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Trade openness and environmental quality: International evidence

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HIGHLIGHTS

- Relation between trade and the environment is examined for 98 countries.
- A long-run relationship exists among pollutant emissions, openness, and growth.
- Openness appears to lead to environmental degradation for the global sample.
- The relationships differ according to the income of countries.
- A feedback effect between trade openness and pollutant emissions exists.

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ABSTRACT

We examine the relationship between trade openness and the environment in a cross-country panel, using the emission of particulate matter (PM10) as the basic indicator of environmental quality. The panel cointegration test results show a long-run relationship between particulate matter emissions, trade openness, and economic growth. We find that increased trade openness leads to environmental degradation for the global sample. However, the results differ according to the income of countries. Trade openness has a benign effect on the environment in high-income countries, but a harmful effect in middle- and low-income countries. These results are generally robust to different measures of trade openness and environmental quality. Interestingly and significantly, the results are consistent with the popular notion that rich countries dump their pollution on poor countries. Finally, we find evidence of a feedback effect between trade openness and particulate matter emissions for the global sample as well as different income groups of countries.

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1. Introduction

Reflecting widespread concerns over environmental degradation, protecting the environment has emerged as a global priority in recent decades. In this context, the impact of trade on the environment is an issue of growing importance in trade policy. There has been an increasing number of empirical studies that investigate the relationship between openness to trade and environmental quality (see, e.g., Frankel and Romer, 1999; Antweiler et al., 2001; Cole and Elliot, 2003; Boulatoff and Jenkins, 2010; Shabaz et al., 2013). The evidence from these studies is mixed, with some studies finding a positive relationship while others find a negative relationship. Both theory and evidence suggest that trade promotes growth. To name just one example, the remarkable

rise of China was driven to a large extent by its integration into the global trading system. If trade leads to growth, and growth leads to environmental deterioration, the affected countries may impose more stringent environmental regulations. We can expect the consequent employment of more environmentally friendly production methods to improve environmental quality. This view is empirically supported by Antweiler et al. (2001) who found that trade openness is associated with reduced pollution as measured by sulphur dioxide concentrations. Baek et al. (2009) also showed that trade and income positively affected environmental quality in developed countries and China. Boulatoff and Jenkins (2010) found evidence of a negative long-term relationship between trade and oil-related carbon emissions across different income groups of countries.

On the other hand, a number of studies have found that increased openness can worsen environmental quality. Conceptually, a country which has a comparative advantage in products that

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require a lot of pollution may specialise in the production of that commodity. But doing so will increase pollutant emissions and adversely affect environmental quality. China's emergence as a global manufacturing powerhouse is a good example of rapid export growth coinciding with extensive environmental deterioration. This negative view of the impact of trade on the environment is consistent with Kellenberg (2009) and Managi and Kumar (2009).

So does trade openness harm or benefit the environment? More specifically, does trade openness increase or reduce pollutant emissions? In this study, we characterise environmental quality as a stock and its rate of deterioration or improvement as a flow. It therefore follows that higher flows of pollutant emissions cause a greater degradation of the environment. We present new evidence from a panel dataset of countries across different regions of the world. Using the globally representative panel dataset, we hope to contribute toward a broader and deeper understanding of the impact of trade on the environment, in particular the linkage between trade and pollutant emissions.

The main findings of the study are as follows. First, we could not reject the existence of long-run relationship between trade openness, particulate matter emissions, and income for the whole panel as well as across different income groups of countries. The finding is qualitatively robust to different measures of trade openness and pollutant emissions. Second, we find that in the long run, increased openness to trade leads to environmental degradation for the global sample. However, the results differ according to country income level. For high-income countries, the environmental effect of trade openness is found to be positive while for middle- and low-income countries, this impact is significantly negative. The results are generally robust to different proxies of trade openness and pollutant emissions. Third, we find evidence of a feedback effect-i.e. bidirectional causal relationships between trade openness and particulate matter emissions for the global sample as well as across different income groups of countries.

