Are left-wing party strength and corporatism good for the environment?

Evidence from panel analysis of air pollution in OECD countries

This version: December 2003

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Abstract. The effect of left-wing party strength and corporatism on air pollution levels in up to 21 OECD countries over the period 1980 or 1990 to 1999 is tested with both fixed-effects and random-effects estimators. Controlling for scale, composition, technique as well as aggregate time effects, robust evidence is found that parliamentary green/left-libertarian party strength is associated with lower pollution levels. The rise of ecologically oriented parties has thus had a real impact on air pollution levels. Traditional left-wing party strength is possibly also associated with lower pollution levels, but the evidence is less consistent and robust. Combined left-wing party strength in government is possibly associated with higher pollution levels, but this result is also far from robust and is practically small. No evidence is found for a consistent systematic impact of corporatism on pollution levels.

Keywords: Green parties, ecological parties, left-libertarian parties, corporatism, environmental policy

1. Introduction

Do countries with a stronger representation of traditional and green/libertarian left-wing parties in parliament and government have lower environmental pollution levels? Do countries with a more corporatist structure of society and economy have less pollution? It is often suggested that the answer to both questions is yes, but existing empirical analyses suffer from important drawbacks. To test the two hypotheses more

comprehensively, I apply panel estimation techniques to a set of air pollution data in 18 to 21 countries of the Organisation of Economic Development and Co-operation (OECD) over the period 1980 or 1990 to 1999, depending on data availability. In using a panel data set and applying more advanced econometric estimation techniques, this article improves on earlier contributions such as King and Borchardt (1994), Crepaz (1995), Jahn (1998) and Scruggs (1999, 2001). I find consistent and robust evidence that a strong presence of green/libertarian left-wing parties in parliament is associated with lower pollution levels. Evidence with respect to traditional left-wing parties' parliamentary strength and the combined left-wing party presence in government is less consistent and robust. If anything, it points towards an ambiguous effect, where traditional left-wing party strength in terms of the share of legislative seats in the national parliament might be associated with lower pollution levels, but a higher share of cabinet portfolios belonging to left-wing parties might be associated with higher pollution levels. Even where statistically significant, the latter effect is practically negligible, however. No evidence is found that would corroborate the hypothesis that a strong corporatist structure of society and the economy systematically leads to lower pollution levels.

The next section considers some theoretical arguments on why left-wing party strength and corporatism might be associated with lower pollution levels. Section 3 reviews the few studies that have addressed the issue empirically. Section 4 presents the research design for this paper's analysis. Results are presented in section 5 and discussed in the last section.

2. The effects of left-wing party strength and corporatism on environmental outcomes

A priori it is not clear that left-wing party strength and corporatism will lead to better environmental outcomes. As concerns party strength, the traditional political objectives of left-wing parties might make them adversary to environmental protection measures. These measures are costly and might threaten jobs, if not economy-wide then possibly in heavily-polluting industrial sectors such as basic metals, chemicals and non-metallic mineral products that are traditionally characterised by strong unionisation. This would endanger the left-wing party objectives of full employment and increasing the materialist benefits to the working class. In as much as environmentalists regard technological progress and the concept of a growing economy within an industrial society with suspicion, they put into doubt the very fundament on which left-wing parties have traditionally based their policies and are profoundly committed to (Touraine, Wieviorka and Dubet, 1987; Dobson, 1995). In some sense, the insensitivity of many traditional left-wing parties to post-materialist environmental concerns in the 1970s and early 1980s has fuelled the emergence of the environmental movement – first as a movement outside the parliamentary system, later on in its more organised form as so-called green and left-libertarian parties. As Kitschelt (1993, p. 98) observes, the long-term governmental incumbency of traditional left-wing parties has been a particularly fertile ground for the promotion of green and left-libertarian parties.

In spite of these reasons that would suggest that traditional left-wing parties might be inimical to environmental protection measures, various authors suggest that, on the contrary, these parties might be more open towards environmental demands from consumers and environmental activists (King and Borchardt, 1994; Benton, 1997; Jahn, 1998). Left-wing parties have often been faster in incorporating such demands into their

party programmes and policy platforms. As traditionally left-wing parties tend to be more interventionist in their economic policy making, they might find it easier to accept that governments need to install environmental protection instruments such as command-and-control, environmental taxes or tradeable pollution permits in order to correct market failures. Being used to the idea of interventionist policies to correct market failures on social grounds it seems a short step towards accepting similar kinds of interventionist policies on environmental grounds.

Sometimes the incorporation of environmental demands into the political agenda of traditional left-wing parties has had the strategic objective of containing the electoral support for competing left-libertarian or green parties. Where electoral laws favour the establishment of new small parties, traditional left-wing parties have often been forced to realign themselves in order to absorb the challenge imposed on them by the environmental movement. On the other hand, where electoral laws favour big parties, the process of responding to new environmentalist demands was often substantially delayed (Rohrschneider, 1993).

