Do Quality Institutions Lead to Quality of Life?
The Drivers of Environmental and Public Health Outcomes

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ABSTRACT

What factors determine the environmental and quality of life conditions that exist in different regions of the world? What factors can explain how these conditions evolve through time? This paper empirically examines the answers to these questions, focusing on the link between economic freedom, its impact on institutional formation, and environmental quality. Compiling a new panel data set that encompasses years of environmental and public health outcomes for 130 countries, we utilize fixed-effects methods to understand the channels in which economic freedom can lead to a cleaner and healthier environment. Our results show that economic freedom manifests itself in better contracting institutions, which then correlate with positive health and environmental outcomes. We also find that lack of economic freedom correlates with poorer political institutions in general, leading to worse environmental and public health outcomes. These results are robust to different control sets and specifications.

JEL Classification: N5, P5, Q2

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I. Introduction

How does economic freedom impact environmental and public health outcomes? It appears that there could be no greater question in economics, as the discipline remains the science of scarcity and the efficient utilization of resources in a world of unlimited wants. More importantly, human action towards the natural world may be mediated or facilitated in different ways, depending upon the organization of the economic system and its prevailing institutions. Whereas some economic arrangements may promote efficient usage of natural resources and a smaller footprint, other institutional arrangements may encourage waste, degradation, and leave a much more harmful imprint on the natural world. Thus, institutional arrangements and how they alter the incentives for resource utilization are an important but somewhat under-researched area in economics.

Fifteen years ago, we (Coursey and Hartwell [2000]) examined this relationship between economic organization and environmental outcomes, using various discrete measures for economic organization that focused on the idea of economic freedom: that is, rather than looking at the outcomes of a specific economic arrangement, we chose to look at the inputs that could account for the institutional make-up of a country. Examining 130 countries from 1960-92, we found that, by nearly every environmental and public health indicator, greater economic freedom led to better outcomes. Indeed, for most metrics, we could discern an environmental Kuznets Curve (EKC), where improvements in economic freedom initially corresponded with worse environmental outcomes, but the highest levels of freedom unequivocally correlated with much better outcomes. The strongest correlations between freedom and environmental improvement occurred in metrics such as access to sanitation, metal intensity, electrical cleanliness, and life expectancy, with the only real aberration being CO2 emissions (following Yandle *et. al's* [2000] theory of differential impact of local versus dispersed pollutants), which seemed to grow linearly with economic freedom.

In the intervening years since this original analysis, the economics discipline has refined its understanding of the interactions between institutions, economic freedom, and economic outcomes (including *inter alia* de Haan and Sturm [2000], McMullen *et. al* [2008], Williamson and Mathers [2011], and Hartwell and Coursey [2015]). In particular, the examination of institutions has made important strides, including in the theoretical basis of institutions (Hodgson [2006]) and quantification of various economic institutions (Hartwell [2013], Bashir and Xu [2014]), enabling us to understand better the channels in which various institutional arrangements can impact environmental, as well as economic, outcomes. Once an afterthought to the distribution of environmental outcomes around the world, institutions have rightly moved to the front of the debate on how to ensure environmental protection and public health.

The purpose of this paper is to further develop the work done in our earlier research, building on recent advances in institutions to see if the relationships regarding institutions and environmental and health improvements hold for a much longer time-series and for much more specific institutions. The underlying hypothesis of this work, as in our earlier papers, is that institutions can have a demonstrable impact in environmental outcomes, and in particular institutions that facilitate economic freedom should lead to better environmental outcomes. Our belief, supported theoretically by papers such as Coase (1937), is that property rights in particular, as an important

facet of economic freedom, will create the basis for competition and a "race to the top" in resource utilization. For this paper, we focus on one specific type of institution, contracting institutions, as encapsulated in the constraints on the executive, to better understand the effect such an economic institution would have on environmental outcomes. Drawing on advances in the literature on institutions, as well as including robust macroeconomic and structural controls and controlling for endogeneity, we find that the correlation between economic freedom and better environmental and public health outcomes remains strong.

The contribution of this paper to the literature is many-fold. In the first instance, this paper continues a rich strain of research into the economic drivers of environmental outcomes but hones in on contracting institutions from the point of view of political arrangements (thus going beyond Kerekes [2011]). Secondly, this paper takes a much longer historical look at environmental outcomes and institutions than other papers, involving nearly 165 years of data for some of our environmental variables. Finally, this research, while only preliminary, opens the door to much more differentiated work in the area of different types of pollution and the various ways in which institutions could impact air pollution versus water pollution.

The rest of the paper is as follows: the next section presents our theoretical basis for the relationship between various types of institutions and environmental and public health outcomes, while Section III explains the empirical strategy and the data. Section IV presents the results of our econometric modeling, while Section V concludes with some recommendations derived from the analysis.

