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Ecological Economics 48 (2004) 439–450

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ANALYSIS

# US environmental load displacement: examining consumption, regulations and the role of NAFTA

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Received 30 October 2002; received in revised form 21 October 2003; accepted 22 October 2003

## Abstract

In light of concerns that structural changes to US production may not be accompanied by similar changes to US consumption, this paper provides a detailed examination of US environmental load displacement over the period 1974–2001. The forces that drive such displacement are also examined, with particular attention paid to the scale and composition of US consumption, the share of imports in consumption, the role of environmental regulations and the potential impact of NAFTA. It is found that the USA as a whole has experienced environmental load displacement over the period under consideration, with the extent of this displacement seeming to increase over the last decade. It would appear to be the increasing scale of US trade that is increasing environmental load displacement. Indeed, the composition of US imports and exports have become significantly cleaner over the period considered. However, although imports from Mexico have grown more rapidly than exports to Mexico, no evidence is found to suggest that NAFTA is increasing displacement to Mexico. With regard to US domestic consumption patterns, although they have become cleaner, a greater share than ever is now met via imports. Sectoral pollution abatement costs are found to be a determinant of this increasing share of imports in domestic consumption.

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*Keywords:* US environmental load displacement; Mexico; NAFTA

## 1. Introduction

It is an undeniable fact that per capita emissions of local air pollutants such as sulphur dioxide, carbon monoxide and particulate matter are falling in most high-income economies. The environmental Kuznets curve (EKC) literature goes a step further and suggests that there is in fact a systematic relationship between a range of environmental indicators and per capita income, with environmental degradation rising

in low income countries and falling in high income countries (Cole et al., 1997; Grossman and Krueger, 1995; Shafik, 1994).<sup>1</sup> It is typically argued that growth-induced structural change (‘the composition effect’) is one cause of the reduction in degradation experienced at higher income levels, with heavy industries replaced by light manufacturing and services.<sup>2</sup> However, if the structural changes experienced

<sup>1</sup> Some question the reliability of this finding (Harbaugh et al., 2002; Stern, 1998).

<sup>2</sup> Environmental regulations are also assumed to play a role (the ‘technique effect’).

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by the manufacturing sector are not accompanied by similar changes to the structure of *consumption* then the composition effect is simply displacing pollution from one country to another. This environmental load displacement also implies that today's developing regions will have no one to whom they can displace their pollution. It is for these reasons that a number of studies have now argued that future research should focus on the environmental impact of consumption at the expense of the more traditional emphasis on production (Ekins, 1997; Muradian et al., 2002; Rothman, 1998).

It is international trade that allows the environmental impact of domestic consumption to differ from that of domestic production. Not surprisingly, concerns over environmental load displacement have, therefore, increased as the liberalisation of trade has increased. Furthermore, since trade liberalisation implies that cost differentials between countries will become increasingly important, inter-country differences in the stringency of environmental regulations have also been implicated as a possible cause of environmental load displacement. The resultant pollution haven literature has found mixed results, although a number of recent papers claim that such regulations can influence international trade and investment flows (Ederington and Minier, 2003; List and Co, 2000). The formation of NAFTA, resulting in liberalised trade between the US, a high wage, high regulation economy, and Mexico, a low wage, low regulation economy, raised fears that the US, in particular, was likely to experience environmental load displacement. Ross Perot, Presidential candidate in the 1992 US elections, famously warned of the 'giant sucking sound' of production and jobs fleeing to Mexico due to the perceived cost advantages associated with Mexico's lower wages and less stringent regulations. Schatan (2000), however, argues that the composition of Mexican manufacturing has not shifted towards pollution intensive industries and hence Mexico has not become a pollution haven. She argues that any post-NAFTA increase in pollution is a result of an increase in the scale of output, rather than due to a change in composition. Others have highlighted the adverse environmental consequences of the rapid growth of the US–Mexico border region, which would partly appear to be a result of the relocation of US firms (Hufbauer et al., 2000).

In light of these concerns, this paper provides a detailed examination of the extent of the USA's environmental load displacement over the period 1974–2001, and considers the forces that drive such displacement. More specifically, Section 2 employs Muradian et al.'s notions of the balance of embodied emissions in trade (BEET) and the environmental terms of trade (ETT), and also examines the pollution intensity of US imports and exports. Total US trade and US trade with Mexico are analysed separately to allow a clearer focus on any possible NAFTA effect. Section 3 then considers some of the factors that are driving load displacement, focusing on US domestic consumption, the share of imports in consumption, and the possible impact of US environmental regulations. Beginning with domestic consumption patterns, both the scale and the composition of US consumption are examined, as are the share of imports in consumption for the manufacturing sector as a whole and for individual 'dirty' sectors. The extent to which environmental regulations influence the share of imports in consumption is then investigated econometrically. The role played by NAFTA is considered throughout. Finally, Section 4 summarises and concludes.

## 2. Environmental load displacement

As an indication of a country's environmental load displacement, Muradian et al. (2002) introduced the concept of the BEET, defined as embodied emissions in imports minus those in exports. If BEET takes a positive value then it implies that the pollution embodied in a country's imports is greater than that in its exports and hence the country can be said to be displacing its environmental load to its trading partners. The World Bank's Industrial Pollution Projection System (Hettige et al., 1994) allows the estimation of pollution embodied in production (and hence in trade). Hettige et al. estimate pollution intensities for a range of pollutants, for each industrial sector in the US (3 or 4 digit ISIC or 3 digit usSIC).<sup>3</sup> The intensities are

<sup>3</sup> Pollution intensities are reported for sulphur dioxide (SO<sub>2</sub>), total particulates (TP), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>) and volatile organic compounds (VOC).

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