Pollution Intensive Industry in Mexico under NAFTA: Model and Empirical Evidence

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The dominant trend in the world economy in the 1990s has been toward liberalized trade. During this period we have witnessed a new round of the General Agreement on Tariffs and Trade (GATT) that has resulted in the creation of a new world trading institution, the World Trade Organization (WTO). In addition, a flurry of regional free trade agreements has been signed in Europe, Asia, Africa, Latin America, and North America.

Environmental economists have suggested that, as world trade liberalizes, it will become less possible to exclude those nations not willing to pay for environmental protection. During trade between two nations, the nation with the lower willingness to pay for environmental quality, the free rider, may enjoy a comparative advantage in pollution intensive industries.[1] Nations that have less stringent pollution controls are commonly referred to as pollution havens.

When the North American Free Trade Agreement (NAFTA), the agreement between Canada, Mexico, and the United States, was under consideration in the early 1990s, the theoretical issues outlined above became real concerns within the public policy arena. Many feared that Mexico's lax environmental laws would induce pollution-intensive firms to either migrate to or expand in Mexico. Using newly available data, this study will be the first to empirically test whether NAFTA has had an effect on the economic presence of pollution intensive firms in Mexico relative to the United States during the first two years after NAFTA went into effect in 1994.

A number of nations are, or will be, engaged in regional free trade agreements in the coming years. In each case, the theoretical possibility of problems associated with pollution havens is a major concern for policy makers and their respective publics. In the Americas in particular, negotiations have begun toward a Free Trade Area of the Americas (FTAA) that could engage virtually all of the countries in the hemisphere. These nations are watching the NAFTA aftermath very closely. Pollution levels in Latin America already cause massive economic and health problems that affect the well being of all individuals. This study will help in the effort to evaluate whether environmental concerns were adequately represented in the formation of NAFTA.

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The structure of this paper is as follows: it will discuss previous empirical studies on the environmental effects of trade. Second, it will present the analysis. Third, it will summarize the major findings of the empirical research. Finally, in a technical appendix, the results of the estimate will be presented.

Empirical Research on Trade and Environment to Date

The revitalization of trade liberalization policies has led to a growing literature on the effects of international trade patterns on the environment. The analyses employed to test this relationship are as varied as the results. While such efforts have shed a great deal of light on historic patterns of trade liberalization and related pollution intensity, none have tested the environmental effects of specific trade agreements.

A good deal of the empirical work on this topic has been thoroughly reviewed by Judith Dean in 1992 and by Adam Jaffe and his colleagues in 1995.[2] This section will review important findings summarized in these articles, important studies that have been published since, and two studies that look at trade and pollution intensity in Mexico.

Literature on Environmental Regulations and Plant Location in the United States

From an economic perspective, the United States can be viewed as a conglomeration of "independent" states that engage in free trade. Thus, the literature on the effects of environmental regulation on domestic plant location may be relevant to problems of international trade and the environment.

The political arena is full of discussion regarding the belief that environmental regulations have a significant effect on the siting of new plants in the United States. The empirical literature, however, suggests otherwise. Relatively early studies by Timothy Bartik showed that, when making location decisions, firms are sensitive to cost variations between states due to state taxes, public services, and unionization of a state's labor force; in contrast, they found little evidence of a relationship between environmental regulations and plant location. In examining the location of manufacturing plants of Fortune 500 companies in the United States from 1972-1978, Bartik considered state air and water pollution control measures, average cost of compliance, and particulate emissions, and found that all had small and insignificant effects on plant locations.[3] Looking at new small businesses in 19 manufacturing industries from 1976-1982, Bartik detected a significant, negative impact of state-level environmental regulations on the rate of start up of small businesses, but with smaller effect.[4]

A study by Arik Levinson is fairly consistent with the results of Bartik. She uses establishment-level data from the Census of Manufactures and the Survey of Pollution Abatement Costs and Expenditures to examine the effect of differences in the stringency

of state environmental regulations on establishment location choice for U.S. manufacturing plants from 1982-1987. Her work shows that interstate differences in environmental regulations do not affect the location choices of most manufacturing plants.[5]

Another study looked at the determinants of new plant location in the U.S. by foreign multinational corporations. In this case the effect of environmental stringency was negative but not statistically significant.[6] This literature suggests that, contrary to public opinion, environmental stringency has had little impact on plant location decisions in the United States.