II. A Model of Institutional Influence

How would institutions influence the development of environmental and public health outcomes? In the first instance, it would be helpful to narrow down what is meant by "institutions," as this will help to isolate the various channels of influence that they have in this sphere. North's (1990:3) famous definition of institutions as the "rules of the game… or, more formally, humanly devised constraints" is often taken as a guide on "how to spot an institution," and it remains useful shorthand for understanding the make-up of institutions within a country framework. Indeed, starting from such a simple definition, we can easily make the leap to environmental outcomes, as rules (both formal and informal) regarding the treatment of resources or the environment (including human life) should play a large role in determining the use of these resources. Even where there are not explicit rules regarding environmental tenets, humanly devised constraints in the form of institutions may have second-order effects that impact the environment or public health, or there may be environmental rules that are less effective than non-environmental ones in affecting outcomes.

Of course, not every institution affects environment and health outcomes in the same manner, and it is more useful for our purposes to explore the different types of institutions and their impact. Hartwell (2013) built on North's (1990) work to delineate three separate types of institutions with a country institutional system:

- *Political*: Institutions pertaining exclusively to the distribution of political power in a society and its exercise;
- *Economic*: Institutions pertaining to the distribution and usage of resources in a society and the economic outcomes resulting thereof; and
- *Social:* Institutions not explicitly concerned with political power or economic incentives but geared towards behavior and norms outside these spheres

In addition, institutions may also be formal, in that they are codified in law and are widely accepted within a country's boundaries, or they may be informal, existing outside of the formal legal system or relying on moral suasion or other mechanisms for enforcement. By separating out these different types of institutions, we can begin to understand that different institutions would have the ability to influence incentives of actors in an economic system, altering behavior that could have an impact on the natural world, albeit in a differentiated manner. For example, most social institutions have injunctions to respect nature but have little power of sanction, apart from the aforementioned moral suasion, meaning that improved environmental outcomes may be less likely to occur. On the other hand, formal political institutions can offer sanctioning mechanisms, generally through the legal system, against pollution or, alternately, offer prescriptions for technology to minimize pollution before it is created.

In fact, much of the literature regarding the institutional drivers of environmental outcomes fixate on political institutions, perhaps due to the (neo)classical example from every college student's first economics class of "market failure." In the Econ 101 example, the environment is a public good, as the dispersal of costs of pollution mean that they are not borne by any one polluter and thus there is a tendency to over-pollute. In order to correct this "market failure," an oversight institution, in particular a dispassionate and incredibly sophisticated government, would be needed to correct the distribution of costs and remove the negative externality. Empirical analyses from Cole *et. al* (2005) and Halkos and Paizanos (2013) have lent credibility to this theoretical idea, showing that greater regulation and greater government spending is necessary for controlling pollutants and thus reducing externalities. Although they do not tackle the institutional issue explicitly, it is implicit in these analyses that a stronger government, able to impose legal diktat on private businesses, is the preferred economic arrangement to improve environmental outcomes across the board. Additionally, it can be argued that political institutions are an ideal mechanism for communicating environmental preferences, as political parties often have a strong stance one way or another on various facets of environmental regulation; in a more open political system, political institutions can translate these preferences into policy and then reality.

However, this assumption of a benevolent-yet-omniscient government clashes with the reality of government institutional design, where competing agencies have their own incentives, bureaucrats have rarely a fraction of the information needed to accurately ascertain costs, and silo mentalities mean that regulations and taxes are levied in isolation from each other. Given this reality, the presence of more regulations and stricter laws may not necessarily lead to environmental improvements (although they may lead to much larger government); as an example, calls for massively increased regulations to reduce CO2 emissions have seen the US Environmental Protection Agency balloon up to where it now employs over 17,000 people and administers regulations spread over 32 printed volumes, while at the same time environmental

improvements have slowed from their fast-paced changes of the 1960s, before much environmental regulation in the US was ever created (Goklany 2007). Moreover, from an economic standpoint, it is unlikely that such a voluminous amount of regulations can create better environmental outcomes even in an effective bureaucracy (especially when one thinks of the paper involved in printing the regulations) when considered against the costs of such regulation. Simply put, political institutions could improve environmental outcomes if they were able to increase the availability of information regarding costs, create a means of redress against the aggression of pollution, and alter incentives towards better utilization of resources. In far too many instances, government agencies are not designed for such an institutional mission.

This reality means that there are perhaps other institutions beyond explicitly political ones that can internalize externalities. The most promising hypothesis on such institutions comes from Coase (1937) concerning contracting institutions, and in particular property rights, as property rights would theoretically mitigate pollution by creating both incentives against pollution and a legal basis for one to seek damages from the polluter. Moreover, the ability to own natural resources creates incentives to economize on resource usage during production, lowering costs in order to raise profits. While property rights may show some difficulties in addressing all environmental outcomes (especially in air pollution, where property rights are more difficult to delineate, see Kerekes (2011)), it would appear that economic institutions may offer a clearer path to improved environmental outcomes than social or political institutions.

