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Economic Integration and the Environment in Mexico

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Assistant Professor of International Relations
Boston University
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Tufts University

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DSFLGKFDLG;KDF;LGK

I. INTRODUCTION

This paper examines the extent to which economic integration affected levels of environmental degradation in Mexico during the period 1985 to 2000. During that time, Mexico transformed itself from one of the most closed to one of the most open economies in the world.

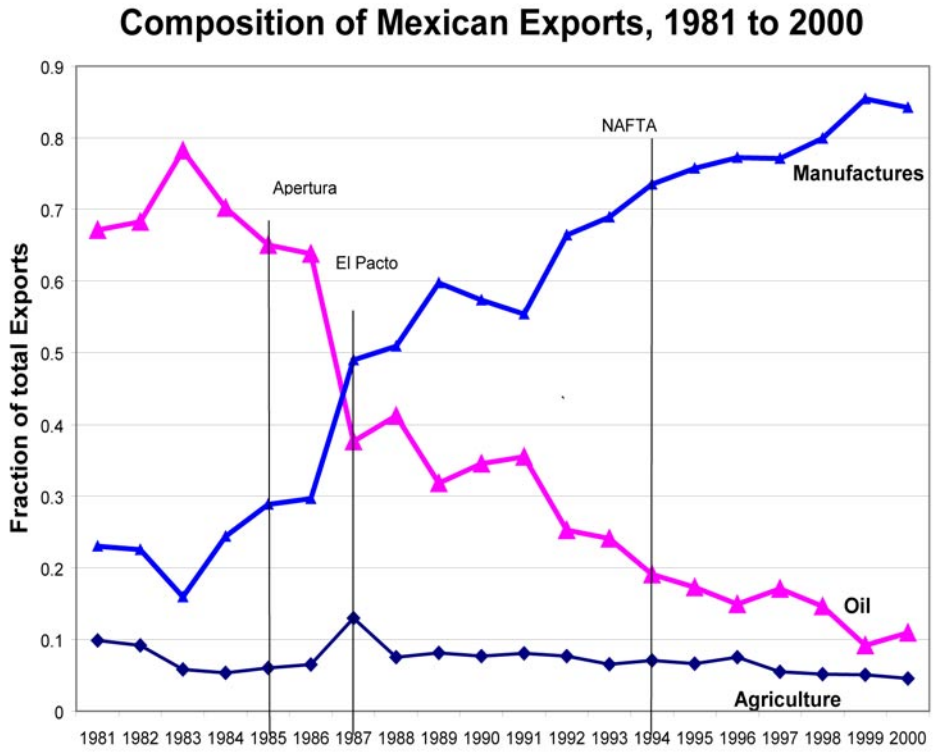
To answer this question, the paper draws on two theories from the economics literature: the so-called environmental kuznets curve (EKC) and the pollution haven hypothesis. During the often contentious debates over the passage of the North American Free Trade Agreement (NAFTA), proponents of free trade drew from the EKC to argue that in nations like Mexico economic integration would eventually lead to environmental improvements. Conversely, opponents of free trade evoked the pollution haven hypothesis to argue that free trade would automatically worsen environmental conditions in developing countries.

Mexico is a perfect laboratory to examine these predictions because it began liberalizing its economy nearly twenty years ago. Indeed, many nations currently engaged in negotiations over a Free Trade Area of the Americas (FTAA) or in the current round of global negotiations under the auspices of the World Trade Organization (WTO) are just now considering taking the steps that Mexico began taking as far back as 1985.

Mexico's transformation to openness occurred through five rather dramatic policy changes. First, in response to deep macroeconomic crises and pressure from international institutions, in 1985 Mexico embarked on what it called it's "aperture" (openness in English) policy where it began lowering tariffs for the first time in many years. Secondly, in 1986 Mexico joined the General Agreement on Tariffs and Trade (GATT) and became actively engaged in the Uruguay Round negotiations. Thirdly, Mexico established its "El Pacto" policy in 1988—an economic pact between the government, private industry, and some labor organizations to stabilize prices, and to further liberalize trade and investment. The capstone of these efforts of course came in 1994 with the passage of the NAFTA. Fifth was Mexico's entry into the Organization of Economic Cooperation and Development (OECD).

Figure 1 exhibits how Mexico's export profile was radically transformed as these policies were being implemented. During the 1970s and early 1980s the engine of growth in the Mexican economy was crude oil exports, which were as high as eighty percent of total exports in the early 1980s. By the year 2000, oil exports had fallen to less than 10 percent of total exports. What has replaced oil exports has been manufactures exports. Indeed, as Figure 1 shows, manufactures exports now comprise close to 85 percent of all Mexican exports—now the leading driver of Mexico's economic performance.

Figure 1



Source: (INEGI, 2000)

The increase in FDI into Mexico has been even more profound than in the case of exports. The average annual amount of FDI inflows nearly tripled between 1985 and 1999. In 1985 the annual amount was $5.3 billion and reached $14.7 by 1999 (UNCTAD 2002). Sixty percent of all FDI into Mexico from 1980 to 2000 came from the United States. Europe supplied 30 percent of FDI, and other countries comprise the rest. By and large, manufacturing receives the largest share of FDI, at 60 percent. Electronics and transportation, the chief exporters in Mexico, are the largest recipients of FDI.