Review of Research on Comparative Advantage and Pollution Intensity in the Global Economy

There have been a number of widely cited studies on international trade flows and environmental stringency. A study by James Tobey looked at the behavior of 23 nations in 1977, testing whether stringent environmental policy caused trade patterns to deviate in commodities produced by the world's "dirty" industries.[7] By matching United States Department of Commerce and EPA data with 3-digit Standard Industrial Classification Codes (SITC), Tobey termed industries as "dirty," or pollution intensive, if direct and indirect abatement costs in the United States were equal or greater than 1.85% of total costs. The pollution-intensive industries that met this standard were Pulp and Paper, Mining, Iron and Steel, Primary Nonferrous Metals, and Chemicals. Tobey went on to create dummy variables ranging from one to seven to measure the level of environmental stringency of a country's environmental policies. The study then regressed net exports on land, labor, capital, natural resources, and environmental stringency. While the hypothesis was that nations with stringent environmental regulations should have a negative coefficient on the measure of environmental stringency, Tobey found that in no case was environmental stringency a statistically significant determinant of net exports.

A later study by World Bank researchers Patrick Low and Alexander Yeats tested whether developing countries gained a comparative advantage in pollution-intensive products relative to developed countries during the period 1965-1988.[8] These researchers used a Revealed Comparative Advantage Model (RCA). RCA is measured by the share of that industry in a country's total exports relative to the industry's share in total world exports of manufactures. The model looked at the RCAs of 109 different countries for pollution-intensive industries. Pollution-intensive industries were those that incurred the highest level of pollution-abatement control in the United States. In this case, the dirty industries were iron and steel, non-ferrous metals, refined petroleum, metal manufacturers, and pulp and paper. The study found that in developing countries the RCAs for these industries were growing relative to those of industrial countries. The authors observed decreases in the developed world and increases in Eastern Europe, Latin America, and West Asia.

Mani and Wheeler found results along these lines in a recent study. They found that, from 1960-1995, pollution-intensive output as a percentage of total manufacturing fell in the OECD and rose steadily in the developing world. However, pollution havens have been transient because economic growth brings "countervailing pressure to bear on polluters through increased regulation, technical expertise, and clean sector production."[9]

Another article that focused on trade between the United States, Japan, Australia, and the Association of Southeast Asian Nations (ASEAN) also used an RCA model to find that dirty product expansion was faster in developing countries. However, a regression analysis in the same article concluded that differences in environmental standards in developing and developed countries were not significant variables influencing these dirty product migrations.[10]

Utilizing a different methodology another World Bank team looked at trade liberalization and the toxic intensity of manufacturing in 80 countries between 1960-1988.[11] These authors define a dirty industry by calculating aggregate toxic releases per unit of output for 37 International Standard Industrial Codes (ISIC) and identify a similar set of heavy polluters: metals, cement, pulp and paper, and chemicals. The World Bank team regressed country growth rates in toxic-intensive industries upon the growth rate in per capita income within the country over the relevant time interval, the log of the initial per capita income at the beginning of each interval, and the Dollar Index (the average annual rate of growth in toxic intensity relative to manufacturing within each country) interacted with growth in per capita income, and dummies for level of openness. They also found that developing countries as a whole had greater toxic intensity growth but that this growth was concentrated in relatively closed, fast-growing economies. Regional work on Latin America has generated similar results.[12] The authors did not rule out, however, that these intensities might have reflected a shift toward a comparative advantage in manufacturing which is generally more capital intensive, and also happens to be more pollution intensive.

A later article criticizes the work of Lucas and others for their classification of dirty industries and their narrow definition of openness. The article, by Michael Rock, regresses the toxic intensity of GDP to income per capita (rough estimates of toxic pollution loads in per unit of GDP for selected countries), income per capita squared, manufacturing share of GDP, energy intensity of GDP, and 4 measures of trade openness. During the period 1973-1985, Rock finds that the more open the trade policy, the greater the pollution intensity.[13]

Empirical Research on Pollution Intensity and Trade with Mexico

Two studies have used different methodologies to test whether Mexico's relatively weak environmental regulations have affected trade flows with the United States. The earlier of

the two studies, by Gene Grossman and Alan Krueger, was widely cited during debates around the passage of NAFTA.[14] These authors tested whether pollution abatement costs in industries in the United States affected imports from Mexico in 1987. Their dependent variable was the ratio of 1987 U.S. imports from Mexico to total U.S. shipments in the same industry. Independent variables were factor shares, U.S. effective tariff rate, and the ratio of pollution abatement to value added in industry. They found traditional determinants of trade and investment patterns to be very important, but the impact of cross-industry differences in environmental costs insignificant and small.

