Senior Project
Department of Economics

" Citizens or Consumers:
The effect of Public and Private Regulation on the Environment"

Brandon Shields

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Advisors: *Francesco Renna*

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Abstract

As the environment becomes an increasing part of the government narrative and an increasing portion of the budget, we as people must ask ourselves how can we best affect environmental policy: as consumers or citizens? The growing amount of private regulation, such as ISO 14001 permits, prompted me to look at if the government was receiving credit for pollution reduction that was actually being done in the private sector. In order to test this, I ran two regressions on a cross-country data set, one accounting for just government regulations and another accounting for government and private regulation. If the government regulations only proved significant in reducing air pollutants in the absence of private regulation, then I could reasonably assert that the government was in fact being credited with pollution mitigation occurring in the private sector. I found that the results were dependent on the pollutant chosen. My hypothesis was supported for per capita SF_6 emissions but was not supported for per capita NO_x emissions. The results indicate that government may in fact, in some areas, being given credit for what is being done in the private sector in terms of pollution reduction. Additional research in this area is required in order to answer the question consumer or citizen.

Introduction:

The protection of the environment has become an increasingly important issue that both national governments and the international community have attempted to address. The international community, through the United Nations, has made many attempts to establish worldwide environmental standards through treaties and conferences. While the Montreal Protocol was successful in eliminating CFCs that deplete the ozone in 1987, the Kyoto Protocol has failed to slow the growth of greenhouse gases (Barrett 2007). International treaties and laws regarding environmental regulation often are not effective because of too many exemptions related to economic conditions, sovereignty infringement, and the lack of a regulatory enforcer. Thus, often, individual nations regulate themselves, the cost of which has been increasing yearly. For example, the United Kingdom spent £3.3 billion on environmental protection in 1996 and spent £13.2 billion in 2009 (Yousif 2007). Of course, government regulation has its own problems regarding efficiency, enforcement, and effectiveness.

While these may seem like the only options, there is a third option: the private sector. The private sector can impose the costs of regulation upon themselves through what are known as IS0 14001 permits. The goal of these permits is to "provide practical tools for companies and organizations looking to identify and control their environmental impact and constantly improve their environmental performance" (International Standardization Organization). External bodies then issue permits only to those who have met the ISO 14001 standards. Companies would self-impose this cost only if it reflected consumer preferences for the environment. Thus, this poses the question as to who is truly driving the reduction in pollution emissions: the private sector or the public sector?

The focus on this paper will compare how government regulations and ISO 14001 permits affect environmental damage within the context of trade theory. I will measure environmental damage, which will be measured by SF6, NOx, and other greenhouse gas (OGHG) emissions. Of course, ISO 14001 permits will also be used to explain environmental damage. While studies by Prakash and Potoski (2006) looked at how FDI affects the amount of ISO 14001 permits, there has not been extensive research on ISO 14001 permits on environmental damage. These permits are becoming increasingly popular among firms. Data from the World Development Indicators shows that around 14,000 were issued in 1999 as compared to 240,000 in 2010.

The demand for these permits can be most easily understood within the context of the Environmental Kuznets Curve (EKC). The EKC hypothesis states that environmental degradation will increase as economic development (wealth) increases until it reaches a maximization point. From that point as wealth or income increases, environmental degradation decreases. This forms an inverted U-shape, and the decrease in environmental damage as income increases can be explained under the idea that the environment is a normal good. Thus, people with higher incomes can demand better environmental quality as either consumers or citizens.

As citizens, they can demand that their government implement environmental regulations aimed at reducing pollution or as consumers reward companies that are environmentally conscious. Companies' adoption of ISO 14001 permits is an indication that consumers reward companies who are environmentally friendly. Government regulations on the environment can increase due to citizen preferences, but political strategic behavior can have the opposite effect of decreasing regulations in order to be more business-friendly. The increasing prevalence of these permits makes them a necessary topic of study in order to truly understand the relationship between the public and private sector and their effects on reducing environmental damage. I hypothesize that while governments receive credit for pollution reduction, the private sector is more responsive to consumers' demands due to direct participation and lack of a principal agents problem and thus is the actual driver behind pollution reduction.

Literature Review

The Environmental Kuznets Curve has always been the foundation of describing the relationship between income and pollution (Shafik 1994, Grosmann and Kreuger 1995). However, it began to be criticized for failing to account for the effects of trade. Cole and Matthew (2003) decided to test the overall robustness of the EKC and to what extent trade shapes the relationship between income and pollution. They hypothesized that the relationship between trade and the environment in the context of the EKC is determined by a country's characteristics since it is these that determine whether or not a country will specialize in pollution-intensive production. Cole's analysis supports the theoretical notion of the EKC, where the estimated relationship between per capita income and emissions is robust across the variety of functional forms utilized. Cole et Matthew (2003) also find that the impact of trade patterns on pollution emissions tends to be small, thus discrediting the pollution heaven hypothesis. Results demonstrate "growth can facilitate the required legislation and investment to help reduce per capita emissions of some pollutants" (Cole et al. 2003).