Table 1

Selected Annual Growth Rates in Mexico, 1940 to 1999				
	1940-1959	*1960-1979*	*1980-1999*	*1985-1999*
GDP	6.3	6.6	2.4	2.6
GDP per capita	3.2	3.4	0.5	0.8
Exports	4.5	8.0	10.3	10.6
Imports	6.8	5.9	6.7	12.8
Manufactures	7.7	6.6	3.1	3.7
Gross Fixed Capital Formation	9.0	8.3	1.6	3.8
Services	*n.a*	6.6	2.5	2.5
Agriculture	5.0	0.9	1.4	1.0

Data from 1960 to present from World Bank Development Indicators.
Data from 1950 to 1960 from (Reynolds 1970).

However, this whole package of policies has translated into very slow economic growth. Growth during the economic integration period has been slower than Mexico's historical averages and below the Latin American average. From 1940 to 1979 Mexico's economy grew at an annual rate of over 6 percent, or over 3 percent in per capita terms. Since the Apertura policies in 1985, the Mexican economy (measured in real GDP) has grown a modest 2.6 percent annually, but less than 1 percent in per capita terms. On average, Latin America and the Caribbean grew at an annual rate of 3.2 percent annually between 1985 and 1999, and 1.6 percent in per capita terms. Although Mexican growth during integration is largely seen as being fueled by growth and investment in manufacturing, manufactures in Mexico grew at 3.7 percent annually in real terms, whereas manufacturing in Latin America and the Caribbean as a whole grew by 5.8 percent annually during the same period (World Bank 2000).

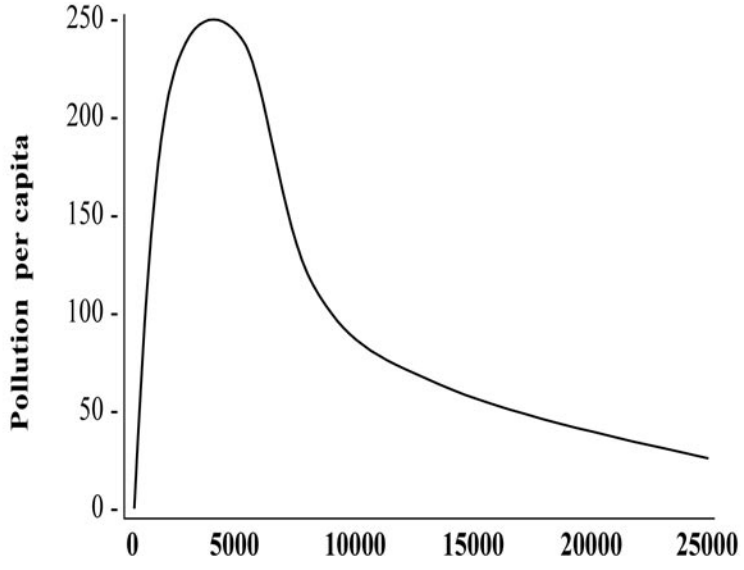
This paper examines the environmental effects of these profound changes in the Mexican economy. The paper is organized in five parts. Following this brief introduction, the second part of this paper is an examination of the EKC for Mexico. Part three is a test of the pollution haven hypothesis for Mexico. The fourth analyses the determinants of environmental degradation. Part five makes some general conclusions regarding the trade and environment question in the Mexican context and draws out lessons for future trade agreements.

II. IS THERE AN ENVIRONMENTAL KUZNETS CURVE FOR MEXICO?

Proponents of NAFTA, and trade liberalization in general, evoked the EKC to argue that free trade would eventually and automatically lead to environmental improvements in developing countries. This section of the paper tests the EKC hypothesis in the Mexican context.

In 1992, the World Bank's *World Development Report* made the case that while trade-led growth may cause sharp increases in environmental degradation during the early stages of economic development, such degradation would begin to taper off as nations reached "turning points" ranging between $3,000 to $5,000 GDP per capita. The Bank was generalizing from a landmark 1991 paper by economists Gene Grossman and Alan Krueger. Working with a cross sectional database of largely developed and some developing countries, this article examined the relationship between ambient concentrations of criteria air pollutants and GDP per capita. When they plotted their regression results they found that lower income nations had higher rates of pollution per capita where the reverse occurred for higher income nations (Grossman and Krueger 1993). The EKC is depicted in Figure 3 (World Bank 1992).

Figure 2
The Environmental Kuznets Curve



Source: Panayatou, 1997

This relationship became known as the EKC, borrowing its name from the landmark article by Simon Kuznets that found a similar relationship between income inequality and GDP per capita in a cross-section of countries in the 1950s. For the EKC, reductions in pollution per capita are argued to be due to three interacting factors, the scale, composition, and technique effects. For the scale effect pollution will increase if the scale of output increases and assuming that pollution per unit of output remains constant. Also assuming that pollution per unit of output remains constant, the composition effect occurs when the sectoral mix of industry changes toward relatively less (or more) pollution intensive industries. Finally, the technique effect occurs with actual reductions in pollution per unit of output through technological change and new regulations that arise along with income. For the developed countries, these three factors are seen to be interacting—as income has grown the composition of industry has shifted toward relatively less pollution intensive economic activity while at the same time improvements in technology and environmental regulation have occurred. Although overall levels of growth (scale) have vastly increased, they have been offset by composition and technique effects.

To this day, generalizations of these findings have been used to make the claim that nations should grow now through trade liberalization and worry about the environment later (Bhagwati 1993).