A more recent study looks at U.S. outbound investment between 1982 and 1994 to see if there is a relationship between increasing costs of pollution intensive activities in the United States and the pattern of foreign investment in Mexico, Venezuela, Morocco, and Cote d'Ivoire.[15] Eskelund and Harrison use Direct Foreign Investment (DFI) as their dependent variable, and regress it upon abatement costs, import penetration, the Herfindahl Index (a measure of concentration in each sector), the interaction of these two latter variables, the labor-capital ratio, market size, wages, and a dummy variable for regulatory barriers against DFI. Their study rejects the hypothesis that patterns of U.S. foreign investment in Mexico (and the other nations) are skewed toward industries with high costs of pollution abatement.

Analysis

Is Mexico a haven for pollution intensive industry as a result of NAFTA? The previous discussion shows that the preponderance of evidence indicates that a nation's level of environmental stringency does not affect international trade flows. The few studies that do show a concentration of pollution-intensive industry in regions with lax environmental laws have done so by using the RCA method. When RCA is coupled with regression analysis, allowing control for other economic factors, the relationship between trade liberalization and pollution-intensive industrial concentration is less evident.[16]

Research to date in this area has made great strides in creating a range of methodologies to test the pollution haven hypothesis. Nevertheless, in addition to the troubling task of defining a dirty industry in the world economy, two issues continue to plague this research. One is the use of arbitrary dummy variables for levels of openness and the relative stringency of environmental regulations between nations. The other is the reliance on historical data and large groups of nations to identify general trends rather than the effects of specific nations' trade policies before and after their implementation. In addition, many of these studies have focused on plant migration, rather than the opening of new plants and the expansion of old ones.

Regression analysis is needed and employed here to isolate the effect of NAFTA on the relative levels of economic activity in dirty industries. As the literature described earlier

has pointed out, changes in the pattern of economic activity may be due to non-environmental factors such as a general shift toward capital intensity, or changes in capital, energy, or land prices. Therefore, these and other general economic indicators were considered in the regressions.

This study attempts to circumvent the previously discussed problems by examining pollution intensity in two nations before and after a specific trade policy, NAFTA, was put into effect. In addition, this study will examine the pollution haven effect more fully. By looking at the relative employment levels of clean and dirty industries in the United States and Mexico, we can account for trends in plant migration, the opening of new plants, and the expansion of existing plants.

More specifically, this study looks at employment levels in five "dirty" and five "clean" industries in the United States and Mexico from 1988-1995, five years before and two years after NAFTA went into effect. The aim of the study is to see if NAFTA had any effect on employment in dirty industries in Mexico relative to clean industries in Mexico, and relative to dirty and clean industries in the United States. In essence, has NAFTA caused an increase in the levels of dirty industry operations in Mexico?

The classification of dirty and clean industries in the world economy represents a key assumption in this model. As reflected in the literature review discussed earlier, two methods are most common. The first, used by Tobey and others, identifies pollution-intensive sectors as those which have incurred high levels of abatement expenditure per unit of output in the United States and other OECD countries. This proxy has been used because pollution abatement data are not often available for developing countries. However, it has been criticized. Firms with very high revenues may pollute a great deal, but their percentage of abatement expenditure per unit of output could be very small. A more direct approach selects sectors that rank high on actual emissions intensity. With each method the same five sectors rank high as the world economy's most pollution intensive industries: Iron and Steel, Non-ferrous Metals, Industrial Chemicals, Pulp and Paper, and Non-metallic Mineral Products. These five industries are the dirty industries in this analysis. Using the same classification as above, the five clean industries are Textiles, Non-electrical Machinery, Electrical Machinery, Transport Equipment, and Instruments. The analysis is performed on newly available data from the United Nations Industrial Development Organization (UNIDO).[17]

