



Does higher economic and financial development lead to environmental degradation: Evidence from BRIC countries

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ABSTRACT

A vast number of studies addressed the environmental degradation and economic development but not financial development. Moreover, as argued by Stern [2004. The rise and fall of the environmental Kuznets curve. *World Development* 32, 1419–1439] they present important econometric weaknesses. Using standard reduced-form modeling approach and controlling for country-specific unobserved heterogeneity, we investigate the linkage between not only economic development and environmental quality but also the financial development. Panel data over period 1992–2004 is used. We find that both economic and financial development are determinants of the environmental quality in BRIC economies. We show that higher degree of economic and financial development decreases the environmental degradation. Our analysis suggests that financial liberalization and openness are essential factors for the CO₂ reduction. The adoption of policies directed to financial openness and liberalization to attract higher levels of R&D-related foreign direct investment might reduce the environmental degradation in countries under consideration. In addition, the robustness check through the inclusion of US and Japan does not alter our main findings.

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1. Introduction

Key policy objective of international efforts to mitigate the adverse effects of global climate change is the reduction of global CO₂ emissions. The success of these efforts depends to a large degree on the commitment of the major CO₂ production nations in meeting global emissions targets. In 1990, the major producers of energy-related¹ CO₂ emissions were US 23.00%, Japan 5.72% the OECD group 24.00%, China 11.00%, India 3.00%, Brazil 0.94% and Russian Federation 3.80%. By 2007, US and Japanese emissions came down to 22.00% and 5.00% respectively, while it increased for BRIC economies, China 16.00%, India 5.00%, Brazil 1.15% and Russia 6.00% (World Bank, 2007). However, during the last years these economies have experienced profound structural changes that continue to influence the evolution of regional CO₂ output, with potentially adverse consequences for global mitigation strategies. While there is evidence of declining energy consumption accompanying the development process, for many of these countries it remains unclear what path economic output will

follow or whether it is likely to translate into rising CO₂ emissions over the longer term.

In addition, during the last decade the environmental Kuznets curve (EKC) hypothesis has gained increasing popularity in academic and policy circles. Taking the EKC at face value is quite attractive because of its long-run implications that economic growth is good for the environment. Policy makers everywhere are watching with much interest the pros and cons of the EKC hypothesis since the debate have considerable importance for national and international policies. The crucial policy question for them as Barbier (1997) argue is “whether economic growth should continue to be the main priority, with protection of the environment a secondary consideration to be addressed mainly in the future, or whether explicit policies to control environmental degradation at the local, national and global level are urgently required today”.

World Bank has long maintained that economic growth is good for both people and the environment. This type of “win-win” situation is based on the view that an immediate benefit of economic growth is a rise in per capita income, which can contribute to alleviate poverty and to clean up the environment. Others such as Beckerman (1992) advocated without reservation economic growth as the most effective solution for curing environmental ills.

On contrary Georgescu-Roegen (1971) and Daly (1977) argue that more economic growth entails more production and

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¹ Energy-related emissions are those generated through the combustion of fossil fuels. While this is the principal anthropogenic source, other important sources include net deforestation and cement manufacture.

consumption activities to satisfy human wants, thus causing more waste, more pollution and more pressure on environmental resources. Rothman (1998) asserted that consumption is the principal driving force behind environmental impact and that there is much to be learned by taking a consumption- rather than production-based approach, as earlier studies have predominantly done. Because it is trade that allows for a divergence of production and consumption patterns within a region this leads to a discussion of how to consider the role of trade in the context of the EKC hypothesis. The author then proposes possibilities for more appropriate measures of environmental impacts and considers the results using one such measure. Kolstad and Krautkraemer (1993) point out the fact that there is a dynamic link between the environment, resource use and economic activity. They argue that while resource use (especially energy sources) yield immediate economic benefits, its negative impact on the environment may be observed in the long run.

Consequently, economic growth in excess of the carrying capacity of the environment is counterproductive and detrimental in the long run to human welfare. Not surprisingly, they have advocated that excessive growth should be dismissed in favour of a zero-growth or steady-state economy to prevent future ecological disaster. While the majority of the studies are focused on economic development and environmental degradation, we consider the financial development as another possible determinant of the environmental performance.