EKC studies have become a cottage industry, with over one hundred articles published since the original 1991 piece (see Panayatou, 2000; Stern 1998). What is ironic is the fact that at as the policy community has rushed to generalize the EKC in the political realm, the consensus in the peer-reviewed academic literature on the EKC has become much more cautious. Most importantly, the literature shows that the empirical evidence for the EKC is relatively weak and limited. While a thorough review of that literature is beyond the scope of this paper, the following limits can be outlined (for a good review see Stern, 1998):

1) EKCs are limited to a small number of pollutants. Most of the studies that have found EKCs have been for ambient concentrations of localized air pollutants in OECD countries

(Grossman and Krueger 1993; Seldon 1994; Panayotou 1997). However, a number of studies have shown that while ambient concentrations for these same pollutants may decline with income, emissions increase along with income (Stern 2001). EKCs have not shown up with most other environmental media such as as water pollution, municipal waste, carbon dioxide, and energy use, evidence of an EKC relationship is questionable (World Bank 1992; Shafik 1994; Hettige 2000).

2) EKC studies have relatively small representation from developed countries. Many of the datasets used in EKC studies have relatively few datapoints for developing countries. EKCs become more ambiguous the more developing countries that are added to a sample (Stern 1998).
3) EKC turning points are much higher than original estimates. A number of articles have found turning points ranging from $7,500 GDP per capita to $15,000 and higher (Seldon 1994; Kaufmann 1998; List 1999). Such evidence implies that pollution per capita may continue for decades before "turning" around.
4) Income isn't the only factor contributing to an EKC. Later studies have shown that factors such as the degree of political freedom and democracy in a nation, population density, economic structure, and historical events (such as the oil price shocks of the 1970s) correlate with reductions in pollution (Torras 1996; Unruh 1997).
5) Limited evidence for the EKC in single-country trajectories. The majority of early EKC studies utilize cross-sectional or panel data of largely developed countries to estimate the relationship between income and pollution. There is some evidence that time-series applications to individual countries do not mimic cross-sectional trends. One study examined the experience of Malaysia, and found no EKC for many of the pollutants examined (Vincent 1997). Interestingly, it was the lack of individual country evidence that eventually led to the discrediting of the original Kuznets curve as a policy prescription.

The literature also expresses a number of conceptual concerns with previous studies and the policy advice that has been subsequent:

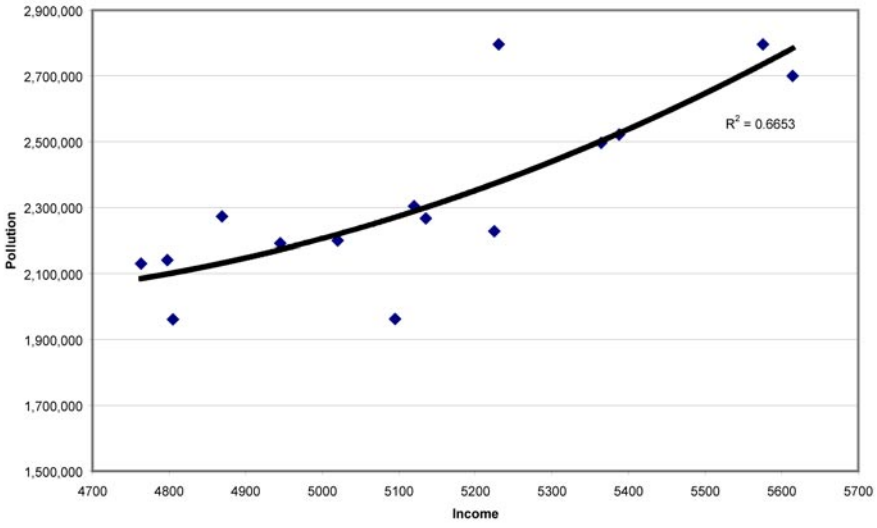
1) Mean vs. median income. Early EKC's implied that environmental degradation would peak at mean world income. Given the fact that many countries were within reach of the mean, it was implied that environmental degradation may soon be on the decline (World Bank, 1992). However, the global income distribution is quite skewed, with many more people below than above the mean. Using the median rather than the mean of global income would imply environmental degradation far into the future.
2) Trade can displace pollution. Perhaps the developed countries may have experienced EKCs partly because they now import pollution-intensive goods from less developed countries. It has been argued that many developing nations, such as China, will not have such a luxury (Lucas 1992; Suri 1998).
3) Irreversibility. Perhaps the major concern is that the environmental damage that occurs during the initial stages of economic development, prior to reaching any turning point, can be irreversible. Examples are deforestation (especially in old-growth forests), loss of biological and genetic diversity, loss of potable water, and deaths related to air pollution (Barbier 1994).
4) Drawing single-country development lessons from cross-sectional evidence is questionable. Many have argued that extrapolating policy advice based on a cross-section of mostly developed countries to developing countries is problematic. Such an approach assumes that the development path of developed countries is easily replicable for the developing countries (Unruh 1997).

Mexico is a perfect laboratory to examine the EKC because it reached $5,000 GDP per capita in the early 1980s, precisely the time when it began liberalizing its economy. According to the early studies then, one would expect that nearly twenty years of economic integration would be resulting in decreases in environmental degradation. For this paper, ordinary least-square

regression analyses were conducted with levels of pollution per capita in Mexico, GDP, and its square for the following types of environmental pollution in Mexico: soil erosion, municipal solid waste, water pollution, carbon dioxide, and emissions of criteria air pollution (SO_x, NO_x, CO, and TSP). The results for each of these regressions (except one) resemble those in Figure 4.