However, many economists remain skeptical of the EKC's existence, including David Stern (2003), who argues that the proper evidence is not there. He cites theoretical problems and econometric problems as the reason why evidence for the existence should be scrutinized. Theoretically, he argues that trade is a determining factor behind the relationship and that the relationship depends on the relative growth of an economy versus its growth in technological innovations. Econometrically, he argues that the fixed effects such as those done by Cole and Matthew (2003) are not as helpful as tests that control for problems of endogeneity. Furthermore, a lack of data with developing nations and an increasing amount of these countries starting to regulate pollution much earlier means the picture of the EKC is incomplete.

Stern's (2003) critique would be seriously addressed by Frankel and Rose (2005), who used the gravity model as an instrument variable (IV) in order to sort out causality. They acknowledge that the effect of trade is theoretically ambiguous as openness can lead to the race-to-the-bottom hypothesis or the gains-from-trade hypothesis. Frankel and Rose attempt to address the problem that trade may be simultaneously determined with income and environmental outcomes. They find income to be too endogenous since both trade and environmental regulation may affect income; thus they use factor accumulation variables as IVs in order to control for this endogeneity. The results of the ordinary least squares (OLS) and two-stage least-squares (2SLS) regressions showed that the coefficient for openness was negative for all three kinds of air pollutants (SO2, NOx, CO). This suggests that the gains-from-trade effect outweighed the race-to-the-bottom effect.

While Frankel and Rose concluded that the pollution haven effect did not play a significant role in trade flows, their research did not look at industry-specific data and thus results may have been driven by the fact that they used aggregate data. Ederington, Levinson, and Minier (2004) capitalize on this limitation by examining compositional effects at an industry level, as they believe industry composition is the direct effect of trade liberalization. The main way Ederington et al. (2004) test this hypothesis is by running a regression of United States imports (economic activity) on a set of industry characteristics. Among these variables, they include an interaction of trade restrictiveness (defined as the average tariff rate) with the average abatement cost for industry *i*. Results from their econometric analysis suggested that polluting industries were not sensitive to changes in environmental regulations, and thus the pollution haven problem was not exacerbated, which echoes Frankel and Rose's findings that the gain-from-trade effect outweighed the pollution haven hypothesis.

Previous research always looked at trade openness between individual nations; it ignored how popular regional trade agreements (MERCOSUR, NAFTA) affected the environment between member nations. This was addressed by Khan and Yoshino (2004), who looked at imports and specific industries in the context of regional trade agreements (RTA). The authors predicted that because RTA members have a reduction in the ad valorem tariff between member nations, this would mitigate cost differences due to environmental regulation. Thus, any differences in pollution intensity would not be due to the pollution haven hypothesis, but rather to the factor endowment hypothesis. The authors also hypothesized that under the pretext that richer nations have more stringent environmental regulations, they would import more dirty goods as opposed to exporting them. Their results showed that middle-income nations had the largest dirty export elasticities in comparison to their clean good exports, since they are likely to have more capital than poorer countries and less stringent environmental regulations than higher-income nations.

While trades relationship has been extensively analyzed in context with the EKC, more recently, government regulation relationship has been studied as well. Work by Markyanda, et al (2006) examined how government regulations affect the shape of the EKC curve and sought to determine the turning point for each individual nation. They measure regulations as combined national and international policies that occurred at specific time periods throughout European history. They ran a fixed effect model where SO2 emissions were used as the measure of environmental damage over a span of 120 years. They found statistically significant evidence that suggested that government environmental regulations do decrease the amount of SO2 pollution. The regulations shift the inverted U-curve to the left or right, but in most cases, it was to the left, implying that the turning point will occur sooner with regulation.

While regulations by law decrease pollution emissions, the Porter hypothesis suggests that regulations also spur environmental innovation that leads to a decrease in pollution reduction in more efficient ways. This was studied by Kneller and Manderson (2013), who looked at UK manufacturing data from 2000 to 2006. They tested to see if the porter hypothesis was statistically significant. They used a GMM estimation model, measuring environmental innovation in terms of R&D and integrated environmental protection. Their results showed that increased regulation stimulated environmental innovation, but a positive impact was not observed.

