CONVERGENCE OF THE ENVIRONMENTAL VARIABLES: EUROPEAN CASE

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Abstract:

The convergence discussion is applied to environmental variables as a borrowed notion. Income convergence notion comes from the economic growth literature and has been applied to per capita emissions as well as energy related variables. Nguyen-Van (2005) states that convergence occurs if countries with low emissions per capita increase their emissions per capita and high emissions countries decrease their emissions per capita.

The first study on per capita CO2 emissions convergence among the OECD countries is Stratzicich and List (2003). They base their argument on the theoretical growth model developed in Bulte et al (2001) which extend the Solow's growth model to include an EKC type pollution behavior and find that in the standard Solow growth model pollution convergence may be expected.

From the policy perspective emission convergence is important as well. Understanding the distribution of per capita CO2 emissions might have important implications concerning international climate change policies. If a specific target level of per capita emissions is reached (i.e. convergence is attained) then this will be an achievement towards ensuring sustainability. Convergence or divergence of per capita emissions will also be critical in negotiations of multilateral climate change agreements, especially in terms of per capita emission allocation/reduction schemes.

There are alternative convergence notions in the literature. In recent years the notion of stochastic convergence is used to analyze the convergence of alternative variables. Stochastic convergence concept focuses on the dynamic properties of a series. For example Bernard and Durlauf (1995) define that stochastic convergence exists if the difference between two series follows a zero mean stationary process which implies that it does not contain a unit-root or a deterministic trend. An alternative testing method is based on Carlino and Mills (1993). In this approach the stochastic convergence of the variable in question to the sample average is tested. From the emission convergence perspective this approach tests whether unit root exists in the log of ratio of per capita emissions relative to the average. In this case existence of a unit root in the log relative series will imply divergence and rejection of unit root implies convergence. Therefore, existence of a unit root in the series will imply that the series is non-stationary and shocks will have permanent effects and emissions will diverge. However, stationarity will imply that shocks to the series will have temporary effects and per capita emissions converge to the average.

In this study convergence of different environmental variables among EU countries will be investigated. The study will focus on three indicators; per capita CO2 emissions, energy intensities and per capita ecological footprints. Study will use stochastic conversion defined in the Carlino and Mills (1993) framework. Unit root tests will be used for a panel of EU countries (27 member countries+ 5 official candidates+ 4 potential candidates=36 countries). In terms of unit root tests an important issue is existence of structural breaks. Tests that disregard the structural breaks when they exist will cause the rejection of stationarity hypothesis. For this reason as the stochastic convergence is analyzed, panel unit root tests with structural breaking suggested by

Carrion-i-Silvestre et al (2005) will also be employed to deal with the breaking of the trends in the variables.

Among the environmental variables per capita CO2 emissions and energy intensity are closely associated with each other. In the convergence literature however there are fewer studies on the energy intensity convergence. In terms of energy intensity, use of fossil fuels is the most important source of CO2 emissions and hence energy intensity and CO2 emissions are closely related. Among the 36 countries included in the study central and eastern European countries are known to have higher energy intensities than the EU15 countries. Through the membership process energy intensities of these countries are declined and from this perspective looking at the stochastic convergence of energy intensities in this sample of countries will be interesting and helpful in understanding the environmental convergence among these countries.

The third indicator that is used in the study is the ecological footprint notion which is first mentioned by Wackernagel and Rees (1996) as an "estimate of resource consumption and waste assimilation requirements for a defined human population or economy in terms of a corresponding productive land area". Compared to the other two indicators that will be used in the study which measure the demand on environment, ecological footprint concept approaches the same issue from the supply side as well, and in that sense is a composite concept.