Figure 3

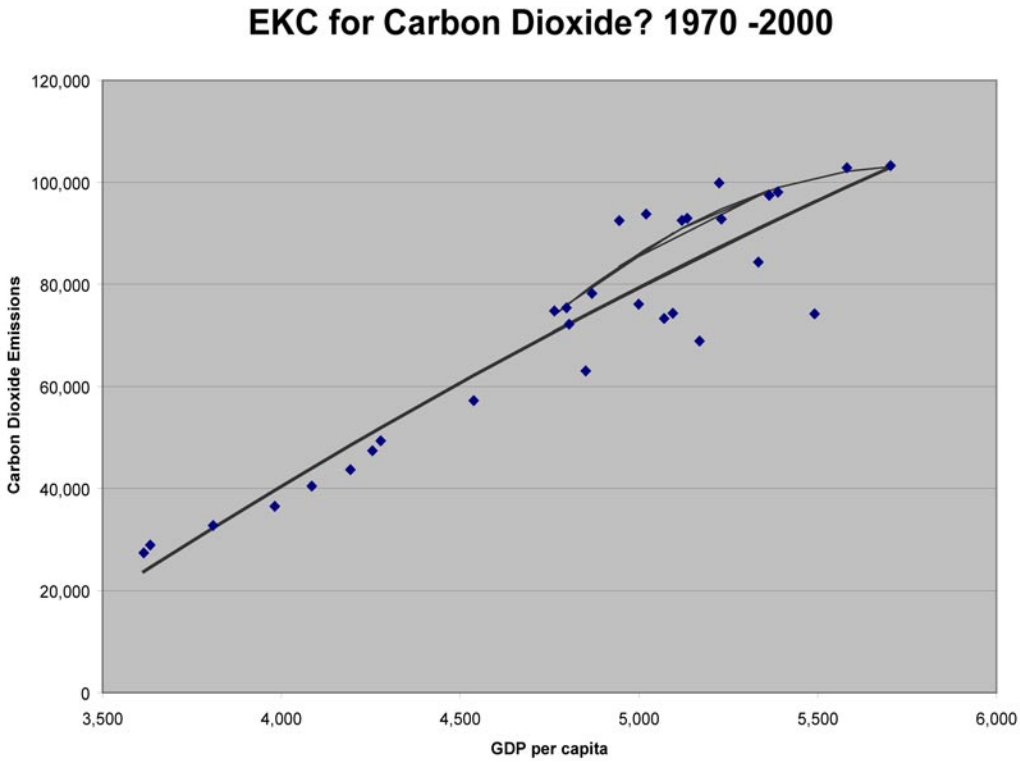
EKC for SOx?



Source: (Gallagher 2004)

Figure 5 shows the results of regression emissions of SO_X per capita on GDP and its square between 1985 and 2000.[1] While the shape of the curve does indeed have parabolic form, rather than evidence of pollution increasing at a decreasing rate, emissions are increasing at an increasing rate. Similar patterns were found for all the other pollutants examined, except one. Figure 4 exhibits the results of similar regressions on levels of carbon dioxide but dating back to 1970 (it is easier to extrapolate CO_2 emissions). Although the 1970 to 2000 trend shows levels of pollution increasing linearly over time, when the 1985 to 2000 is independently analyzed to compare with the other regressions, there is evidence that with income levels of CO_2 are increasing at a decreasing rate in an EKC-like fashion.

Figure 4



Source: (Gallagher, 2004)

Interestingly, virtually no other study has found an EKC-like relationship for CO_2 and income, so why in Mexico? Referring back to Figure 1 it is important to remember that from 1970 to 1985 Mexico was a prime oil producer. In per capita terms, oil use has diminished significantly over this period. Other nations do not see this pattern because Mexico is particularly well endowed with crude oil.

Although these regressions find very little support for an EKC in Mexico, in no way do they prove the EKC wrong. These findings are in step with the peer reviewed literature. Like that literature, this work finds that an EKC has not held for emissions (while concentrations could indeed be increasing), that there is scant evidence of an EKC for this single country case. However, also consistent with the literature, it may just be that Mexico's EKC turning point may be much further into the future—a possibility that will be further analyzed in the fourth part of this paper.

III. IS MEXICO A POLLUTION HAVEN?

Opponents of free trade often claim that trade liberalization will result in a mass migration of pollution intensive industry from developed countries with stringent environmental regulations to developing countries with lax environmental standards. Not only will such migration cause increases in pollution in developing countries, they argue that pressure will then be exerted on developed country standards in the name of competition—effectively creating a "race to the bottom" in standards. This section of the paper examines the extent to which this phenomenon occurred in Mexico.

Race to the bottom discussions are perfectly plausible in economic theory. The Hecksher-Ohlin (H-O) theory in trade economics postulates that nations will gain a comparative advantage in those industries where they are factor abundant. Applying the H-O theory to pollution then, it could be argued that a country with less stringent environmental standards would be factor abundant in the ability to pollute. Therefore, trade liberalization between a developed and a developing nation where the developed nation has more stringent regulations may lead to an expansion in pollution intensive economic activity in the developing country with the lesser regulations. The developing country with the less stringent regulations becomes a "pollution haven" for pollution intensive economic activity.

During the debates, opponents of NAFTA pointed to real life environmental disasters in Mexico's maquiladora zones as proof that pollution havens exist(Audley 1996; Mayer 1998). Mexico's maquiladoras have long been plagued with excessive air, water, and soil pollution. In addition, there is evidence that the Mexican authorities would often turn a blind eye to such behavior (Stromberg, 2002).

Like the EKC literature, it is also ironic that the peer reviewed literature has found very limited evidence for pollution havens but that the policy community continues to cite it as a dire consequence of trade liberalization. Again, a full review of the literature is beyond the scope of this paper. However, extensive studies have been conducted at the global and regional level. In addition, a number of studies have focused on the United States, a large country with a number

of freely trading "states" with different levels of environmental stringency (and very reliable data) have also failed to find strong evidence of pollution havens (Jaffe 1995; Panayotou 2000).