All the aforementioned research always looked specifically at government regulation. However, in the mid-90's, an environmental management certification became popular called ISO14001. This international certification is not required by firms, but rather is self-imposed. Prakash and Potoski (2013) investigate whether trade and environmental quality has an effect on the amount of ISO 14001 permits. Prakash and Potoski hypothesize that ISO 14001 adoption rates will be less in countries more structurally dependent on exports (race-to-the-bottom) or adoption rates will be higher in countries whose major trading partners have adopted ISO 14001. Using OLS and a model where the dependent variables was the amount of ISO certification in country *j* during time *t*, explained by export dependence, bilateral trade weighted ISO adoption, and SO2 emissions, Prakash and Potoski did not find evidence in support of the race-to-the-bottom hypothesis. They instead concluded that trade can be used as a way to spread ISO 14001 certification. However, this study did not take into account endogeneity, and thus their results should be understood with that implication in mind.

Methodology

This study will use a model very similar to the one presented by Frankel and Rose (2005). The theoretical model on the following page is a visual representation of the causal relationship between trade, GDP, and the environment, which showcases the problems of endogeneity. Two major forces drive the theoretical model: trade and income. Income can either directly affect pollution through the scale effect, where an increase in the size of the economy will lead to a proportioned increase in the amount of pollution. Income also affects pollution through the technique effect due to regulation. Due to the environment being a normal good, an increase in income leads to increase demand for the environment, which can manifest itself through either public or private regulation. Private regulation measured by the ISO 14001 permits are not impacted by the scale effect in my model because I have normalized the GDP and ISO 14001 permit data.

The other major component of the theoretical model is trade. The literature surrounding trade and the environment focuses on three main theories of pollution reduction: the pollution haven hypothesis, factor endowment, and gains from trade. In terms of government regulations, the pollution haven hypothesis predicts that countries with many environmental regulations will have less capital-intensive industries, which will create pollution "havens" in countries with fewer regulations. The factor endowment theory says that countries with a comparative advantage in capital-intensive goods will pollute more than those with a comparative advantage in labor. Finally, the gains from trade theory states that as income increase, the demand for the environment, a normal good, will increase, and pollution will decrease. Thus wealthier nations will have less pollution per capita than developing countries.

These theories do not apply the same way to the ISO 14001 permits, which directly reflect consumer preferences. For example, the pollution haven hypothesis is not consistent with ISO 14001 permits; if the firm is regulating itself, it does not matter where it is located in the world since the permits are international and self-imposed. As to the factor endowment theory, companies would not regulate themselves if the cost were to be so high that it diminished their competitive advantage. Thus, the ISO 14001 permits explain pollution reduction through gains of trade; income determines preferences, which determines the level of pollution from one country to another.

I will be running a standard OLS regression with the understanding of its limitations. The model I have presented suffers from dual causality, a major violation of the OLS technique. I attempted to account for this where possible by lagging the trade variable "Open" and the income variable. I will first estimate the empirical model with only the measurement of government regulation and then run the same equation with the measure for private regulation. I will then compare the significance of government regulations between both equations and the significance of private regulation.

I will estimate the following cross-country equations:

$$(1)\ EnvDam = \beta_0 + \beta_1 income00_i + \beta_2 income200_i + \beta_3 GovRegs_i + \beta_4 Open00 + \beta_5 Polity_i + \beta_6 Oil_i + e_i$$

$$(2)\ EnvDam = \beta_0 + \beta_1 income00_i + \beta_2 income200_i + \beta_3 GovRegs_i + \beta_4 IP_i + \beta_5 Open00 + \beta_6 Polity_i + \beta_7 Oil_i + e_i$$

It is important to make note that unlike most of the literature, I am not logging the dependent variable or the income variables. Original EKC curves did not log these variables, and the reason is because negative pollution is not possible unless one is considering a forestation. The reason for my linear-linear model is that I cannot log my "GovRegs" variable because it is an index. Thus in order to be consistent amongst the variables, I chose not to take the natural log. The Description of the Variables can be seen in the Appendix 2B. The expected signs can be found on Appendix 3C.

Data

The dependent variable will be three different airborne pollutants: SF6, NOx and a compilation of Other Greenhouse Gases (OGHG). The environmental Kuznets Curve suggests that the relationship between income and environmental damage is an inverted U shape; thus I will have an income and income squared terms measured as PPP controlled GDP per capita. I also use a relatively new measure for regulations (GovRegs), which surveys CEOs, the details of which are in the table in Appendix 2B. Kellenberg (2009) was the first to suggest the use of this data as a better measurement of government regulation. ISO 14001 permits were also normalized (IP), and the variable "Open" allows us to see the effects of ISO 14001 certifications and government regulations in the context of trade. I will measure the openness of each country using the standard measure of (X+I)/(GDP). Furthermore, I will control for how democratic nations are, which reflects the probability that the government reflects the desires of citizens. I will also control for current and former OPEC nations who tend to have high per capita income due to large amounts of oil wealth and small populations. The Descriptive Statistics can be found on Appendix 4D.