However, this incorporation of environmental demands has not always been driven entirely by strategic concerns. As Benton (1997, p. 43) argues, in many cases environmental pollution hits the poor and the working class more than the rich who can isolate themselves better from the damaging effects of environmental pollution. He maintains that ‘many thousands of socialist activists in their local communities and in their trade unions have been concerned with environmental health provision, with campaigning against air and water pollution, and with health and safety standards in the work-place’. He also contends that ‘socialist analysis has always emphasised the parallels between lack of ‘goods’, and a plentiful supply of ‘bads’, endemic to

capitalism', referring to Friedrich Engels's study of the Conditions of the Working Class in England.

Whilst Pepper (1984, p. 213) is right in suggesting that the environmental movement started out 'politically most ambiguous' with 'distinctive and opposite political wings', it is also true that the more successful political mobilisation of environmental demands has usually been part of a wider left-wing political agenda. Indicative of this is that the environmental movement originated as part of a broader new social movement, in which libertarian leftist issues such as solidarity, egalitarianism, women's rights and anti-militarism played an important role. Where green parties have been successfully established and have gained electoral success, they have often had a strong influence of former, often radical, left-wing activists and have generally been positioned in the left-wing part of the political spectrum (Bomberg, 1998, appendix 1). This is in spite of claims that were often made by green parties that their policy proposals were 'not left-wing, nor right-wing, but up in front' (King and Borchardt, 1994, p. 225) or 'beyond left-wing and right-wing' (Dobson, 1995, p. 170), a view which has found its academic expression in the writings of Beck (1995) and Giddens (1994). For example, while there have been many different political positions present at the foundation of the German Green Party ('Die Grünen') across the full range of political ideology, the right-wing proponents soon left the party, leaving it firmly rooted in the left-wing part of the political spectrum. The right-wing environmentalist party ÖDP ('Ökologisch-Demokratische Partei') that was later on founded by estranged former members of the Green Party never gained a seat in any German state or the federal parliament. Where green parties have gained electoral strength to a degree that they have participated in governments, they have usually sought coalitions with traditional left-wing parties – for example, in Belgium, Germany,

France, Finland and Italy. Conversely, these parties have been more willing to form coalitions with green parties than centrist or right-wing parties.

The ecological orientation of green/left-libertarian parties is beyond doubt. What is less clear, however, is whether their rise in Western democracies has had a significant impact on pollution levels. That it has is not *a priori* clear given that they have commonly remained small minority parties. We therefore have definite expectations about the direction of an impact of green/left-libertarian party strength on pollution levels, but its actual significance awaits to be tested empirically.

As concerns corporatism, Crepaz (1995) and Scruggs (1999) are the major proponents of the view that a more corporatist structure of society and economy is favourable to environmental outcomes. Corporatism can be defined as 'a system of interest representation in which a small number of strategic actors (usually representatives of capital and labour), organised in peak associations, represent large parts of the population in an encompassing fashion' (Crepaz, 1995, p. 391f.). These are extensively consulted by governmental policy makers (Scruggs, 1999, p. 3) in a form of interaction that is 'consensual, co-operative, and goal oriented' (Crepaz, 1995, p. 391f.). Corporatism stands in contrast to pluralism, which can be characterised by 'a large number of atomistic interest groups which are in a competitive struggle over access to the legislative process' and a form of interaction that 'follows an adversarial logic' and is process oriented (ibid.). As with the effect of left-wing party strength on the environment, one could also argue with respect to corporatism that in its traditional form it might be regarded as inimical to environmental protection due to its emphasis on job protection and economic growth and possibly a structural incapability to incorporate non-traditional and long-term oriented policy objectives (Sruggs, 1999, p. 4). Against this, Crepaz argues that the small number of strategic actors typical for corporatism

facilitates the internalisation of environmental externalities since the higher degree of inclusion supposedly ensures that the interests of the corporatist actors converges to those of the general public. Similarly, Jänicke (1992) suggests that in corporatist societies new and old interests are better balanced and new interests and ideas such as demand for environmental protection is easier and earlier accommodated. Similar to Benton's (1997) point with regard to left-wing parties, Scruggs (1999, p. 7) also argues that environmental degradation affects the material aspirations of trade unions and that they are not necessarily inimical to non-material policy issues either since they 'have long pursued intangible "quality of life" issues'. Against this, Hukkinen (1995) in a case study of Finnish waste management argues that corporatist institutions with their often long-term entrenched modes of interest representation and various forms of institutional and cognitive inflexibilities tend to be slow in accepting new ecological considerations into their realm. Corporatism might have advantages in dealing with short-term environmental problems, but when it comes to solving more long-term environmental problems, the inability to accommodate interests outside the established modes of representation might present an obstacle.