In employment levels one expects to see a pollution haven effect if it indeed exists. Because the data only allows us to look at the first two NAFTA years, we are looking for the very early signs of change. Again, examining employment levels allows us to examine trends in plant migration, the opening of new plants, and the expansion of old ones. In this short time period, one might expect that the migration of plants or the building of new ones might be very costly or involve time-consuming capital construction. However, it is

relatively cheap to add and subtract workers from plants in a short period. Using data on employment allows us to circumvent some of the problems in earlier studies—mainly that they looked at plant migration alone.[18] This study also looks at the number of establishments in clean and dirty industries in both countries as well. Examining establishment levels provides us with a check on the robustness of the implications of the employment results.

Results

The analysis shows that prior to NAFTA, employment levels in dirty industries were relatively higher in Mexico and employment levels in clean industries were relatively higher in the United States**.** During the NAFTA years, however, employment levels in dirty relative to clean industries showed no significant increase in either country. This leads to the conclusion that NAFTA did not result in a pollution haven effect for employment levels in Mexico. In short, NAFTA did not cause Mexico to become a pollution haven.

The results of this paper may be explained by some to argue that Mexico already was a pollution haven and that NAFTA simply has not changed that. While such an interpretation is possible, this study can shed little light on that conclusion. The possibility that lax environmental regulation in Mexico had already attracted dirty industries warrants future research.

As indicated in the technical appendix, when the number of establishments is used as the dependent variable, NAFTA seems to cause less of a decline in dirty industries relative to clean. Such a result lends support to the pollution haven hypothesis but with puzzling caveats. First, the result disappears by adding wages to the equation. Second, employment grew more in clean than dirty industries during the NAFTA years in Mexico. Nevertheless, this is an area that warrants close attention. More years of data may reveal that the increase in dirty establishments now may represent increases in employment later.

While the model developed for this study may prove to be a useful tool for future tests of specific trade policy on the pollution haven hypothesis, potential weaknesses of the data and the underlying assumptions should be recognized. First, even though the previous studies have used one of the two dirty industry classification methods applied here, both methods have been criticized for leaving out too much and for using OECD environmental standards as proxies. Second, the absence of measures of the level of environmental stringency, and the use of proxies for such variables as land prices, creates the possibility of an omitted variables bias. Third, and perhaps most significant, this study relies on data from a limited number of years. NAFTA went into effect only in 1994. Available data therefore provides only two post-NAFTA years for analysis, both of which were macroeconomic slump years in Mexico. A more compelling result will require more years

of data. Two years of post-NAFTA data only show that nothing happened quickly, hardly a sufficient basis upon which to test the effects of a major trade pact. In addition, more regional, provincial, or statewide data would be useful. While there may not be an economy-wide pollution haven effect in Mexico, there may be "hot spots" where dirty industries are rapidly expanding.

Nevertheless, the model developed here and its findings have important implications for public policy. With more and better data this model can be used to test pollution intensity for NAFTA and can be adapted to analyze other trade agreements. If later research continues to find evidence that disproves a pollution haven effect, the accumulated evidence would indicate that environmental regulations in developed countries do not induce firms to migrate to developing nations. Therefore, arguments against improving environmental regulations in industrialized nations for reasons related to international competitiveness will come into question.