Results:

A table of the results can be seen in Appendix 5E. However, due to the small coefficients, I calculated the elasticities for each variable which can be seen on Appendix 6F. Looking first at SF6 emissions without regressing "IP," all the variables are statistically significant. The negative sign on trade supports the gains-from-trade theory, while the negative sign on the "income200" supports the shape of the inverted U-curve. Appendixes 7G -9I show graphs for all three pollutants where "incomme00" is plotted against the pollutant. The negative sign in front of the policy variable suggests that the more democratic a population nation is, the less likely the nation is to pollute, while the positive sign in front of "popdens" intuitively suggests that an increase in population density increase pollution emissions. The variable of interest is significant and negative at the 90% confidence interval. An increase in the "GovRegs" by 100% (the variable was scaled by 100) will decrease SF6 emissions by 2.22% metric tons of CO2 equivalent per person. This value is statistically significant, yet notice when we run the same regression with IP permits, "GovRegs" is no longer significant while "IP" is statistically significant, where increasing ISO 14001 permits per capita by 100% decreases SF6 emissions by .26% metric tons of CO2 equivalent per person. This shows that the private sector is more effective at mitigating pollution and, furthermore, that credit given to the government is inappropriate.

NOx emissions and OGHG emissions both have negative signs in front of the "income200" terms both with and without "IP" however, with no statistical significance, they do not support the inverted-U shape of the EKC. While openness was not significant in either regression of NOx, it was for OGHG; the sign was negative, which supports the gains-from-trade hypothesis. In the case of NOx, "GovRegs" were not significant when ran with or without "IP." However, "IP" was extremely significant, where an increase in 100% ISO 14001 permits per capita will decrease per capita NOX emissions by .18% metric tons of CO2 equivalent per person. For OGHG, "GovRegs" were not significant in either regression, and neither was "IP."

Conclusion and Limitations:

In determining whether the government in receiving credit for pollution reduction that truly belongs to the private sector, I received three different answers for three different pollutants. My hypothesis was supported in the case of SF6 emissions where government regulations were initially significant, but once regressed with Iso 14001 permits, they were no longer significant. ISO 14001 permits were, in fact, significant, which suggests that the gains from trade theory is the motivating force behind pollution emissions; this was further evidenced by the fact the openess was negative and significant. In the cases for NOx and OGHG emissions the null hypothesis was supported since government regulations were not significant without the ISO 14001 permits. Bearing that in mind, the ISO 14001 permits were significant in reducing pollution, with NOx emissions suggesting the gains-from-trade theory was at work, but this was not supported by a significant trade openness value. OGHG emissions, on the other hand, had a negative and significant trade variable, which does support the gains-from-trade as opposed to the pollution haven hypothesis, but neither government nor private regulation was significant in explaining pollution emissions. The OGHG may not have responded well with the ISO 14001 permits due to broadness. Since the compilation is so broad and ISO 14001 permits broadly cover any air pollution, it may be difficult to find a statistically significant causal relationship. I also calculated the turning point for SF6, NOx, and OGHG, which were $43,789, $44,347, and $75,806 respectively. These numbers are extremely high, as most research points to per capita income being around $8,000 for a turning point. These numbers are questionable but do not nullify my results. However, the evidence provided by the SF6 emissions has many possible policy implications, the most evident being that if the private sector can mitigate pollution more effectively than the public sector, governments may consider relying more on the private sector for this function while they can more effectively and efficiently allocate funds to more pressing public goods, something the private sector struggle to deliver. We must continue research into this topic, which until now has been relatively ignored.

As aforementioned, this study suffers from problems of endogeneity regarding income. This could be solved in further research by implementing the 2SLS technique, specifically using the gravity trade model and technique developed by Frankel and Rose (2005). This would allow the researcher to step outside the realm of correlation and into causality. Another limitation of this study is that it only looks at one measure of environmental damage. Additional air pollutants could be analyzed such as air particulates or other measures of environmental damage such as the biological oxygen demand or energy use. While difficult to find, comprehensive data on government investment into environmental regulation would be the most accurate way to determine the role of government. This also would allow me to make direct comparisons with ISO14001 permits since I cannot log the current index measure of government regulations. Another possible alteration to this study would be to use the sum of emissions over a span of time as opposed to one only one year; some economists in the field have argued that this will yield better results. What is clear is that ISO 14001 permits are increasing in popularity and have what might be a measurable impact on pollution reduction. Trying to conquer these limitations is critical in recognizing how trade and ISO 14001 permits (private regulation) determine the level of pollution in a given nation.