Ironically, however, it is often the interplay of economic and political institutions that determines the extent of a country's property rights. In particular, countries with large governments, typified in an unconstrained executive, rarely have well-protected property rights, as governments powerful enough to implement their every whim do not suddenly reverse themselves at private property (Weingast [1995], Levinson [2010]). Thus, more constrained executives would correlate with higher property rights, and should, in turn, lead to better environmental outcomes. Indeed, previous empirical work from Congleton (1992), Barrett and Graddy (2000), and Lamla (2009) have confirmed that political indicators have a direct influence on pollution levels, as their indirect influence on the development of other institutions in an economy impacts environmental efficiency. This idea, of a constrained executive allowing for property rights, is also in line with earlier theoretical and empirical exercises that link economic freedom writ large with better environmental outcomes.

Although not a direct overlap with the idea of contracting institutions, they are two sides of the same coin: in the first instance, economic freedom, as measured in commonly-available indices such as the Heritage Foundation's Index of Economic Freedom, often contains property rights as a crucial component, meaning that a country that is by definition economically free has secure property rights. Secondly, property rights and secure contracting institutions are often also the consequence of economically free societies or, to put it another way, once the executive is constrained, property rights institutions may then arise. The distance between the constraints on the executive and the creation of formal property rights is economic freedom. Finally, property rights are often conceived of in a narrow sense, especially in relation to environmental outcomes, usually exclusively concerned with land and land usage. When one expands the remit of property rights to include the disposal of or management of any resource, as well as the additional supporting institutions that are necessary, we bring in additional facets of economic freedom

such as right to trade and the judiciary. Thus, property rights and economic freedom often reflect similar attributes of an economy and its institutional make-up, with property rights one portion of economic freedom and freedom writ large also encompassing supporting institutions for property rights.

Bringing in the broader idea of economic freedom also allows us to understand more channels in which better contracting institutions may improve the environment. The first additional channel regards information, in that more economically open societies should be able to harness the superior abilities of the market in disseminating and coordinating information relating to the relative scarcity of resources. If imperfect information, especially regarding costs, is associated with environmental usage, freer countries economically should be able to alleviate this asymmetry somewhat and disperse needed knowledge. Secondly, we believe that freer countries will be characterized by more competition, which in turn will lead to greater innovation among industries in order to conserve scarce resources; in line with the assertion above that ownership of a resource creates a greater incentive to conserve it, so too will the presence of others who are attempting to utilize that resource in production. Of course, this relationship is unlikely to be linear, as open economies can realistically be assumed to see perhaps higher levels of materials usage in opening stages of development, tapering off as technological innovation takes over from materials accumulation (following the Environmental Kuznets Curve (EKC) hypothesis, see Grossman and Kruger [1993] and more recent work from Dasgupta *et. al* [2002] and Carson [2010]). But on average, we should expect to see higher levels of freedom characterized by higher levels of property rights and higher levels of cleanliness.

III. Empirical Strategy and Data

In order to extend our earlier analysis and attempt to relate contracting institutions to environmental and public health outcomes, for this paper we model environmental outcomes as a function of economic freedom, macroeconomic variables, and time (to capture microeconomic and technological advances not captured in the freedom or macroeconomic variables). The original model as it appeared in Coursey and Hartwell (2000) was rather simple, shown as:

$$(1)\ Y_{it} = \alpha MACRO_{it} + \beta FREEDOM_{it} + TIME_i + \varepsilon_{it}$$

Where Y was the specific environmental and public health outcome in question, MACRO referred to the matrix of macroeconomic controls, FREEDOM was captured using Freedom House's civil liberty index, and TIME was a simple time dummy to capture trend and technological effects.

For this more in-depth exercise, the basic structure shown in Equation 1 has been augmented to encompass several other possible determinants of environmental outcomes, as well as our institutional variables of interest:

$$(2)\ Y_{it} = \alpha MACRO_{it-1} + \gamma STRUCTURE_{it-1} + \beta INSTITUTIONS_{it-1} + \varepsilon_{it}$$

Where all independent variables are lagged one year in order to attempt to alleviate simultaneity and endogeneity issues.

The panoply of environmental and public health outcomes that are utilized as the Y variable are, with minor exceptions, similar to those in our original work (Table 1). As in Coursey and Hartwell (2000), we focus on "materials-use intensity" indicators (as in Bernardini and Galli [1993], Jalas [2002]) to capture environmental efficiency, on the theory that materials usage gives a much better sense of the economic utilization of resources over gross output; that is, resources are undoubtedly going to be utilized in economic processes, but using them wisely without unnecessary waste and in the most efficient manner possible will be a hallmark of an environmentally-friendly system. Intensity is defined here (as originally in Malenbaum [1978] and more recently in West *et. al* [2014]) as the "apparent consumption" of a particular good (production plus imports less exports) per unit of GDP, in order to capture the amount of a material needed to satisfy an additional unit increase in national income. More efficient countries would need less of a particular resource in order to achieve the same increase.