Nevertheless, why consider financial development when discussing the relationship between economic growth and environment? The most prominent reason is that financial liberalization and development may attract FDI and higher degrees of R&D investments which in turn can speed up economic growth (Frankel and Romer, 1999), and hence affects the dynamic of the environmental performance. The second reason is that financial development provides developing countries with the motive and opportunity to use new technology, help them with clean and environment-friendly production, and consequently improve global environment at large and enhance regional development sustainability (Birdsall and Wheeler, 1993; Frankel and Rose, 2002). The third reason, contrary to the second one, is that though financial development may enhance economic growth, it may result in more industrial pollution and environmental degradation (Jensen, 1996; World Bank, 2000).² Moreover, Stern (2004) presents a critical history of the EKC. According to him the arguments of EKC do not stand firm on strong econometric footing. He pointed out that the major weaknesses associated with the econometric estimations namely, heteroskedasticity, omitted variables bias and critical issues relating to co-integration analysis.

Given these reasons and concerns in the literature, our research tries to fulfill the econometric weakness raised by Stern (2004) while extends the discussion about the importance of financial development in environmental degradation. We limit our focus to BRIC countries, controlling for robustness of results including USA and Japan, as the debate on the pace and level of economic and financial development is mostly pertinent in the context of developing economies. Yet, Goldman Sachs (2003) argues that BRIC economies could become a much larger force in the world economy than G6 in less than 40 years. By 2025 they could account for over half the size of the G6. We use CO₂ emissions as the environmental pollution measure for several reasons. CO₂ emissions, once thought to be a harmless by-product

of combustion, are now believed to be the primary greenhouse gas responsible for the problem of global warming (IPCC, 2007). Regulating and monitoring anthropogenic emissions of CO₂ from various economic activities has become a central issue in the ongoing negotiation for an international treaty on global warming (Cline, 1992; Revkin, 2000). Moreover, the scope of its spatial impact makes CO₂ pollution more suitable for country-level aggregate study. Also, we believe that our regression model includes a much larger set of relevant explanatory variables for cross-country CO₂ variation than most other existing studies in the EKC literature. Additionally, the policy recommendations highlighted in this paper are based on the fact that firms in developing countries do not have incentives to invest in pollution-control mechanism because of the weak institutional structure. Therefore, higher economic and financial reforms in future are necessary to strengthen institutional structure which can provide adequate incentives for controlling pollution.

The rest of the paper is organized as follows. Section 2 discusses the importance of economic and financial development for environmental quality. Section 3 presents the empirical design and results. Section 4 concludes.

2. The role of economic and financial development for environmental performance

The main issue of particular interest of this paper is the impact of economic and financial development on the pollution performance relationship. The relationship between the economic development and CO₂ emissions, the most important greenhouse gas implicated in global warming, is widely studied in the literature. As argued by Meadows et al. (1992), far from being a threat to the environment in the long term, economic growth appears to be necessary to maintain or improve the environmental quality.

At the same time, there is a growing concern about the adverse environmental impacts of economic growth (Grove, 1992). This concern has led to a rich stream of research on the notion of environmentally sustainable economic development that explores the tradeoff between economic growth and environmental quality (Anderson, 1992). The dominant view is that the conventional tradeoff between economic growth and environmental quality is not inevitable. In fact, it is possible to mitigate greatly or to even reverse tradeoff through appropriate policy interventions (Antle and Heidebrink, 1995; Grossman and Krueger, 1995; Selden and Song, 1994; Shafik, 1994). This issue is particularly significant for developing countries who, under pressure to achieve accelerated economic growth face the danger of adopting economic policies that run contrary to the objective of their long-term environmental sustainability (Serageldin and Steer, 1994).

The empirical findings for the net impacts of economic development upon environmental quality seem to depend upon characteristics of different pollutants (Shafik and Bandyopadhyay, 1992; Hettige et al., 1992; Birdsall and Wheeler, 1993; Diwan and Shafik, 1992). For example, some air pollutants such as suspended particulate matter, sulfur dioxides, carbon monoxide and oxides of nitrogen, which have relatively significant health and environmental degradation effects, appear in an inverted U-shaped relationship with economic development. Selden and Song (1994) have looked at various air pollutants like SO₂, NO_x and CO and find similar results related to EKC. However, the inflection points were substantially different across studies. In this framework, Holtz-Eakin and Selden (1995) have found that CO₂ emissions did not show the same EKC pattern. Instead, Shafik and Bandyopadhyay (1992) show that the CO₂ emissions have been found to increase monotonically with per capita GDP.

² Moreover, since environmental control increases manufacturing cost, pollutant industries and enterprises may be transferred to underdeveloped areas where environmental standards are relatively low, and turn these areas into "pollution havens".

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