A small handful of studies have examined the pollution haven hypothesis in the Mexican case. None find evidence of the relationship. Grossman and Krueger (1993), performed the only such study during the NAFTA debates. In a cross-industry comparison of data in one year, 1987, the authors tested whether pollution abatement costs in U.S. industries affected imports from Mexico, as one would expect if Mexico was functioning as a pollution haven relative to the U.S. They found the impact of cross-industry differences in pollution abatement costs on U.S. imports from Mexico to be positive, but small and statistically insignificant. Indeed, traditional economic determinants of trade and investment, such as factor prices and tariffs, were found to be far more significant.

Another study examined whether pollution abatement costs affected patterns of U.S. foreign investment into Mexico and three other countries. Also a cross-industry comparison of data in one year, this time 1990, this study had similar results to those of Grossman and Krueger. The authors did find a positive relationship between pollution abatement costs and levels of FDI. However, such a relationship was not found to be statistically significant (Eskeland and Harrison 1997). Kahn (2000) is the only study to examine this question over time. Rather than looking at the costs of pollution abatement like the previous two studies, Kahn looked at the pollution intensity (using U.S. Toxic Release Inventory Data) of U.S. trade with Mexico and other countries in 1972, 1982, and 1992. He found the pollution content of U.S. imports from Mexico had slightly declined during the period (Kahn 2001).

Table 1 presents the share of pollution intensive industry in Mexico and the United States between 1988 and 1998. If Mexico was serving as a pollution haven for pollution intensive or "dirty" firms from the United States, we would expect that the share of dirty industry in the United States would decline while the share in Mexico would increase during this period of close integration between the two countries. As Figure 5 shows however, while the share of dirty industry in the United States did decrease, it decreased even more in Mexico.

Table 2

Share of Dirty Industry in National Manufacturing			
	1988	1994	1998
Mexico			
production	30.1%	23.1%	26.5%
employment	7.9%	6.3%	5.9%
US			
production	17.0%	15.1%	14.7%
employment	11.3%	11.2%	11.2%

Source: (Gallagher, 2004)

Based on these data I have ran a number of regression analyses where it was examined whether growth in Mexican exports, production and the Mexican export share of U.S. consumption was correlated with marginal environmental abatement costs in the United States. Not only were no statistically significant relationships found, but in some cases the signs of the coefficients were "wrong." That is, one would expect that as marginal abatement costs increase in the United States, so would Mexican economic activity in corresponding sectors (Gallagher, 2004).

The reason why this analysis and so many others like fail to find evidence for pollution havens in developing countries is that the economic costs of environmental degradation are relatively much smaller than many other factors of production—especially those that determine comparative advantage. Mexico is factor abundant in unskilled labor that takes the form of manufacturing assembly plants. On average, such manufacturing activity is relatively less pollution intensive than more capital laden manufacturing activities such as cement, pulp and paper, and base metals production. As we saw, the latter sectors have been contracting in the Mexican case. In terms of costs, even at the margin, the costs of pollution are too small to significantly factor into the average firm's location decisions. A related explanation is that many firms are simply too large and cumbersome to move to another location, and they need to stay close to their product markets. The marginal abatement costs are small related to the transaction

costs of decommissioning and actually moving to another country (Neumayer 2001).

Although this work shows that the majority of firms that move to Mexico do not move there because of low environmental standards, such a finding does not imply that when firms move to Mexico that they are model environmental corporations. In fact, we know there are "leaders" and "laggards" with respect to environmental standards among U.S. companies doing business in Mexico. To take the electricity industry as an example, a plant in Mexico being built by InterGen, which is owned by Shell Oil and Bechtel corporations, will not comply to U.S. standards even though the electricity will be serving the U.S. market. On the other hand, a similar electricity plant is being built by Sempra Energy Group Enterprises, but that plant will adhere to California's stringent environmental standards. A representative from Sempra has said "we thought it was good business and it made environmental sense." (Weiner 2002). Such leaders and laggards cannot be picked up in the aggregate level analyses conducted in this and the other examinations of the pollution haven hypothesis for Mexico.

When conducting studies such as these we are estimating the marginal pollution abatement costs (or levels of pollution) for individual industries. However, as has been shown in Mexico, the environmental problems that occur within the firm's grounds can be less severe than pollution problems in the surrounding community that arise as a result of internal migration by employees to work at the firms themselves. Mexico's notable maquiladora environmental problems are the lack of sewage treatment facilities, the lack of adequate roads and other infrastructure (which exacerbate air and water pollution problems), and an increase in inefficient automobile and trucking transportation (OECD 1998). While problems such as plant-level air and water pollution, and the handling of toxic pollutants on the job certainly persist in maquiladoras, these "community" environmental problems are those in most crisis. Such problems are seen as a function of internal migration to work at the plants in question. Local municipalities desperate for investment lack the ability to erect the necessary fiscal measures to provide basic services to these rapidly swelling populations.

IV. ECONOMIC INTEGRATION AND ENVIRONMENTAL DEGRADATION IN MEXICO

The analyses described in this paper reveal that contrary to notions argued in conventional policy circles economic integration does not automatically improve or degrade the environment. In the Mexican case, environmental degradation clearly worsened between 1985 and 2000. This evidence makes one question the policy lessons put forth from EKC generalizations. However, environmental conditions are not worsening in Mexico because the country is serving as a "haven" for dirty industry in the United States—as shown by the analysis of the pollution haven hypothesis here.

