ravallion et al. (2000) and Heerink et al. (2001), it is assumed here that demand for environmental quality/damage is a derived demand, determined by the level and composition of goods and services consumed. The basic theoretical set up of this paper is built on aggregation of the micro level environmental damage demand functions over the population of persons/households/countries belonging to a given country/country-group. Two relationships have been examined here, viz., whether for individual country-groups the mean emission and inter-country inequality of emission are significantly related to the corresponding mean income and inter-country income inequality. While a justification for this analysis can be readily given in terms of the aggregation of the micro level emission demand function, it is, in fact, a follow up of an earlier study (viz., Dinda and Coondoo, 2006) based on the same basic data set, in which existence of a cointegrating relationship between income and CO₂ emission was examined separately for different country-groups. In that analysis, such a cointegrating relationship was found for most of the country-groups. Now, existence of a cointegrating income–emission relationship naturally suggests existence of a corresponding relationship between inter-country inequality of income and CO₂ emission for individual country-groups.

Here we have examined if (1) mean CO₂ emission, mean income and inter-country income inequality and (2) inter-country CO₂ emission inequality, mean income and inter-country income inequality are significantly interrelated, separately for country-groups to see if a change in the *inter-country income distribution pattern* would result in a change in mean emission and the corresponding inter-country inequality of

¹ In fact, in Torras and Boyce (1998), literacy, political liberty and civil rights turned out to be better proxies for power inequality and the effect of inequality on environmental quality worked out to be stronger in poorer countries.

² Empirical evidences based on cross-country data suggest that economic growth in a poor country often leads to worsening of environment. For a few environmental indicators, however, the evidences suggest that the direction of the relationship eventually gets reversed and environment starts improving with income growth. The existence of such non-linearity in the relationship of income with environmental indicators should have implications for the relationship between income inequality and environmental indicators. Here we focus on those implications.

³ This is the third of a set of three papers reporting results of empirical analyses based on the same data set. The other two papers are Coondoo and Dinda (2002) and Dinda and Coondoo (2006).

Download English Version:

<https://daneshyari.com/en/article/5051902>

Download Persian Version:

<https://daneshyari.com/article/5051902>

[Daneshyari.com](https://daneshyari.com)