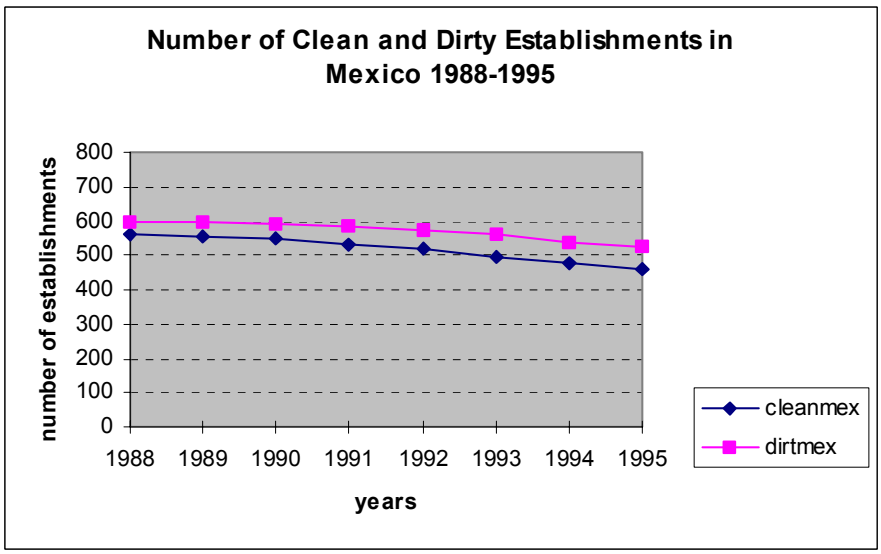
Technical Appendix

While this study used a number of data sources, most of the data used came from the newly available Industrial Statistics Database from the United Nations Industrial Development Organization (UNIDO).[19] The database contains time series data starting with 1981 for approximately 109 countries. The data are arranged according to ISIC code at the 4-digit level. Information in the database is presented by country, year, and industry. It includes number of establishments, employment, wages and salaries, output, value added, gross fixed capital formation, and number of female employees. The data are originally stored in national currency values at current prices. The database allows for data conversion from national currency into current U.S. dollars using the average period exchange rates as given in the International Financial Statistics. Table 1 gives definitions for the variables used in the study.

Table 1: Explanation of Variables Used

VARIABLE	DATA
LNEMPLOYEES	Log of employment levels in each industry grouped by ISIC code, UNIDO
LNESTABS	Log of number of establishments in each industry grouped by ISIC code, County Business Patterns
MEXICO	Dummy variable 1=Mexico, 0= US
CLEAN	Dummy variable, clean industries in both countries previous to NAFTA, 1 = clean Industry, 0=dirty
MEXCLEAN	Interaction of MEXICO and CLEAN in Mexico before NAFTA

NAFTA	Dummy variable 0 = years before NAFTA, 1 = years with NAFTA
NAFTACLEAN	Interaction of NAFTA and CLEAN during NAFTA years
NAFTAMEX	Interaction of NAFTA and Mexico
NAFTAMEXCLEAN	Interaction of NAFTACLEAN and MEXICO
LNAVEWAGES	Log of average wages by industry, UNIDO

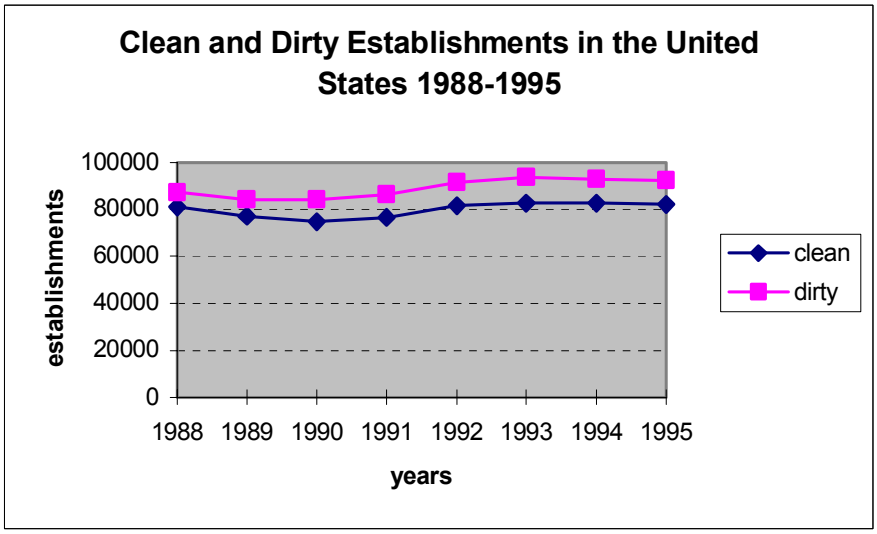


Methodology

Table 2 presents raw data on employment levels each year in each country for the five "dirty" and the five "clean" industries mentioned above. This figure provides an initial indication of the presence of a NAFTA effect. Table 3 presents the data on establishments.