A Mexican government report titled *Sistema de Cuentas Económicas y Ecológicas de Mexico*, includes national levels of data on a variety of environmental media and attempts to estimate the economic costs of such environmental degradation (INEGI, 1999). Despite the fact that Mexico reached levels of income beyond the range of a predicted EKC turning point, national levels of soil erosion, municipal solid waste, and urban air and water pollution from 1985 to 1999. According to these data, rural soil erosion grew by 89 percent, municipal solid waste by 108 percent, water pollution by 29 percent, and urban air pollution by 97 percent. These air pollution figures are "national" estimates of CO, NO_x, SO_x, HC, and PT. According the same report, the government estimates that the economic costs of environmental degradation between 1985 and 1999 averaged 10 percent of GDP per annum. That figure stands in stark contrast to the annual rise in economic growth, which was only 2.6 percent.

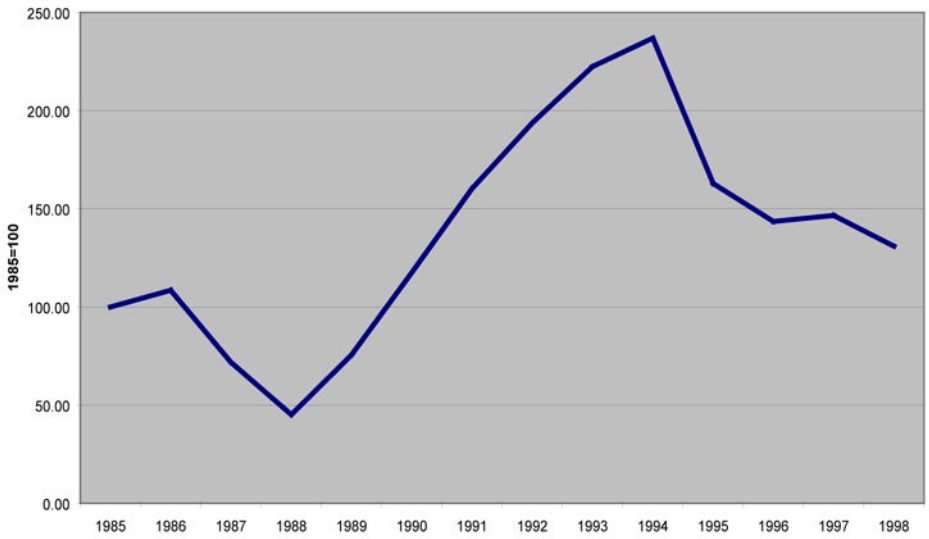
If the environment isn't worsening because of pollution havens, what *is* triggering environmental degradation in Mexico? The economist Kym Anderson and others have argued that without the proper environmental policies in place, economic integration can exacerbate existing market failures such as negative environmental externalities (Anderson 1992). The lack of institutional capacity for protecting the environment in Mexico explains in large part why the Mexican economy continues to worsen at levels that are costly to the Mexican economy. By all indicators, there is significant evidence that Mexico's environmental institutions are unable to keep up with the demands of the economic transformations occurring in the country.

Although Mexico has established key environmental laws and institutions, real spending on the environment shrank during the period of integration, plant-level environmental inspections declined, and the environmental "side" agreement institution established to help with Mexican environmental problems is not equipped to fill in the gap.

Figure 5 exhibits real spending on environmental protection in Mexico between 1985 and 1999. Real increases came in the lead up to NAFTA between 1988 and 1994 but after 1994 spending dropped by 45 percent. Of course, Mexico experienced a macroeconomic crisis in 1995 and had to severely curtail spending. However, shortly after the crisis many other government programs resumes previous spending levels but environmental protection did not. Even at the highest point, the average OECD country spend more than three times the amount that Mexico did on the environment in terms of GDP (OECD 1998).

Figure 5

Real Spending on Environmental Protection in Mexico

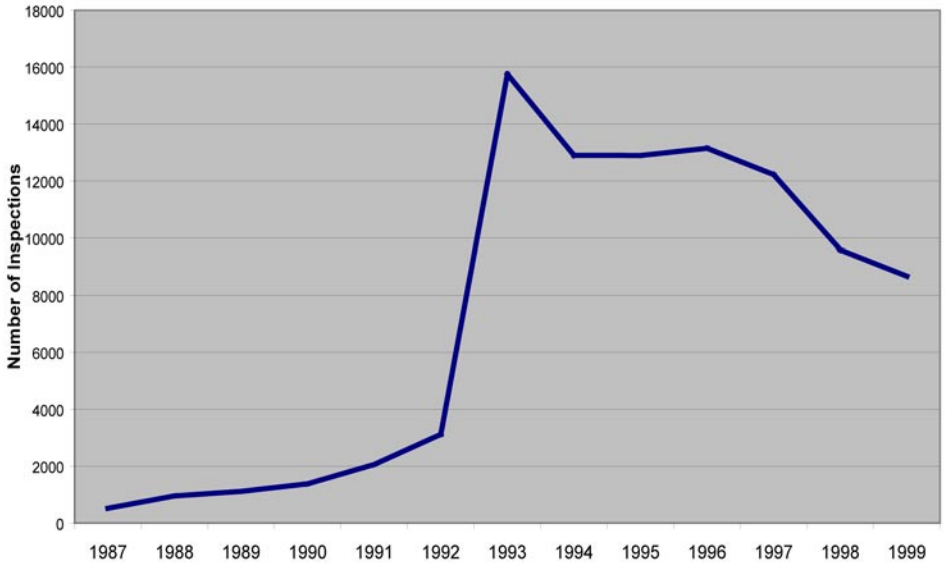


Source: (Gallagher, 2004)

The World Bank recently published a survey on the determinants of environmental compliance in Mexico. According to their study, one of the key drivers of compliance to Mexican environmental law was plant-level inspections. Figure 7 exhibits the record on plant level inspections in Mexico over the same period. The trend is very similar to the spending graph.