The rest of the paper is organised as follows. The second section reviews the relevant literature. The third section discusses the empirical framework and data. The fourth section reports and discusses the empirical results. The final section concludes the paper.

2. Trade and the environment: Some conceptual issues

According to Copeland and Taylor (2013), trade openness can influence the environment through two key channels: the scale effect and the composition effect. The scale effect refers to the impact of trade on the level of economic activity. Specifically, increased openness leads to a greater economic activity, for instance, more transportation services, and more generally, more production and consumption of goods and services. Since these activities inherently entail environmental costs, one might conclude that increased economic activity stimulated by trade openness worsens environmental quality.

On the other hand, the composition effect refers to the influence of trade on the composition of output across countries. Specifically, poor countries with relatively weak environmental regulations will specialise in producing dirty goods while rich countries with tough environmental policies specialise in clean goods. This leads to a shifting of polluting industry from developed to developing countries (Copeland and Taylor, 2013). This view is consistent with Baek et al. (2009) who find that trade and income favourably impact environmental quality in developed countries. However, the study found that the environmental impact of trade was negative in most developing countries. Dirty industry

migration raises a serious concern that poor and less developed countries are increasingly bearing the pollution burdens of consumption in rich and developed countries (Copeland and Taylor, 2013).

Yet there are also conceptual grounds for a beneficial effect of trade on the environment. Antweiler et al. (2001) argue that increased openness may promote the environment through the technique effect. Specifically, if higher real income induced by trade liberalisation leads to a higher level of economic development, which is usually associated with greater ability and willingness to implement and enforce environmental regulations, environmental quality might improve. In addition, if the greater scale of economic activity due to increased openness encourages exploration into cleaner production techniques, this will reduce pollutant emissions. In other words, openness to trade can benefit the environment if it brings about income gains which enable some countries to specialise in relatively clean industries (Copeland and Taylor, 2013).

Since theory offers grounds for both positive and negative relationships between trade and the environment, the issue must be settled through empirical analysis. In this context, we empirically analyse a large cross-country dataset of particulate matter emissions in 98 countries. Our empirical analysis of the relationship between trade openness and environmental pollution takes into account the income effect – i.e. the Environmental Kuznets Curve (EKC) hypothesis. This hypothesis posits an inverted U-shaped pattern between environmental pollution per capita and income per capita. As income increases, environmental pollution increases up to some income threshold, after which environmental pollution declines.¹ The evidence on the EKC hypothesis is mixed and inconclusive. The results from some studies are consistent with the hypothesis (e.g., Dinda and Coondoo, 2006; Managi and Jena, 2008).

On the other hand, many other studies (e.g., Dinda et al., 2000; Coondoo and Dinda, 2008; Akbostanci et al., 2009) refute the EKC hypothesis. Coondoo and Dinda (2002) discuss the issue of causality in the context of EKC from the standpoint of economic theory, and explain how this links up with the concept of income-emission causality underlying the Granger causality test. Their study used a dataset which covers 88 countries to examine income-emission causality patterns separately for 12 country groups across different continents. The results reveal three different types of causality relationship for different country groups. These studies that test the EKC hypothesis are, however, based on a bivariate framework which might suffer from omitted variable bias that causes spurious results.

To summarise, the literature on the relationships between trade openness and environmental quality is inconclusive. Further, very few studies have used a panel framework to address possible cross-country dependence. We were only able to find Jaunky (2011), Aroui et al. (2012), Hagggar (2012) and Ozcan (2013). Yet, none of these studies looks at a sample of countries from the whole world nor do they incorporate income level and the EKC hypothesis into the analysis. Our aim is to contribute to the literature by filling these gaps.

3. Empirical framework and data

In this section, we described the framework and data that we use for the empirical analysis of the relationship between trade and the environment.

¹ Dinda (2004) provides a thorough review of the EKC literature, including background history, conceptual insights, policy implications, and the conceptual and methodological critique.

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