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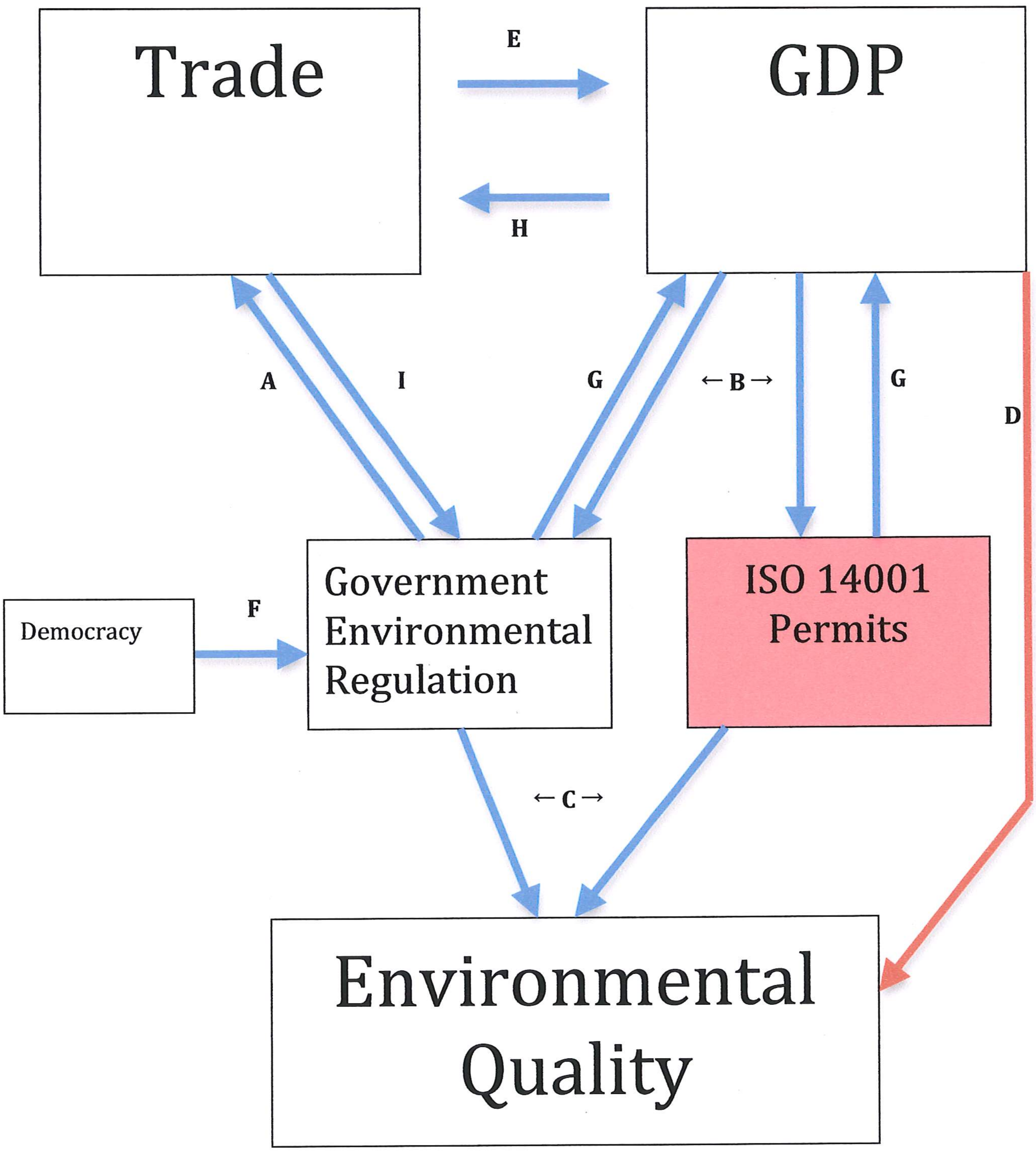
APPENDIX 1A



A – Pollution Haven Effect
B – Environmental Quality is a normal good
C – Technique Effect
D – Scale Effect / EKC
E – Gains From Trade
F-Type of gov. reflects ability to reflect citizen's pref.
G-Effect of regulation on productivity
H-reverse causality form income to trade
I-Pollution Haven Effect