Table 1 – Environmental and Public Health Outcomes: the Y Variables

Indicator	**Definition**	**Source**
Access to Safe Water	% of the population with reasonable access to an adequate amount of water from an improved source (household connection or protected well or spring)	World Development Indicators (WDI)
Access to Sanitation	% of the population with at least adequate access to disposal facilities that can effectively prevent contact with human waste	WDI
CO2 Emissions	Total CO2 Emissions Excluding Land-Use Change and Forestry, in metric tons	World Resources Institute (WRI) CAIT Climate Data Explorer
"Cleanliness"	Total CO2 emissions in kilo tons divided by total electric output, in kilowatts	Author's calculations from WRI, Datamonitor, and WDI data
Coal Intensity	Coal Consumption + Imports - Exports /GDP (Constant 2000 US$)	Author's calculations from Datamonitor and WDI data
Electrical Intensity	Electrical Power Consumption + Imports - Exports /GDP (Constant 2000 US$)	Author's calculations from Datamonitor and WDI data
Gas Intensity	Natural gas consumption + Imports - Exports/ GDP (Constant 2000 US$)	Author's calculations from Datamonitor and WDI data

The MACRO vector, as used in our original paper in 2000, focused on a few select macroeconomic and demographic determinants of pollution, following the trend of growth regressions in vogue at the time (building on Barro [1991] and continuing through Levine and Renelt [1992] and Fischer [1993], among many others). The three most prominent controls we utilized were: log of per capita GDP, with higher levels of income tending to be associated with lower levels of pollution (Selden and Song [1994]); secondary school enrollment, to proxy for the fact that a more-educated populace would likely demand higher environmental outcomes

(Martins *et. al* [2004]); and population density, which we used as a proxy for urbanization and geographical dispersion, which could either increase the impact of human activities in a smaller area and increase pollution or perhaps create economies of scale in pollution abatement (making pollution easier to clean).

Borrowing from recent advances in the determinants of environmental quality (see especially Fuchs [2003] and Gassebner, Lamlay, and Sturm [2010]), for this paper we extend these variables (as in Hartwell and Coursey [2015]) to include various attributes of the structure of the economy (STRUCTURE in Equation 2) that could also influence broader environmental and public health outcomes. Specifically, we include value-added to GDP from agriculture (on the basis that water pollution might be increased in the presence of higher-intensity agriculture); value-added to GDP from manufacturing (similarly, air emissions should increase with higher levels of heavy industry); and trade intensity or openness, defined as total exports + imports over GDP (on the basis of evidence that trade may have some effect on pollution, see Copeland and Taylor [1995]).

The biggest advance here, however, regards the core of our hypothesis, and that is the manner in which we measure institutions. In particular, our original work utilized Freedom House's civil liberty index, which ranks rule of law, human rights, and personal autonomy and economic rights on a scale of 1 to 7 (with higher values corresponding to more freedom). While this index was useful in 2000 to show the effects of various extreme measures of freedom or repression over the time period in question, the scale also brought together countries that had very different levels of environmental regulation under the same heading. Moreover, its aggregation across types of institutions made it very difficult to understand the exact channels of influence which positive environmental outcomes emerged from; was it rule of law that drove better usage of coal? Or were economic rights the main factor? Moreover, this indicator did not allow for the various institutional gradations between similar countries, as both the US and France were ranked the same, although the two have very different approaches to environmental regulation, property rights, and executive constraints.

Following off our theoretical discussion above, our preferred indicator for capturing property rights is the Polity IV "executive constraints" indicator. Coded from 1 to 7, higher values correspond with more constraints on a country's executive, mainly as seen in checks and balances and the existence of other political actors that can restrain the executive from operating as he or she wishes. Used most prominently in the economics literature in Glaeser *et al.* (2004) and in the political science literature in Li (2009), the executive constraints indicator may be taken as a proxy for government ability to expropriate, as executives with many restraints are often too busy pushing against the legislature and judiciary to make overt moves towards property rights (although this is not always the case). In regards to the environment, constrained executives should mean that property rights are better protected and there should be better quality supporting institutions, both of which can translate "constantly evolving environmental preferences" into action "more quickly in an open regime" (Coursey and Hartwell 2000:4). The Polity IV indicator also has the advantage of an incredibly long time-series, with some countries having an uninterrupted ranking back to 1815.

As a check on the executive constraints indicator, we will also include various alternative measures of property rights; taking a more nuanced view of freedom than was available at the time of our first publication, we will include the Freedom House Index, the Fraser Economic Freedom of the World Index (Gwartney *et. al* [2014]) and the Heritage Foundation's Index of Economic Freedom, both of which have substantial recent coverage but limit our historical view somewhat.