It is not just differences in interest representation, however, that set aside corporatism from pluralism according to Crepaz (1995) and Scruggs (1999). There are also fundamental differences in the capacity to put environmental protection into reality. Corporatist societies are better able to deliver improvements in environmental outcomes due to their organised and consensus-oriented mode of decision-making. Once enough pressure for such improvements has built up, corporatism 'provides the ideal institutional bodies to institute efficient pollution abatement policies' (ibid., p. 398). Corporatism can more easily overcome collective action problems characteristic for most environmental areas and deter free-riding by companies due to its high degree of

integration and its ability to compensate losers with generous compensation schemes (Scruggs, 1999, p. 2). Pluralism, on the other hand, has problems in correcting market failures since it itself mimics a market form of interest representation and therefore suffers from similar forms of market failure. In conclusion, Crepaz (ibid., p. 393) argues that "the success or failure of environmental policies is *intimately connected to* whether the system of interest representation is consensual and accommodative (corporatism) or whether it is adversarial and competitive (pluralism)" (emphasis added).

3. Review of existing quantitative studies

There are only few studies that have analysed the effect of left-wing party strength and corporatism on environmental outcomes. King and Borchardt (1994) look at per capita pollution levels of five air pollutants as well as their unweighted sum for 17 OECD countries in one year only, 1980. They use six proxy indicators of left-wing party strength averaged over the period 1970 to 1980. Those six indicators comprise the percentage of years that left-wing parties participated in government, the percentage of cabinet portfolios held by left-wing parties, the percentage of years that left-wing parties were a dominant force in government, their share of seats in national parliament, their share of votes in national elections as well as an index of labour organisation, derived from the percentage of the work force organised in labour unions and the centralization of unions into peak associations. The first five indicators draw from the classification and data collection of Swank's (2002) Comparative Parties Data Set, the same source that this article will use, whereas the index of labour organisation is taken from Lange and Garrett (1985). King and Borchardt (1994) enter each proxy indicator of left-wing party strength in isolation, not in combination, due to small degrees of freedom and very strong correlation among some of their indicators.

After controlling for energy consumption per capita, the proportion of energy inputs from oil and solid fuels and the industry share of gross domestic product (GDP), they find that one or the other proxy variable for left-wing party strength always tests statistically significant with a negative sign of the coefficient, suggesting that left-wing party strength leads to lower pollution levels. Note that while King and Borchardt (1994) do not explicitly include a corporatism variable in their main estimations, their last variable of left-wing party strength called index of labour organisation can be interpreted as a proxy for corporatism rather than left-wing party strength. This variable tests statistically significant for three air pollutants and the sum of pollutants. Furthermore, in sensitivity analysis they substitute left-wing party strength with Lijphart and Crepaz's (1991) measure of corporatism. This measure of corporatism is a composite index of prior indices developed by 12 experts. The composite index is simply the mean value of the standardised prior indices. King and Borchardt (1994) find that corporatism is associated with lower pollution levels for all but one air pollutant. With respect to the other control variables, they find a statistically significant positive effect of energy consumption and of the proportion of energy inputs from oil and solid fuels. The share of industry tests insignificantly in the vast majority of cases.

The major focus of Crepaz (1995) is on testing the effect of corporatism. He pools per capita air pollution data of 18 OECD-countries from two years (1980 and 1990 or 1991). However, due to unavailability of data, the number of observations is often lower than 36. Following Schmidt (1992), he uses a one to five point scale for classifying countries into one of the following categories over the period 1976 to 1980 and 1986 to 1990, respectively: bourgeois hegemony, bourgeois dominance, balance, social democratic dominance, social democratic hegemony. For corporatism he uses the Lijphart and Crepaz (1991) measure already mentioned. Controlling furthermore for per

capita energy consumption, GDP per capita and percentage growth of GDP, he finds a statistically significant negative effect of corporatism on pollution levels for four out of five air pollutants. Contrary to the findings of King and Borchardt (1994), political dominance tests insignificant throughout such that left-wing party strength is not found to lead to lower pollution levels. With respect to the other control variables, Crepaz (1995) finds a statistically significant positive effect of energy consumption throughout, a negative effect of income, which is statistically significant for three out of five air pollutants, and no effect of GDP growth on pollution levels.

Jahn (1998) constructs an indicator of environmental performance that aggregates trends in pollution levels between 1980 and 1990 for a whole range of pollutants from air, water and soil pollution as well as waste, where all pollutants are given the same weight. He finds a positive bivariate correlation with environmental performance that is significant for Lijphart and Crepaz's (1991) measure of corporatism and for electoral strength of social democratic parties derived from Lane, McKay and Newton (1997). The correlation is insignificant for so-called socialdemocratic welfare state regimes, which is simply a dummy variable for Scandinavian countries and the Netherlands, as well as for an index of so-called social democratic government power derived from Merkel (1992). Both the corporatism and the electoral strength of social democratic parties variable remain statistically significant in multivariate regression. As further control variables, gross national product (GNP) tests significant with a positive sign, whereas population density as well as changes in industrial production and size of industrial sector are insignificant.