APPENDIX 2B

DATA DESCRIPTION

Variable	Description	Source
SF6	Thousands of metric tons of CO2 equivalent per capita scaled by 100	2012 World Development Indicators
NOx	Thousands of metric tons of CO2 equivalent per capita scaled by 100	2012 World Development Indicators
OGHG	Thousands of metric tons of CO2 equivalent per capita scaled by 100	2012 World Development Indicators
PopDens	Population per square mile	2012 World Development Indicators
Income00	PPP controlled per capita GDPO in $I for 2000	Penn world Tables
income200	(income)*(income)	Penn World Tables
GovRegs	How stringent is your country's environmental regulation? (1 = lax compared to most countries, 7 = among the world's most stringent) in 2008	Travel and Tourism Competiveness Report
Polity	An index where 10 = full democracy and -10 equals full autocracy.	Polity IV Project
IP	Per capita ISO 14001 in 2008	United Nations Environment Programme
Open	Trade % of GDP in 2000	2012 World Development Indicators
Oil	Where 1 = current or former OPEC nation	OPEC Website

APPENDIX 3C

Expected Signs

Variable	Expected Sign	Explanation
Income00	$0<\beta$	Inverted U shape of the EKC Curve
income200	$0>\beta$	Inverted U shape of the EKC Curve
GovRegs	$\beta<0$	The purpose of Government Regulations is to decrease pollution
Polity	$\beta<0$	The more democratic, the more likely to reflect the environmental demands of citizens.
IP	$\beta<0$	ISO 14001 Permits are designed to decrease environmental impact to reflect consumer preferences
Open	$\beta\neq 0$	The negative sign suggest the Gains-from-Trade theory while a positive sign supports the pollution haven hypothesis
Oil	$\beta>0$	A control variable but OPEC nations tend to be developing nations with lax environmental standards.
PopDens	$\beta>0$	The more people per square mile implies more pollution per square mile

APPENDIX 4D

Descriptive Statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
income00	175	8.9575189	10.8948622	0.3087400	55.5429000
GovRegs	122	3.9319672	1.0273344	2.3000000	6.4000000
Open00	166	87.6053860	49.3197529	20.3060448	371.8242436
Polity	150	4.2533333	6.1526299	-10.0000000	10.0000000
popdens	175	178.2870533	557.3884581	1.7170074	6913.43
SF6pc	123	0.0013549	0.0031121	0	0.0179096
NOxpc	123	0.0599867	0.0525577	0.0095532	0.3121718
OGHGpc	123	0.0143113	0.0232664	0	0.1129440
IP	137	0.000041707	0.000078850	4.4195779E-8	0.000485702

APPENDIX 5E

Results

[*t-value*]

Determinants of Air Pollution Concentration						
Determinant		W/O IP			W/ IP	
	SF6	Nox	OGHG	SF6	Nox	OGHG
Intercept	0.0299	0.0241	0.018	0.00193	0.00733	0.01594
	[1.62]	[0.89]	[1.57]	[1.28]	[0.23]	[1.21]
Income00	0.00038	0.00124	0.002	0.00043	0.00204	0.00235
	[3.00]	[1.07]	[4.14]	[3.33]	[1.51]	[4.12]
Income200	-5E-06	-8E-06	-1E-05	-5E-06	-2.3E-05	-1.6E-05
	[-1.91]	[-0.44]	[-0.94]	[-2.24]	[-0.97]	[-1.38]
GovRegs	-0.0008	0.00559	-0.004	-0.0005	0.00968	-0.00395
	[-1.78]	[0.64]	[-1.38]	[-1.04]	[0.97]	[-1.33]
IP	N/A	N/A	N/A	-8.7739	-139.448	-17.8241
	N/A	N/A	N/A	[-2.40]	[-1.83]	[-.76]
Open00	-1.3E-05	-4E-05	-8E-05	-1E-05	-1.8E-05	-7.7E-05
	[-2.02]	[-0.31]	[-2.17]	[-1.74]	[-0.16]	[-1.88]
Polity	-0.00012	0.00124	-8E-05	-1E-04	0.00145	-5.1E-05
	[-2.24]	[2.02]	[-0.43]	[-1.82]	[2.16]	[-.16]
Oil	0.00224	-0.0156	-0.005	0.00214	-0.01715	-0.00507
	[1.79]	[-1.82]	[-1.4]	[1.76]	[-1.95]	[-1.45]
PopDens	6.64E-07	-1E-05	6E-06	3.52E-07	-1.2E-05	5.62E-06
	[1.81]	[-1.83]	[3.82]	[1.80]	[-1.91]	[3.78]