In terms of the chosen estimator, the exigencies of our dataset and the interactions expected between institutions, macroeconomic variables, and environmental/health outcomes calls for a sophisticated econometric approach. Our earlier work utilized both a pooled OLS and a fixed-effects specification, but advances in econometrics and the difficulties in panel data argue for a reappraisal of this approach. For this examination, for the shorter time-series indicators (including the public health outcomes), we will use a fixed-effects estimator with robust standard errors, clustered at the country level to deal with heteroskedasticity. But where we have a longer time-series available (with an average *t* dimension over 50 years), a trait present in some of the environmental indicators, we instead utilize a panel fixed-effects estimator (OLS) with Driscoll-Kraay (D-K) standard errors. The advantage of D-K standard errors is that they allow for correcting for heteroskedasticity and serial correlation, as well as the spatial correlation that is likely to be present in such an examination of environmental outcomes (Anselin 2001).[1] As a check on these results, and given the possibility of endogeneity bias in the results that cannot be corrected via use of lags, we utilize an alternate set of factor endowments (as in Cole and Elliott [2003]) in place of macroeconomic variables. Such an approach obviates the need for dynamic panel estimation, given the exogeneity of such endowments in our models; moreover, the long time-series available here makes over-proliferation of instruments a real problem in a system-GMM framework, even with collapsed instruments.

The data for this estimation covers approximately 195 countries over a shifting window from 1850 to 2010, although not every dependent variable is available for every year/country pair and most control variables are only available from 1960 onward. Macroeconomic variables and the factor endowment of land/population come from the World Bank's World Development Indicators for 1960 onward, while labor/capital endowments are derived from the Penn World Tables for 1950 onward; additional macroeconomic control variables will eventually be obtained from the Cross-National Time Series database, which has an extensive-yet-basic complement of macroeconomic attributes going back as far as 1816.

IV. Results

Tables 2 and 3 show the results of the fixed-effects econometric estimation of the relationship between economic freedom and economic institutions on the one hand and public health (Table 2) and environmental outcomes (Table 3) on the other. The first issue we can see is the wide variation in coverage of the different institutional/freedom indicators: in particular, the Fraser series has about half the coverage of the Heritage Foundation, and a third of the contract-intensive money and Freedom House indices. This reality causes some issues with the estimations, as we will see below.

[1] Other routine diagnostics regarding stationarity were also carried out via a Phillips-Peron test, robust to serial correlation and including a trend. All variables were found to be stationary.

Leaving this statistical issue aside, the picture that is painted by the results has vivid green colors. Table 2 shows that by nearly every metric of freedom or institutional quality (with the puzzling exception of the Fraser Institute), more freedom leads to better access to clean water. On the other hand, access to sanitation is largely driven by other metrics, although, somewhat oddly, increases in property rights and in the Fraser measure of freedom are negatively and significantly correlated with access to sanitation. We surmise that either the effects captured by the various indicators are very different (in that the Fraser and property rights indicators reflect facets of freedom not amenable to increased sanitation access), or, simply, that greater property rights means better but more exclusive latrines.

The results are less ambiguous when it comes to our environmental intensity indicators (Table 3), where cleanliness and intensity of consumption in coal and gas improves as freedom and contracting and rule of law institutions improve.[2] While executive constraints has little impact with the materials-use indicators, interestingly, the Y variable with the longest time-series, CO2 emissions by metric ton, shows a strong negative correlation with executive constraints; simply put, it appears that, historically, property rights lead to less overall emissions. Turning to the other metrics, electricity intensity seems to show deterioration no matter which metric is utilized, apart from civil liberties, which could be capturing a more holistic view of a country's institutional system than the other variables of freedom.[3] A possible reason for this result is that countries can have extensive economic freedom in other spheres, but still have highly regulated state monopolies in electric generation and supply.

As a final check against these results, and to guard against endogeneity of the macroeconomic variables, I select the significant environmental regressions from each Y variable and substitute endowment data instead of macroeconomic variables (Table 4). This Table, similar to Hartwell and Coursey (2015), we believe will show the persistent influence of property rights and economic freedom writ large, even in the face of factor endowments.

V. Concluding Remarks

These results show that higher levels of economic freedom continue to be associated with better environmental and public health outcomes, while the results for property rights specifically (as proxied by executive constraints) are much more ambiguous. Using more nuanced indicators for freedom and economic institutions, we can ascertain that freedom does indeed have environmental rewards, although (as in Doucouliago and Ulubasoglu [2006]) the results are sensitive to which measure of "freedom" and which institutional indicator is utilized. When this work is complete, we believe that it will continue to show a stronger association with property rights, although the limitations of data for some intensity indicators require more research.

[2] Given that these intensity indicators measure the amount of X consumed versus output of GDP, negative signs imply less use of a resource per $ of output and are thus more desirable.

[3] An alternate measure of political freedom, the Polity IV democracy/autocracy indicator, was used (not reported) and showed similar results as civil liberties.