Similar to Jahn (1998), Scruggs (1999, 2001) analyses an aggregate index of environmental performance that measures improvement in sulphur and nitrogen dioxide emissions, fertilizer use and per capita municipal waste generation over the period 1975

to 1990 and 1980 to 1995, respectively. Controlling for income and growth per capita, energy and nuclear power use, population density and the share of manufacturing, he finds that Lijphart and Crepaz's (1991) measure of corporatism is positively associated with good environmental performance. In further specifications he adds other control variables, including some variables, which attempt to measure certain aspects of corporatism separately. In total, he analyses 19 different explanatory variables, but he can never include more than a few in any single estimation since with 17 observations such estimation would run out of degrees of freedom. In what is of relevance here, a variable measuring the average vote share of green and left-libertarian parties over the period 1970 to 1990 tests statistically significantly with a positive coefficient only in two out of ten model specifications.

These prior attempts at analysing the effect of left-wing party strength and corporatism on the environment suffer from a number of important problems. First, the number of observations is very small. This implies that the degrees of freedom in the estimations are very small and that often only a limited number of variables can be included in the estimations. Second, often only cross-sectional data in one year or averaged over a number of years are analysed. This implies that only the cross-sectional variation of the data (the 'between' dimension), but not the time-series variation (the 'within' dimension) is exploited for statistical estimation. Connected to this, the absence of a true panel means that only the simple estimation technique of ordinary least squares (OLS) can be used, but not advanced techniques such as fixed-effects or random-effects estimators. These advanced techniques have the advantage that they can fully exploit the cross-sectional and time-series variation of the data (random-effects estimator) or use the time-series variation only, but control for unobserved heterogeneity across countries (fixed-effects estimator). Crepaz (1995) uses observations from two moments

in time, but instead of using a fixed-effects or random-effects estimator, he uses OLS, which suffers from heterogeneity bias if unobserved country effects are correlated with his explanatory variables (Wooldridge, 2002).

Both Jahn (1998) and Scruggs (1999, 2001) realise that unobserved country heterogeneity due to the existence of fixed effects might pose a problem for estimating the determinants of pollution. These fixed effects, examples of which are cross-country differences in the way pollution is measured as well as differences in the environmental absorptive capacity, potentially render pollution levels difficult to compare across countries. In order to mitigate the impact of fixed factors on the estimation results Jahn and Scruggs refrain from analysing pollution levels and look at changes in pollution levels from the start year to the last year in their period of study instead. This procedure represents a simple, but inferior method for controlling for unobserved country heterogeneity. It is much more efficient to use all observations in the period of study and to control directly for unobserved country heterogeneity. This paper improves upon the earlier studies in creating a panel of data, for which both fixed-effects and random-effects estimators are used. As the next section will explain, fixed-effects estimators control for unobserved country heterogeneity in wiping out all fixed effects. Random-effects estimators leave the fixed effects in the error term of the model, but allow to test whether they systematically bias our estimated coefficients. If they do not, then we can be confident that our estimates are not affected by unobserved country heterogeneity.

4. Research Design

4.1 The dependent variables

Ideally one would like to test the impact of left-wing party strength and corporatism on a variety of aspects of environmental pollution. Unfortunately, poor data availability

means that comprehensive quantitative tests are currently confined to emissions of important air pollutants, which have traditionally been characterised by relatively good monitoring and recording. Emission data for 18 OECD-countries stem from EMEP (2002). The Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (EMEP programme) provides the arguably most comprehensive and consistent data on air pollution available. It forms an important component of the Convention on Long Range Transboundary Air Pollution (LRTAP), which was signed in 1979. For sulphur dioxide (SO_2), which damages human health and causes acid rain, and nitrogen dioxide (NO_2), which contributes to the production of smog and acid rain, the data cover the period 1980 to 1999.[1] For volatile organic compound (VOC), which plays an important role in the production of photochemical oxidants, and carbon monoxide (CO), which decreases the absorption of oxygen by red blood cells, emission data before 1990 were too sparse for many countries so that our panel covers the period 1990 to 1999 only. In very few cases, emission data needed to be interpolated to bridge gaps in the time series in order to create a balanced panel. The 18 countries include Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. Unfortunately, EMEP (2002) does not cover Australia, Japan and New Zealand and OECD (1995, 1999a, 2001) does not report enough data for these countries to be included in the panel. Data availability is much better for carbon dioxide (CO_2) emissions, which come from EIA (2001) for all 21 OECD countries. Carbon dioxide is of course the major cause of climate change.