APPENDIX 6F

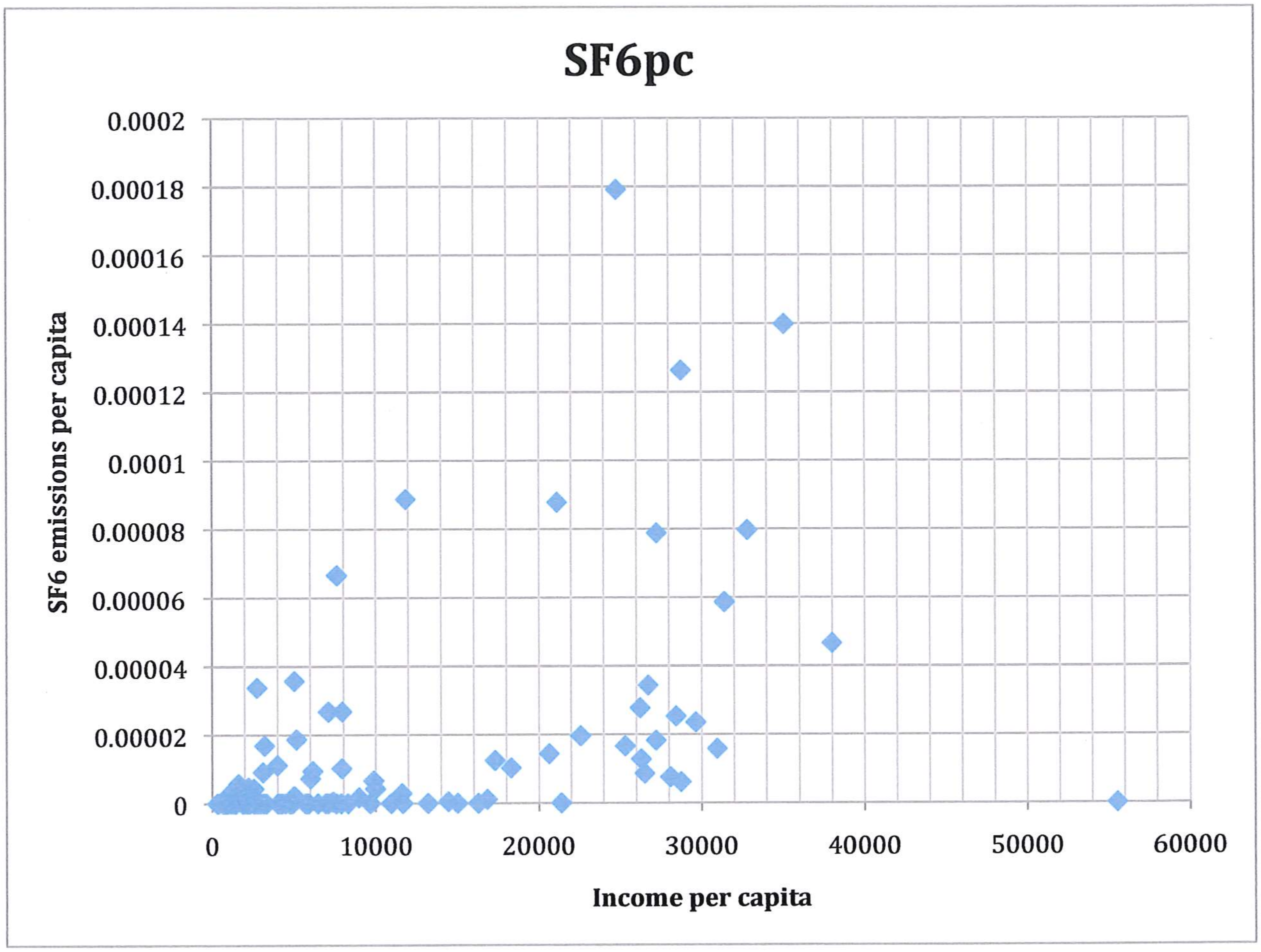
Results-Elasticities

[t-values]

Determinants of Air Pollution Concentration						
Determinant	W/O IP			W/ IP		
	SF6	Nox	OGHG	SF6	Nox	OGHG
Intercept	0.0299	0.0241	0.018	0.00193	0.00733	0.01594
	[1.62]	[0.89]	[1.57]	[1.28]	[0.23]	[1.21]
Income00	2.44286	0.18393	1.43	2.733635	0.3026	1.493929
	[3.00]	[1.07]	[4.14]	[3.33]	[1.51]	[4.12]
Income200	-0.03214	-0.0012	-0.009	-0.031214	-0.00341	-0.00985
	[-1.91]	[-0.44]	[-0.94]	[-2.24]	[-0.97]	[-1.38]
GovRegs	-2.22857	0.36335	-1.245	-1.514147	0.6292	-1.10036
	[-1.78]	[0.64]	[-1.38]	[-1.04]	[0.97]	[-1.33]
IP	N/A	N/A	N/A	-0.263216	-0.18361	-0.53472
	N/A	N/A	N/A	[-2.40]	[-1.83]	[-.76]
Open00	-0.81343	-0.0517	-0.494	-0.733963	-0.02602	-0.48017
	[-2.02]	[-0.31]	[-2.17]	[-1.74]	[-0.16]	[-1.88]
Polity	-0.36857	0.08887	-0.024	-0.292584	0.103917	-0.01558
	[-2.24]	[2.02]	[-0.43]	[-1.82]	[2.16]	[-.16]
Oil	0.00224	-0.0156	-0.005	0.00214	-0.01715	-0.00507
	[1.79]	[-1.82]	[-1.4]	[1.76]	[-1.95]	[-1.45]
PopDens	8.44E-02	-0.0344	0.072	0.04	-0.03584	0.071454
	[1.81]	[-1.83]	[3.82]	[1.80]	[-1.91]	[3.78]