Table 2

Table 3



The graphs in Tables 2 and 3 certainly do not show a relative leap in dirty industry presence in Mexico since NAFTA's passage in 1994. In fact, in both dirty and clean industries employment and the number of establishments seemed to decline in Mexico, and to be fairly constant in the United States.

Regression analysis is needed and employed here to isolate the effect of NAFTA on the relative levels of economic activity in dirty industries. As the literature described earlier has pointed out, changes in the pattern of economic activity may be due to non-environmental factors such as a general shift toward capital intensity, or changes in capital, energy, or land prices. Therefore, these and other general economic indicators were considered in the regressions.

The regression equation used in this study is as follows.
Log(EMPLOYEES) = *B0* + B1MEXICO + *B2*CLEAN + *B3*MEXCLEAN + *B4*NAFTA + *B5*NAFTACLEAN + *B6*NAFTAMEX + *B7*NFTAMEXCLEAN + *B8*LNAVEWAGES + *B9*LNENERGY +*B10*INTEREST + *B11*POPDENS + *Year Dummies* + *Mexico Year Dummies*

If NAFTA has had an effect on the relative levels of employment in clean and dirty industries in Mexico and the United States, some or all of the coefficients the variables NAFTA, NAFTACLEAN, NAFTAMEX, and NAFTAMEXCLEAN would be statistically significant.

To determine employment levels for the post-NAFTA years for clean industries in Mexico one adds the coefficients on CONSTANT, CLEAN, MEXICO, MEXCLEAN, NAFTA, NAFTACLEAN, NAFTAMEX, and NAFTAMEXCLEAN. For dirty industry levels the calculation is conducted by adding CONSTANT + MEXICO + NAFTA +NAFTAMEX.

Similar, simpler calculations are conducted for the U.S. post-NAFTA experience and the pre-NAFTA experience in each country.

Empirical Results

Using data on the five dirty and five clean industries mentioned earlier, and estimates of the basic specification presented in Table 2, this analysis reveals that previous to the passage of NAFTA, Mexico had a relatively higher presence of pollution-intensive industries. As Table 4 indicates however, the first two years of NAFTA do not alter the relationship. When looking at employment data, no early evidence indicates that Mexico has become a pollution haven as a result of NAFTA.

Table 4 - Results of Pollution Intensive Regression Analysis Using Employment Levels[1]

Adjusted Squared Multiple R = 0.83
Number of Observations: 160

Variable	Coefficient	T-Statistic
CONSTANT	12.885	93.663
CLEAN	1.126	5.118
MEXICO	-2.437	-9.967
MEXCLEAN	-1.562	-2.078
NAFTA	-0.067	-3.113
NAFTACLEAN	-0.059	-0.888
NAFTAMEX	-0.425	-3.857
NAFTAMEXCLEAN	0.339	1.230

An initial glance at the results shows that in both countries and in both industries, employment decreased during the NAFTA years. The calculations reveal no significant relative change in dirty industry employment after NAFTA. In fact, weak evidence indicates less of a decline in employment for clean industries in the post-NAFTA years.[2]

When the wages (LNAVEWAGES) are added to the regressions, they significantly influence employment levels. Lower wages were highly correlated with employment levels in each country. Adding this variable causes all the NAFTA interaction variables to lose their statistical significance. Thus, adding this variable does not fundamentally change the results: there is no significant growth in dirty relative to clean industries in Mexico in the post- NAFTA years.[3] The results with LNAVEWAGES included are shown in Table 5.

Table 5: Results of Pollution Intensive Regression Analysis Using Employment Levels and the Log of Average Wages

Adjusted R Square = 0.85

[1] Year dummies were also included in addition to interactions between Mexico and these year dummies. Variables such as capital expenditures, interest rates, and GDP per capita, were included as well, but none were statistically significant and all were omitted from the final specification. The standard errors are robust against heteroskedasticity and auto-correlation.

[2] This study was also used to examine employment levels in a larger set of industries (15), eight dirty and seven clean. The same results show up in that analysis. The new "dirty" industries included are Petroleum Refineries, Petroleum Manufactures and Plastics Manufacturers. The new "clean" industries are Printing and Publishing, Tobacco Manufacturing, Footwear, and Furniture and Fixtures.

[3] The only wage measure constructed is statistically endogenous, thus wage inclusion should be considered with caution. Both sets of results are included.