Figure 6

Plant-Level Environmental Inspections in Mexico



Source: (Gallagher, 2004)

In 1992, the year of intense debate over trade and environment, the Mexican government made great efforts to show that it was poised to crack down on environmental violations (Mayer, 1998). However, as this figure shows, after NAFTA was passed levels of inspections have decreased by over 40 percent. Even at their peak, plant-level environmental inspections in Mexico only reached 6 percent of all firms (Gallagher, 2004).

The NAFTA did come with an environmental "side" agreement, the North American Agreement on Environmental Cooperation (NAAEC). NAAEC was equipped with a secretariat called the North American Commission for Environmental Cooperation (NACEC). NACEC is involved in a number of technical cooperation efforts that have revealed positive results and that could serve as a pilot for more ambitious efforts in the future. As examples of some of its impressive work, NACEC has (see Markell and Knox, 2003):

- Played a key role in establishing a Pollution Release and Transfer Registry (PRTR) in Mexico that surpasses the U.S. and Canadian equivalents;
- Sponsored rigorous research and symposia dedicated to understanding the effects of trade on the environment in North America;

- Facilitated a mechanism whereby civil society organizations can officially file claims against governments favoring trade over the environment;
- Created a number of pilot funding programs that build the environmental capacity of small and medium sized enterprises and civil society organizations.

NACEC however, is ill-equipped to help solve Mexico's significant environmental problems. In addition to lacking the necessary mandate, NACEC lacks resources to counter these problems. By its very nature, an institution with an annual budget of $9 million can hardly make a dent in a series of problems that cost the Mexican economy over $36 billion annually. Although NACEC is not equipped to reverse overall trends, it has had made a number of significant strides in some areas.

On the other hand, NACEC has set an important precedent for trade policy. Because of NAFTA's incorporation of environmental considerations, trade policy is no longer seen as separate from environmental policy (Marc-Johnson and Beaulieu 1997). Although NACEC was not designed to significantly reverse the environmental consequences of economic growth in Mexico, it serves as a pilot project to examine how effective institutions could be designed for Mexico and other nations where trade-led growth needs to be channeled in a more environmentally benign manner.

Mexico needs to dramatically change its perception of the trade and environment relationship. Indeed, it may even make economic sense. Economist Theodore Panayotou has argued that because it make take decades for developing nations like Mexico to reach EKC turning points, the accumulated environmental damages may far exceed the present value of higher future growth. Thus, environmental protection may be justified on purely economic grounds (Panayotou 2000).

Table 2 presents a series of calculations aimed at showing how Panayotou's hypothesis is justified in the Mexican case. In this table I estimate the number of years it would take for Mexico to reach different EKC turning points, the amount of environmental damage that would occur to the turning point, and the present value of the economic costs of that environmental damage (based on the pollution and economic cost estimates in the Mexican government report INEGI, 1999).

Table 3

Economic Costs of Future Environmental Damage due to increases in Criteria Air Pollution in Mexico

GDP per capita	Turning Point Year	Damage Costs to Turning Point ($US billions)	
		(r=.06)	(r=.03)
$7,500	2028	79	114
$10,000	2057	105	194
$15,000	2097	119	279

Source: Gallagher, 2004

The first column selects three turning points from the peer reviewed literature. The second column estimates the year in which Mexico would reach that turning point assuming that the Mexican economy grows twice the rate it did in per capita terms between 1985 and 1999. Based on the pollution growth rate of criteria air pollution between 1985 and 1999 I estimated the amount of pollution that would occur each year and then multiplied those figures by the abatement cost estimates for criteria air pollution in the Mexican government study. The last two columns present the net present value of those future costs at discount rate of 6 and 3 percent. According to these calculations the future costs of solely air pollution damages in a business as usual scenario for Mexico could range from $79 to $270 billion—or one-fifth to three-fifths of Mexico's current GDP. These estimates are in no way precise, but they do make the point that Mexico may be trading off future growth for environmental degradation.

V. LESSONS FOR THE FUTURE

The analyses in this paper show that the environment continued to worsen in Mexico as it transformed itself from one of the most closed to the most open economies in the world. Indeed, according to the Mexican government the economic damages due to environmental degradation were 10 percent of GDP on an annual basis between 1985 and 1999, dwarfing the 2.6 annual growth in GDP.

Contrary to what some politically motivated analysts who evoke the EKC would suggest, this analysis shows trade-led growth without the proper environmental policies in place will not automatically lead to environmental improvements. At least for now, there is now sign of Mexico reaching a turning point regarding levels of environmental degradation. At current rates of growth, it may be costly decades before a turnaround occurs.

However, this analysis also shows no evidence of Mexico serving as a pollution haven for dirty firms from the United States. Indeed, the share of dirty industries in Mexico has been shrinking for more than ten years. This does not say that when foreign firms move to Mexico that they are perfect environmental citizens, it simply states that firms don't move to Mexico because of lax environmental regulations.

Rather than a pollution have affect the reason for Mexico's continuing environmental problems is that the Mexican and other North American governments have not adequately addressed the market failures resulting from economic transformation by establishing the proper environmental institutions.

These findings underscore the need to couple any economic integration with environmental policy at the local, national, and international level. The fact that there was no EKC-like relationship found for Mexico shows that economic integration cannot be relied on for automatic environmental improvements. Indeed, it shows that the lack of effective environmental institutions in the presence of economic integration has exacerbated longstanding environmental problems in Mexico.