We believe the implications of this research continue to point the way towards alternative solutions to increased government involvement in environmental protection, along the lines of Khanna (2001) and in a market-based manner. In fact, smaller governments and increased property rights combined with supporting institutions (encapsulated in supporting institutions) appear to be the key factors for environmental improvement. In a policy sense, the way forward for environmental policymaking appears to be concentrating on improving property rights and limiting the power of the state, rather than expanding it.

REFERENCES

Anselin, L. (2001). Spatial effects in econometric practice in environmental and resource economics. *American Journal of Agricultural Economics*, 83(3), pp. 705-710.

Barrett, S., and Graddy, K. (2000). Freedom, growth, and the environment. *Environment and development economics*, 5(4), pp. 433-456.

Barro, R. J. (1991). Economic Growth in a Cross Section of Countries. *The Quarterly Journal of Economics*, 106(2), pp. 407-443.

Bashir, M. F., and Xu, C. (2014). Impact of Political Freedom, Economic Freedom and Political Stability on Economic Growth. *Journal of Economics and Sustainable Development*, 5(22), pp. 59-67.

Bernardini, O., and Galli, R. (1993). Dematerialization: long-term trends in the intensity of use of materials and energy. *Futures*, 25(4), pp. 431-448.

Carson, R. T. (2010). The environmental Kuznets curve: seeking empirical regularity and theoretical structure. *Review of Environmental Economics and Policy*, 4(1), pp. 3-23.

Clague, C., Keefer, P., Knack, S., and Olson, M. (1997). 'Institutions and Economic Performance: Property Rights and Contract Enforcement,' in Clague, C. (ed.), *Institutions and Economic Development*. Baltimore: Johns Hopkins Press.

Cole, M.A., and Elliott, R.J.R. (2003). Determining the trade-environment composition effect: the role of capital, labor and environmental regulations. *Journal of Environmental Economics and Management*, 46 (3), pp. 363-383.

Cole, M. A., Elliott, R. J., and Shimamoto, K. (2005). Industrial characteristics, environmental regulations and air pollution: an analysis of the UK manufacturing sector. *Journal of Environmental Economics and Management*, 50(1), pp. 121-143.

Congleton, R. D. (1992). Political institutions and pollution control. *Review of Economics and Statistics*, 74(3), pp. 412-421.

Copeland, B. R., and Taylor, M. S. (1995). Trade and transboundary pollution. *American Economic Review*, 85(4), pp. 716-737.

Coursey, D.L, and Hartwell, C.A. (2000). *Environmental Outcomes and Openness: A Historical and International Comparison*, Working Paper No. 0010, Harris School of Public Policy Studies, University of Chicago.

Dasgupta, S., Laplante, B., Wang, H., & Wheeler, D. (2002). Confronting the Environmental Kuznets Curve. *Journal of Economic Perspectives*, 16(1), pp. 147-168.

De Haan, J., and Sturm, J. E. (2000). On the relationship between economic freedom and economic growth. *European Journal of Political Economy*, 16(2), pp. 215-241.

Doucouliagos, C., and Ulubasoglu, M. A. (2006). Economic freedom and economic growth: Does specification make a difference? *European Journal of Political Economy*, 22(1), pp. 60-81.

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics*, 32(3), pp. 485-512.

Fuchs, D. A. (2003). *An Institutional Basis for Environmental Stewardship*. Amsterdam: Springer Netherlands.

Gassebner, M., Lamla, M.J., and Sturm, J-E. (2010). Determinants of Pollution: What Do We Really Know? *Oxford Economics Papers*, 63(3), pp. 568-595.

Glaeser, E. L., La Porta, R., Lopez-de-Silanes, F., and Shleifer, A. (2004). Do institutions cause growth?. *Journal of Economic Growth*, 9(3), pp. 271-303.

Goklany, I. (2007). *The Improving State of the World: Why We're Living Longer, Healthier, More Comfortable Lives on a Cleaner Planet.* Washington DC: Cato Institute.

Gwartney, J., Lawson, R., and Hall, J. (2014). *Economic Freedom of the World: 2014 Annual Report*. Fraser Institute. http://www.freetheworld.com/2014/EFW2014-POST.pdf

Halkos, G. E., and Paizanos, E. A. (2013). The effect of government expenditure on the environment: An empirical investigation. *Ecological Economics*, 91(1), pp. 48-56.

Hardin, G. (1968). The tragedy of the commons. *Science*, *162*(3859), pp. 1243-1248.

Hartwell, C.A. (2013). *Institutional Barriers in the Transition to Market: Explaining Performance and Divergence in Transition Economies.* Basingstoke: Palgrave Macmillan.

Hartwell, C.A. and Coursey, D.L. (2015) Revisiting the environmental rewards of economic freedom. *Economics and Business Letters*, 4(1), pp. 36-50.

Hodgson, G. (2006). What Are Institutions? *Journal of Economic Issues*, 40(1), pp. 1-25.

Jalas, M. (2002). A time use perspective on the materials intensity of consumption. *Ecological Economics*, 41(1), pp. 109-123.