[1] For Greece, Portugal and Spain, sulphur dioxide and nitrogen dioxide data for 1999 were taken from OECD (2001) instead.

How can one compare pollution levels in different countries given that population size and the size of the economy differ quite dramatically? Probably the best way to 'normalise' emissions is to divide absolute emission levels by total population. From a human health perspective, per capita pollution levels are arguably a more relevant indicator than pollution per unit of GDP. All emission data were therefore transformed into per capita values, using population data from World Bank (2001).

4.2 The explanatory variables

As concerns the explanatory variables, we distinguish five kinds of effects: scale, composition, technique, left-wing party strength and corporatism. The first three general effects are in accordance with the literature on the so-called Environmental Kuznets Curve (EKC). Scale is measured by economic activity and the extent of vehicle use in the economy. Both are included here since economic activity and higher vehicle use can be expected to raise pollution levels, all other things equal, since both are important causes of air pollution emissions. Readers familiar with the EKC literature will wonder why income (economic activity) is not expected to have a non-linear effect on pollution levels. Note that the famous inverted U-shaped association between income and pollution only holds true if income is the only explanatory variable. Composition (the share of manufactures and fossil fuels) and technique (energy efficiency) effects are the very causes of the potentially negative impact of income on pollution at higher income levels. However, if these effects are controlled for, then income merely captures the scale effect, which can unambiguously be expected to raise pollution levels. In (non-reported) pre-testing a squared income variable did not gain statistical significance, which supports our assumption that the effect of income on pollution levels is essentially linear once composition and technique effects are controlled for.

As mentioned, composition refers to the share of manufacturing to total value added, which is expected to have a positive impact on pollution levels given that manufacturing is usually regarded as more pollutive than services. The composition effect also refers to the share of fossil fuels among total primary energy consumption, which should have a positive effect on pollution. Lastly, the technique effect comprises the efficiency of energy use for economic activity, which can be expected to be associated with lower pollution levels. To this we add left-wing party strength and corporatism, our main variables of interest.

Note that this set-up implies that any effect that left-wing party strength and corporatism might have on the environment is additional to the other three effects, in particular the extent of vehicle use, the share of fossil fuels and the efficiency of energy use for economic activity. The dilemma one is confronted with is that left-wing party strength and corporatism will have an effect on pollution via some policy variable. Does this mean that one should not include any policy variable on which left-wing party strength and corporatism could potentially have an impact upon and be it very small? We believe the answer must be no. In the end, left-wing party strength and corporatism can have an effect on any of the explanatory variables one could think of. But nobody would argue that all control variables should therefore be excluded from the estimations. Instead, one should include all variables, which can reasonably be expected to be outside the major route through which left-wing party strength and corporatism impact upon pollution. Our implicit assumption here is that their effect on pollution, if existent, works via environmental regulation, which is difficult if not impossible to measure quantitatively, and not via the extent of vehicle use, the share of fossil fuels and the efficiency of energy use for economic activity. We feel theoretically justified to do this because the extent of vehicle use is a difficult variable to target for policy

makers and corporatist actors given that it is partly determined by different cultural attitudes, geographical conditions and the affluence of a society. The share of fossil fuels is mainly determined by the availability of renewable resources and national attitudes towards the use of nuclear power. The efficiency of energy use of economic activity reflects the level of technological advancement of an economy and is again difficult for policy makers and corporatist actors to impact upon. If it is true that these effects are basically independent of left-wing party strength and corporatism, then it would be wrong not to control for these factors as their exclusion might lead to omitted variable bias. Left-wing party strength or corporatism might pick up some effect that is a consequence of a spurious correlation. Later on, we will test whether our results change dramatically if these three variables are excluded from the estimations.

As mentioned, the scale effect consists of economic output as measured by GDP per capita in purchasing power parity as well as per capita use of vehicles. GDP data in constant US$1996 come from the Penn World Tables for the period 1980 to 1998 (Heston, Summers and Aten, 2001). They have been extended to 1999 using growth rates from World Bank (2001). Data on the use of vehicles of four or more wheels per 1000 inhabitants stem from IRF (various years) and Euromonitor (2002). The composition effect is measured by the share of GDP from manufacturing and the share of primary energy consumption that derives from fossil fuel energy sources. The value that manufacturing adds to GDP is a variable that was astonishingly difficult to construct for some countries and derives mainly from OECD (1999b) in addition to a range of other OECD-sources. The share of fossil fuel among total primary energy consumption variable is constructed from BP (2001). The technique effect is measured by the ratio of GDP per unit of energy used taken from World Bank (2001).