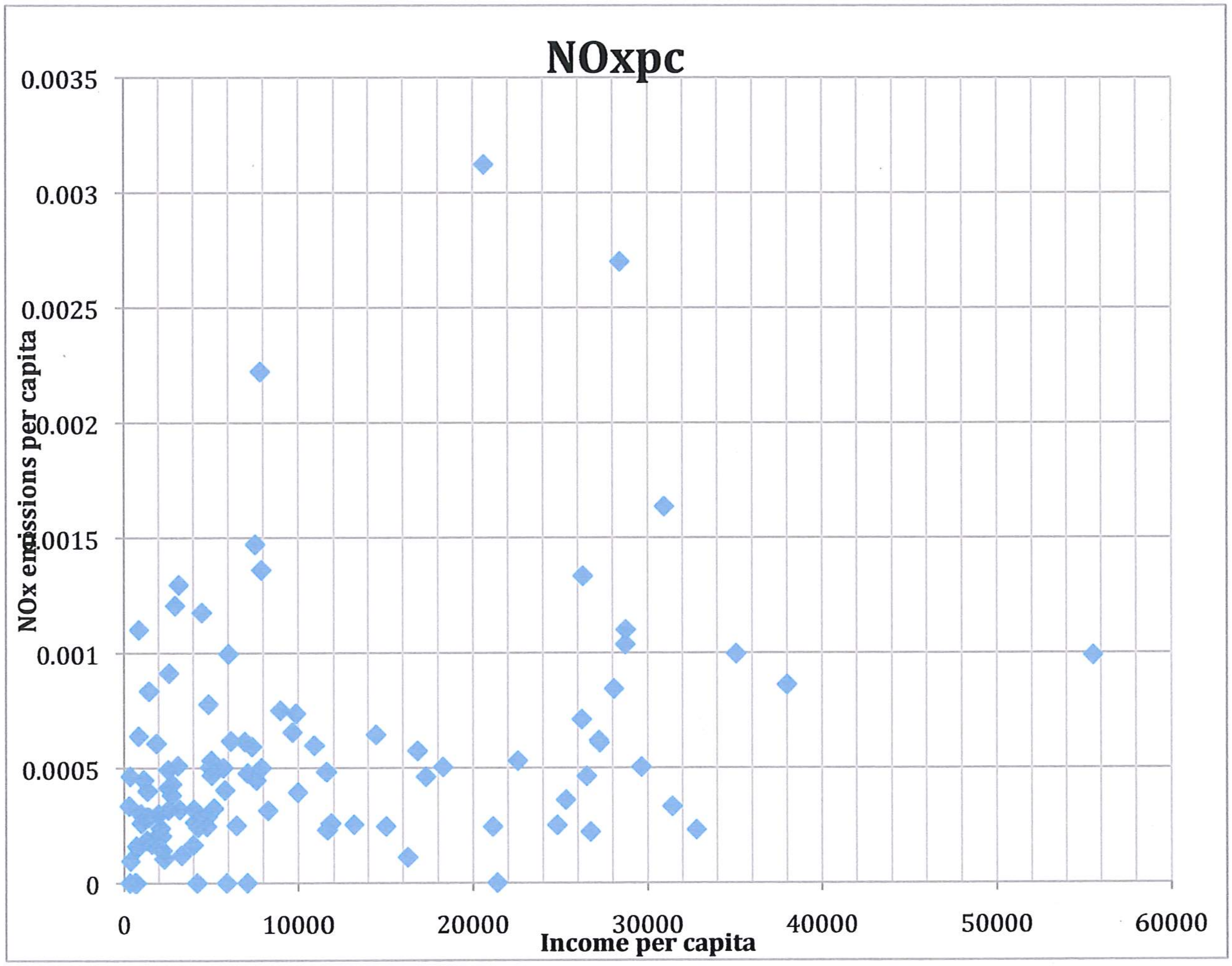
APPENDIX 7G

The Effect of Income on SF6 Emissions



APPENDIX 8H

The Effect of Income on NOx Emissions



APPENDIX 9I

The Effect of Income on OGHG Emissions