Kerekes, C. B. (2011). Property Rights and Environmental Quality; A Cross-County Study. *Cato Journal*, 31(2), pp. 315-338.

Khanna, M. (2001). Non-mandatory approaches to environmental protection. *Journal of Economic Surveys*, 15(3), pp. 291-324.

Lamla, M. J. (2009). Long-run determinants of pollution: A robustness analysis. *Ecological Economics*, 69(1), pp. 135-144.

Levine, R., and Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *American Economic Review*, 82(4), pp. 942-963.

Levinson, D. J. (2010). Parchment and politics: the positive puzzle of constitutional commitment. *Harvard Law Review*, 124(3), pp. 657-746.

Li, Q. (2009). Democracy, autocracy, and expropriation of foreign direct investment. *Comparative Political Studies*. 42(8), pp. 1098-1127.

Malenbaum, W. (1978). *World Demand for Raw Materials in 1985 and 2000*. New York: McGraw-Hill.

Martins, M. C. H., Fatigati, F. L., Vespoli, T. C., Martins, L. C., Pereira, L. A. A., Martins, M. A., and Braga, A. L. F. (2004). Influence of socioeconomic conditions on air pollution adverse health effects in elderly people: an analysis of six regions in Sao Paulo, Brazil. *Journal of Epidemiology and Community Health*, 58(1), pp. 41-46.

McMullen, J. S., Bagby, D., and Palich, L. E. (2008). Economic freedom and the motivation to engage in entrepreneurial action. *Entrepreneurship Theory and Practice*, 32(5), pp. 875-895.

North, D. (1990). *Institutions, Institutional Change, and Economic Performance*. Cambridge: Cambridge University Press.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Rode, M., and Coll, S. (2012). Economic freedom and growth. Which policies matter the most? *Constitutional Political Economy*, 23(2), pp. 95-133.

Selden, Thomas M. and Song, Daqing (1994). Environmental Quality and Development: Is There a Kuznets Curve for Air Pollution? *Journal of Environmental Economics and Management*, 27(2), pp. 147-62.

Weingast, B. R. (1995). The economic role of political institutions: market-preserving federalism and economic development. *Journal of Law, Economics, & Organization*, 11(1), pp. 1-31.

West, J., Schandl, H., Krausmann, F., Kovanda, J., and Hak, T. (2014). Patterns of change in material use and material efficiency in the successor states of the former Soviet Union. *Ecological Economics*, 105, pp. 211-219.

Williamson, C. R., and Mathers, R. L. (2011). Economic freedom, culture, and growth. *Public Choice*, 148(3-4), pp. 313-335.

Yandle B, Vijayaraghavan M, Bhattarai M (2000). "The Environmental Kuznets Curve: A Primer," The Property and Environment Research Center, available on-line at: http://www.perc.org/articles/article688.php.

Table 2 – Public Health Outcomes as a Function of Freedom and Institutions

	Access to Safe Water				**Access to Sanitation**			
	FE	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**
INSTITUTIONAL VARIABLES								
Executive Constraints	0.02				-0.01			
	*2.18**				*2.84***			
FREEDOM VARIABLES								
CIVIL		0.004				0.001		
		*1.78**				*0.47*		
Heritage IEF			-0.01				0.005	
			1.39				*0.58*	
Fraser EFW				-0.06				-0.05
				*7.58***				*4.58***
MACRO CONTROLS								
GDP	-1.38	0.01	0.003	-0.05	1.44	0.009	-0.00001	0.09
	*2.00**	*1.69**	*0.52*	*7.08***	*2.37**	*1.03*	*0.00*	*16.65***
Schooling	0.05	0.001	0.0006	0.0005	0.10	0.001	0.001	0.001
	*4.79***	*8.36***	*7.80***	*5.07***	*9.38***	*9.23***	*11.68***	*10.82***
Industry	0.09	0.02	0.01	0.002	0.08	0.03	0.02	0.02
	*3.88***	*6.79***	*4.55***	*0.49*	*4.17***	*6.33***	*5.37***	*3.41***
Agriculture	-0.08	-0.001	-0.002	-0.007	-0.05	-0.002	-0.004	-0.004
	*2.88***	*6.04***	*7.26***	*17.91***	*1.85**	*6.87***	*12.92***	*8.35***
Openness	-0.85	-0.01	-0.003	-0.01	-0.37	0.002	0.003	-0.05
	*1.69**	*2.56***	*0.85*	*3.09***	*0.67*	*0.56*	*0.67*	*8.16***
Trend	0.43	0.004	0.004	0.004	0.27	0.007	0.005	0.005
	*14.33***	*24.13***	*15.36***	*14.11***	*11.16***	*21.80***	*12.70***	*16.70***
C	-765.4	4.39	4.52	5.13	-502.64	4.21	4.32	3.78
	*13.60***	*92.00***	*86.44***	*88.97***	*10.93***	*64.40***	*50.71***	*78.69***
N	2031	1691	1095	511	2005	1651	1081	502
within R-squared	0.97	0.93	0.92	0.82	0.99	0.93	0.94	0.79