As concerns left-wing party strength, the way in which Crepaz (1994) and sometimes Jahn (1998) measure such strength is too simplistic and is based on subjective evaluation instead of objective data. Here instead only objective data are used that provide substantial variation both across countries and over time with respect to left-wing party strength. It is measured by three variables: the share of green or left-libertarian party legislative seats as a percentage of all legislative seats, the share of traditional left-wing party legislative seats and the share of cabinet portfolios belonging to left-wing parties (both green/libertarian and traditional). All three variables stem from the Comparative Parties Data Set of Swank (2002) and refer to the national parliament. Note that this source puts green and left-libertarian parties together, which can be justified given that these parties pursue very similar objectives, in particular with respect to environmental policy. As concerns cabinet portfolios, no separate data for green/libertarian and traditional left-wing parties exist, but it is clear that given the minority status of green/left-libertarian parties, this variable is dominated by traditional left-wing parties. Table 1 lists the major green and left-libertarian as well as traditional left-wing parties for all the 21 OECD-countries included in this study.

< Insert Table 1 about here >

The corporatism effect is measured by Siaroff's (1999) indicator on a one to five scale. He rates countries on a five-point scale according to eight aspects of corporatism: the annual average level of strike volume, the nature and goals of trade unions, the amount of legal and state support for unions and union power, the nature of economic ties of firms, the nature of industrial conflict and wage dispute resolution, the extent of political exchange between corporate actors and policy makers and, lastly, the general nature of the public-private interaction. This indicator is superior to the Lijphart and Crepaz (1991) measure used in earlier studies for a number of reasons. First, the

Lijphart and Crepaz measure is regarded by Kenworthy (2001, p. 10) as an unabashedly atheoretical aggregation of a dozen previous measures. Second and more importantly, it approximately refers to the period 1950 to 1980, whereas the pollution data for this study refer to 1980 to 1999. Third, it does not cover either Greece, Portugal or Spain. Siaroff's (1999) indicator does not suffer from any of these problems. It has been used by Lijphart (1999) himself in later work who praises it for overcoming many of the problems that researchers face in measuring the strength of corporatism in a country. Since Lijphart (1999, p. 176) notes 'reasonable agreement' between Siaroff's (1999) indicator and their own older one, we are confident that our research design with respect to the corporatism variable overlaps reasonably well with existing studies. Table 1 also lists Siaroff's corporatism score for the countries included in this study.

4.3 The estimation technique

Formally, we test the following model:

$$\ln(P_{it}) = \beta_1 \ln(GDP_{it}) + \beta_2 ln(Vehicles)_{it} + \beta_3 Manufact_{it} + \beta_4 Fossil_{it} + \beta_5 \ln(Efficiency_{it}) + \beta_6 Leftseat_{it} + \beta_7 Greenseat_{it} + \beta_8 Leftcabinet_{it} + \beta_9 Corporatism_{it} + \gamma_t + (a_i + u_{it})$$

Time is indicated by t, countries are indicated by i. All variables were inspected for skewedness in distribution and were logged if the same was detected. The γ variables are T-1 year specific dummy variables. Their inclusion lets each year have its own intercept to allow for aggregate time effects such as exogenous technical progress. The a_i represent individual country effects. Their inclusion in the model to be tested ensures that unobserved time-invariant country heterogeneity, that is heterogeneity of countries

that is not fully captured by the explanatory variables, is accounted for. The fixed-effects estimator subtracts from the equation to be estimated the average of the equation. Because of this so-called within transformation the individual country effects a_i are wiped out and the coefficients are estimated based on the time variation within each cross-sectional unit. The big advantage of the fixed-effects estimator is that any potential correlation of the explanatory variables with the fixed effects is rendered unharmful since the fixed effects and therefore their correlation with the explanatory variables are wiped out from the equation to be estimated. Note that without the within transformation, correlation of the explanatory variables with the fixed effects would bias our estimations. One disadvantage of using the fixed-effects estimator is that the coefficients of time-invariant variables cannot be estimated. Also, variables with very little time-variation are estimated inefficiently. The random-effects estimator can estimate time-invariant variables and will estimate all coefficients more efficiently as it uses both the cross-sectional (between) and time-series (within) variation of the data. However, it depends on the assumption that the country effects are not correlated with the explanatory variables so that the individual country effects a_i can be regarded as part of a composite error term $v_{it} = a_i + u_{it}$.

This random-effects assumption can be tested with a so-called Hausman test. This tests whether the coefficients estimated by a random-effects estimator systematically differ from the coefficients estimated by a fixed-effects estimator for those variables that can be estimated with the fixed-effects estimator. Only if this test fails to reject the hypothesis that the coefficients do not systematically differ from each other, can we assume that the individual country effects can be treated as random effects and we can therefore trust that the estimated coefficients of the random effects estimator are free

from unobserved heterogeneity bias. For each pollutant we report estimation results for both fixed-effects and random-effects models.