However, a silver lining lies in the fact that there was no pollution haven found for Mexico. Such evidence suggests that strengthening environmental institutions and standards in developing and developed countries alike will not deter foreign and domestic investments. Because the abatement costs of pollution are so small relative to other key costs, firms will not move to or from countries like Mexico as regulations rise (at least to U.S. levels).

Finally, this paper shows that substantial international financing can supplement developing country environmental goals. While the North American Commission for Environmental

Cooperation has many of the traits of an effective international body that can help fill the nation-state gap in environmental protection in the context of economic integration, its small budget hinders it from making much progress toward reversing Mexico's alarming trends.

This analysis suggests that further trade commitments in the hemisphere should be eyed with extreme caution until the proper environmental institutions and policies are in place at the national level and/or at an international level in tandem with further integration. This analysis has demonstrated that such caution may be justified on purely economic grounds.

BIBLIOGRAPHY

Anderson, K. (1992). The standard welfare economics of policies affecting trade and the environment. The Greening of World Trade Issues. R. Blackhurst. Ann Arbor, The University of Michigan Press.

Audley, J. (1996). Green Politics and Global Trade: NAFTA and the Future of Environmental Politics. Washington D.C., Georgetown University Press.

Barbier, E. B. (1994). Natural Capital and the Economics of Environment and Development. Investing in Natural Capital: The Ecological Economics Approach to Sustainability. Jesse Aussebel. Washington, Island Press.

Bhagwati, J. (1993). "The Case for Free Trade." Scientific American (269): 42-49.

Eskeland, G. S. and A. E. Harrison (1997). Moving to Greener Pastures? Multinationals and the Pollution Haven Hypothesis. Trade, Global Policy, and the Environment. P. G. Fredriksson. Washington, D.C., World Bank.

Gallagher, K. (2004). Free Trade and the Environment: Mexico, NAFTA, and Beyond. Palo Alto, Stanford University Press.

Grossman, G. M. and A. B. Krueger (1993). Environmental Impacts of a North American Free Trade Agreement. The Mexico-US Free Trade Agreement. P. Garber, MIT Press.

Hettige, H. et al. (2000). "Industrial Pollution in Economic Development: The Environmental Kuznets Curve Revisited." Journal of Development Economics 62(2).

Jaffe, A., SR Peterson, R Stavins (1995). "Environmental Regulation and the Competitiveness of US Manufacturing." Journal of Economic Literature 33: 132-163.

Kahn, M. E. (2001). "United States Pollution Intensive Trade Trends From 1972 to 1992." Medford, MA, Tufts University.

Kaufmann, R. (1998). "The Determinants of Atmospheric SO2 Concentrations: Reconsidering the Environmental Kuznets Curve." Ecological Economics 25(2): 209-20.

List, J., Gallet, Craig (1999). "The Environmental Kuznets Curve: Does One Size Fit All?" Ecological Economics 31(3): 473-480.

Lucas, R. E. B., et al (1992). Economic Development, Environmental Regulation, and the International Migration of Toxic Industrial Pollution. International Trade and the Environment. P. Low. Washington, World Bank.

Marc-Johnson, P. and A. Beaulieu (1997). The Environment and NAFTA. Washington D.C., Island Press.

Mayer, F. (1998). Interpreting NAFTA: The Science and Art of Political Analysis. New York, Columbia University.

Neumayer, E. (2001). Greening Trade and Investment. London, Earthscan.

OECD (1998). Environmental Performance Review for Mexico. Paris, OECD.

(OECD), Organization of Economic Cooperation and Development. (1998). Mexico. Paris, OECD.

Panayotou, T. (1997). "Demistifying the Environmental Kuznets Curve." Environment and Development Economics 2(4): 451-463.

Panayotou, T. (2000). Economic Growth and the Environment. Cambridge, MA, Center for International Development at Harvard Univeristy.

Panayotou, T. (2000). Globalization and Environment. Cambridge, MA, Harvard University, CID.

Reynolds, C. W. (1970). The Mexican Economy. New Haven, Yale University Press.

Seldon, T., Song, D (1994). "Environmental Quality and Development: Is there a Kuznets Curve for Air Pollution?" Journal of Environmental Economics and Management 27: 147-162.

Shafik, N. (1994). "Economic Development and Environmental Quality." Oxford Economic Papers 46: 757-773.

Stern, D. (1998). "Progress on the Environmental Kuznets Curve?" Environment and Development Economics 3: 173-196.

Stern, D., Common, Michael (2001). "Is There an Environmental Kuznets Curve for Sulfur?" Journal of Environmental Economics and Management 41(2): 162-178.

Suri, V., and Chapman (1998). "Economic Growth, Trade and Energy: Implications for the Environmental Kuznets Curve." Ecological Economics 25(2).

Torras, M. a. J. B. (1996). "Income, Inequality, and Pollution: A Reassesment of the Environmental Kuznets Curve." Ecological Economics.

UNCTAD (2002). World Investment Report, 2002. Geneva, Unctad.

Unruh, G., and W. Moomaw (1997). "An Alternative Analysis of the Apparent EKC Relationship." Ecological Economics.

Vincent, J. R. (1997). "Testing for Environmental Kuznets Curves Within a Developing Country." Environment and Development Economics 2(4): 417-431.

Weiner, T. (2002). "U.S. Will Get Power, and Pollution from Mexico." New York Times: A3.

World Bank (1992). World Development Report. Washington, International Bank for Reconstruction and Development.

World Bank (2000). World Development Indicators Database.

ENDNOTES

[1] The first differences of these data were also taken to control for the possibility of serial auto-correlation.

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