*Note: absolute values of t-stats are under the coefficients, with * signifying significance at the 10% level and ** at the 1% level. All independent variables included at their lags.*

Table 3 - Environmental Outcomes as a Function of Property Rights and Freedom

	CO2 Emissions	**"Cleanliness"**				**Coal Intensity**				**Electrical Intensity**				**Gas Intensity**			
	D-K	**D-K**	**D-K**	**D-K**	**D-K**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**
INSTITUTIONAL VARIABLES																	
Executive Constraints	-0.75	0.004				-0.005				-0.01				-0.0001			
	*2.54**	*1.21*				*1.55*				*0.53*				*0.80*			
FREEDOM VARIABLES																	
CIVIL			-0.02				0.01				-0.08				-0.02		
			*1.95**				*0.57*				*3.50***				*0.74*		
Heritage IEF				-0.02				-0.53				0.24				-0.48	
				0.56				*5.18***				*4.42***				*5.21***	
Fraser EFW					-0.14				-1.09				0.19				-0.16
					*2.90***				*7.98***				*1.70**				*0.97*
MACRO CONTROLS																	
GDP	489.17	-1.81	-0.48	-0.46	-0.81	-0.48	-0.35	0.77	-0.95	-1.06	-0.54	-0.97	-0.57	0.00	-0.40	-0.58	-0.85
	*5.41***	*5.07***	*14.53***	*10.94***	*26.78***	*2.26**	*5.85***	*9.48***	*7.50***	*2.72***	*10.97***	*9.98***	*4.89***	*0.03*	*5.45***	*5.90***	*5.35***
Schooling	-2.15	-0.02	-0.0004	-0.002	-0.0001	0.02	0.01	0.007	0.01	-0.03	0.008	0.002	0.006	0.0001	0.008	0.005	0.003
	*2.20**	*1.92**	*1.16*	*2.25**	*0.29*	*2.55**	*9.47***	*5.25***	*5.33***	*2.87***	*8.54***	*2.27**	*3.86***	*4.32***	*7.91***	*7.07***	*3.31***
Manufacturing	-2.06	0.02	0.01	0.05	0.06	0.01	0.26	0.21	0.25	0.06	0.15	0.10	0.35	-0.001	0.36	0.21	0.36
	*3.01***	*1.24*	*0.63*	*2.17**	*2.45**	*0.82*	*6.44***	*3.11***	*2.86***	*3.69***	*4.70***	*2.70***	*5.94***	*1.89**	*6.47***	*3.49***	*3.74***
Agriculture	1.43	-0.04	0.01	0.001	0.01	0.02	0.009	-0.01	-0.05	0.001	-0.005	-0.008	-0.03	0.001	0.004	-0.08	-0.05
	1.63	*4.40***	*4.22***	*0.31*	*5.64***	*1.29*	*3.72***	*1.61*	*6.77***	*0.00*	*2.68***	*2.49**	*5.70***	*2.60***	*1.19*	*1.80**	*6.14***
Openness	6.61	-0.29	0.05	0.05	-0.01	0.07	0.06	-0.35	0.23	-0.10	0.06	0.02	-0.02	0.002	-0.03	-0.05	-0.67
	0.25	*0.45*	*2.43**	*1.76**	*0.32*	*0.29*	*1.33*	*5.59***	*3.30***	*0.22*	*2.46**	*0.43*	*0.36*	*0.98*	*0.60*	*0.95*	*9.16***
Trend	-1.29	-0.22	-0.03	-0.03	-0.02	-0.01	-0.01	0.03	0.01	0.38	0.03	0.04	0.04	-0.0005	0.03	0.03	0.05
	0.62	*9.96***	*27.53****	*22.38***	*15.11***	*1.41*	*2.52**	*7.39***	*3.10***	*27.95***	*15.28***	*13.47***	*11.17***	*0.44*	*12.83***	*8.89***	*14.19***
C	-933.05	457.25	3.04	2.97	5.38	23.68	-1.73	3.64	6.47	-762.90	2.71	4.79	3.05	0.09	-10.06	-5.80	-5.01
	0.26	*10.21***	*9.89***	*7.82***	*23.60***	*1.48*	*2.96***	*4.60***	*6.74***	*28.47***	*2.87***	*4.92***	*2.70***	*0.45*	*15.72***	*6.85***	*4.11***
N	3286	2980	1755	1116	522	1276	1192	788	377	2442	1222	797	364	1190	1062	717	341
within R-squared	0.20	0.619	0.53	0.56	0.62	0.11	0.08	0.05	0.25	0.75	0.61	0.59	0.82	0.09	0.33	0.11	0.15

Table 4 – Property Rights/Freedom and Environmental Outcomes, Alternate Controls

TBD