5. Results

Tables 2 to 6 report results for our sample of air pollutants. Estimations for all pollutants follow the same ordered structure. Regression I provides fixed-effects estimation, regression II random-effects estimation. Note that the corporatism variable is excluded from the fixed-effects regressions as it varies only very little over time, which implies that fixed-effects estimation is not suitable. In all estimations two absolute t-values are reported in brackets. The one directly under the reported coefficient refers to standard errors that are robust towards arbitrary heteroscedasticity and autocorrelation. This became necessary as serial correlation was detected for all four pollutants. The absolute t-value below that additionally allows for the possibility that observations are clustered, that is, they are assumed to be independent merely across, but not necessarily within countries. Both t-values are reported since there is a trade-off between making the estimations as robust as possible to violations of the model assumptions and estimating the coefficients as precisely as possible since the standard errors that are robust towards clustering are generally higher. Also, given that we use robust standard errors and that we have clear expectations about the expected sign of the estimated coefficients, we will use a rather generous level of .10 to call an estimated coefficient statistically significant. The exact degree of statistical significance can be observed by looking at the reported absolute t-values. The reported Hausman tests refer to standard errors that are fully robust including with respect to clustering.

< Insert Table 2 about here >

Starting with carbon dioxide emissions in table 2, regression Ia suggests a statistically significant positive effect of per capita economic output (*GDP*), per capita vehicle use (*Vehicles*) and the share of primary energy consumption derived from fossil fuel energy sources (*Fossil*) on pollution levels, as expected. However, contrary to expectation, such a positive effect is also estimated for the left-wing party share of cabinet portfolios (*Leftcabinet*). A negative effect is estimated for the ratio of GDP per unit of energy used (*Efficiency*) and the share of traditional left-wing (*Leftseat*) as well as green/left-libertarian parties (*Greenseat*) among total legislative seats, all in accordance with expectation. The manufacturing share (*Manufact*) tests insignificantly. The variables *Vehicles*, *Leftcabinet* and *Leftseat* lose their significance if the standard errors are additionally made robust towards clustering. Basically the same picture emerges if the model is tested with random instead of fixed effects in regression IIa. The corporatism variable (*Corporatism*), the estimation of which becomes possible now, tests statistically significantly positive. This would suggest that countries with a more corporatist structure have higher per capita levels of pollution. Note, however, that this result is sensitive with respect to standard errors that are robust towards clustering. In spite of the rather close similarity between our fixed and random effects results, the Hausman test rejects the random effects assumption at the .05 level. However, further non-reported tests showed that the Hausman test clearly fails to reject the random effects assumption if the test is restricted to the three variables of left-wing party strength (p-value .31). We can therefore at least be confident that the estimated coefficients of these variables do not suffer from unobserved country heterogeneity bias. Even for the general Hausman test, Wooldridge (2002, p. 291) notes that rejection of the random effects assumption via a Hausman test need not imply that one has to give up

the random effects assumption if, as is the case here, the differences between the fixed and random effects estimates are practically small.

In the case of carbon dioxide emissions one might argue that the sample should be restricted to the time period from the late 1980s onwards. This is because carbon dioxide was not perceived as a pollutant before the late 1980s and therefore no deliberate control policies were enacted before that time. Regression Ib reports the fixed-effects and regression IIb the random-effects results for the restricted sample covering the time period 1989 to 1999. The major differences are that *Leftcabinet* now becomes insignificant, whereas the effect of *Vehicles* and *Corporatism* not only become stronger, but also more clearly statistically significant even in the case where standard errors are robust to clustering.

< Insert Table 3 about here >

Turning to fixed effects estimation for sulphur dioxide emissions reported in regression I of table 3, *GDP*, *Vehicles* and *Fossil* are positively associated and *Efficiency* as well as *Greenseat* are negatively associated with pollution levels, all in accordance with expectation. All the other variables are insignificant. Only *GDP*, *Efficiency* and *Greenseat* remain significant if standard errors are made robust towards clustering. If the random effects estimator is used in regression II, then the results are again rather similar. The only difference is that *Manufact* is positively associated with pollution levels as expected, a result which is not robust with respect to standard errors allowing for clustering effects, however. *Corporatism* tests insignificantly throughout. The Hausman test marginally fails to reject the random effects assumption at the .05 level.

< Insert Table 4 about here >

Regression I of table 4 reports fixed effects estimation results for nitrogen dioxide emissions. *GDP*, *Vehicles*, *Manufact* and *Fossil* have the expected positive effect on pollution levels, *Efficiency*, *Leftseat* and *Greenseat* have the expected negative effect. *Leftcabinet* exerts a positive effect on pollution levels. Whilst this is contrary to our expectation, it is nevertheless in accordance with the estimation result observed for carbon dioxide emissions. *Leftcabinet* loses its significance together with *Vehicles* and *Manufact* if standard errors are made robust towards clustering. Random effects estimations, as reported in regression II, are basically the same as their fixed effects counterpart. Interestingly, as was the case with carbon dioxide emissions, *Corporatism* tests significantly positive, but becomes insignificant if standard errors are made robust towards clustering. In spite of the general compatibility between fixed and random effects estimations, the Hausman test rejects the random effects assumption at the .05 level.