Number of Observations = 160

Variable	Coefficient	T-Statistic
CONSTANT	20.239	5.165
CLEAN	1.064	4.171
MEXICO	-3.661	-5.435
MEXCLEAN	-1.634	-2.324
NAFTA	0.078	0.999
NAFTACLEAN	-0.055	-0.890
NAFTAMEX	0.038	0.111
NAFTAMEXCLEAN	0.342	1.256
LNAVEWAGES	-0.715	-1.881

While examining the number of employees is probably the best available test of the pollution haven effect, similar regressions can use the number of establishments in each country as the dependent variable. While such an experiment does not allow one to consider the expansion of existing plants, it allows an examination of plant migration and the establishment of new plants. The addition and omission of average wages changes the scope of the results. The results when using the log of the number of establishments with and without the wage variable are presented in Tables 6 and 7.

Table 6: Results of Pollution Intensive Regression Analysis Using Establishment Levels

Adjusted R Square: 0.88
Number of Observations: 160

Variables	Coefficients	T-Statistics
CONSTANT	9.538	25.475
CLEAN	-.2038	-0.370
MEXICO	-4.935	-9.616
MEXCLEAN	-0.209	-0.230
NAFTA	0.022	0.685
NAFTACLEAN	0.024	0.995
NAFTAMEX	-0.136	-3.680
NAFTAMEXCLEAN	-0.065	-2.029

Table 7: Results of Pollution Intensive Regression Analysis Using Establishment Levels and the Log of Average Wages

Adjusted R Square: 0.89
Number of Observations: 160

Variables	Coefficients	T-Statistics
CONSTANT	14.982	2.661
CLEAN	-0.249	-0.433
MEXICO	-5.841	-8.310
MEXCLEAN	-0.262	-0.297
NAFTA	0.131	1.086
NAFTACLEAN	0.276	0.907
NAFTAMEX	0.065	0.136
NAFTAMEXCLEAN	0.219	0.872
LNAVEWAGES	-0.529	-0.972

The results in Table 4 lend some support to the pollution haven hypothesis for Mexico. Although the number of establishments in Mexico declined overall, the number of establishments in clean industries declined further. A credible explanation could be that more dirty establishments could represent more employment in the future. What makes this result puzzling is that the results in Table 2 indicate relative employment growth in

clean industries. Also troubling is that, when the wage variable is introduced, the result disappears.

Notes

[1] Baumol, W. and W. Oates, *The Theory of Environmental Policy*, (New York: Cambridge University Press, 1988).
[2] See Judith Dean, "Trade and the Environment: A Survey of the Literature," *International Trade and the Environment*, ed. Patrick Low, (Washington DC: World Bank, 1992); and Adam Jaffe et al., "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?" *Journal of Economic Literature*, 33 (March 1995).
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[4] Bartik, Timothy, "Small Business Start-ups in the United States: Estimates of the Effects of Characteristics of States," *Southern Economic Journal*, 55, No. 4 (April 1989), 1004-18.
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[7] Tobey, James, "The Effects of Domestic Environmental Policies on Patterns of World Trade" *Kyklos* 43, no. 2 (1990), 191-209.
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[11] Lucas, Robert, David Wheeler, and Hemamala Hettige, "Economic Development, Environmental Regulation, and the International Migration of Toxic Industrial Pollution, 1960-1988," *International Trade and the Environment*. ed. Patrick Low, (Washington DC: World Bank, 1992).
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[14] Grossman, Gene and Alan Krueger, "Environmental Impacts of a North American Free Trade Agreement," in *The US - Mexico Free Trade Agreement*, ed. Peter Garber, (Cambridge: MIT Press, 1993).
[15] Eskelund, Gunnar and Ann Harrison, "Moving to Greener Pastures: Multinationals and the Pollution Haven Hypothesis," World Bank Policy Research Paper #1744, (Washington DC: World Bank, 1998).
[16] Abimayu, Anggito, "Impact of Free Trade on Industrial Pollution: Do Pollution Havens Exist?" *ASEAN Economic Bulletin*, 13, no. 1 (July 1996).
[17] United Nations Industrial Development Organization (UNIDO), *Industrial Statistics* (Geneva: UNIDO, 1998).
[18] Jaffe, 132-163.
[19] UNIDO.