< Insert Table 5 about here >

Results for carbon monoxide are reported in table 5. Regression I reports the expected positive impact of *GDP*, *Vehicles* and *Fossil* and the expected negative impact of *Efficiency* on pollution levels. As concerns left-wing party strength, the by now familiar ambiguous effect becomes apparent again: *Leftcabinet* is positively associated with pollution levels, whereas the opposite is true for *Leftseat* and *Greenseat*. If standard errors are made robust towards clustering, then few variables remain significant, namely *Efficiency*, *Leftseat* and *Greenseat*. Random effect estimation results reported in regression II are rather similar, but the coefficients for *Fossil* and *Leftcabinet* remain below statistical significance. The *Corporatism* variable is clearly statistically insignificant. The Hausman test clearly fails to reject the random effects assumption.

< Insert Table 6 about here >

Finally, with regard to volatile organic compounds, *GDP*, *Vehicles* and *Fossil* have the usual and expected positive effect and *Efficiency* a negative effect on pollution in fixed effects estimation reported in regression I of table 6. *Leftcabinet* and *Leftseat* are statistically insignificant, but *Greenseat* is again statistically significantly associated with lower pollution levels. Results are basically unaffected by making standard errors robust towards clustering or by employing random effects estimation instead (see regression II). *Corporatism* tests clearly insignificantly and the Hausman test marginally fails to reject the random effects assumption at the .05 significance level.

6. Sensitivity analysis

In this section we will examine whether our results are sensitive to changing certain assumptions about our estimations. If the three variables are entered in isolation rather than simultaneously, then basically the same conclusions prevail (detailed results not reported). I also checked for a non-linear effect of left-wing party strength via the inclusion of squared terms. No robust evidence for non-linear effects were found.

What happens to our variables of left-wing party strength and corporatism if we estimate reduced models, in which the variables *Vehicles*, *Fossil* and *Efficiency* are taken out? Referring to random-effects estimation with standard errors that are fully robust even towards clustering, left-wing party cabinet strength and traditional left-wing parliamentary strength become insignificant throughout, whereas green/left-libertarian parliamentary strength has a consistently significantly negative impact on pollution levels. The corporatism variable is insignificant in the case of carbon, sulphur and nitrogen dioxide emissions, but marginally significant with a negative coefficient for the other two pollutants.

Our estimations implicitly assume a contemporaneous effect of left-wing party strength and corporatism on air pollution levels. Of course, there might exist a time lag between environmental policy decisions and environmental improvements.[2] To be sure, since our indicators refer to emission data there is less reason to be concerned about time lags than if we used (non-existent) ambient environmental quality data. Still, to test for a possibly delayed effect we lagged our variables of interest by one year. The results did not change much, in some cases the estimated effect became even stronger.

Another potential problem arises from the fact that our political and corporatism variables refer to the national level, whereas air pollution levels might be affected by decisions at a different level. As concerns the sub-national level, we do not see much reason for being concerned. Air pollution is an environmental topic, which is commonly dealt with at the national level in most countries of our study and sub-national entities such as the provinces in Spain or the Länder in Germany have to adopt the decisions taken at the national level. The United States is probably the country included in our sample, for which the 50 states have the greatest leeway to deviate from national standards. However, our results do not dramatically change if the United States is excluded from the sample.

More problematic than the sub-national level is the influence of the supra-national level in the case of the European countries, which are members of the European Union (EU). There exist various EU directives regulating air pollution levels and the EU is often regarded as an important driver of environmental improvements in EU member countries (Zito 2000; McCormick 2001). Does this bias our results? To start with, one needs to keep in mind that these directives are negotiated between national

[2] I am thankful to an anonymous reviewer for pointing out the potential sensitivity of results to this aspect and the one dealt with in the next paragraph.

governments, the European Commission and the European Parliament, which implies substantial influence of national policy makers on the outcome. More importantly, EU directives are not directly binding, but need to be implemented in the EU member countries. At this stage, national policy makers have an enormous influence on how and to what extent the directives are translated into national law. To provide an admittedly crude test of whether our failure to control for the impact of supra-national policy making biases our results, we included a dummy variable for membership in the EU in sensitivity analysis. Our results were hardly affected. While the dummy variable sometimes tests significantly with the expected negative sign the estimation results of our other variables of interest hardly change.

7. Discussion and concluding observations

On the whole, the hypothesised scale effect on pollution levels is well confirmed in our estimations. A higher per capita economic output and, if less clearly, greater per capita use of vehicles lead to increased per capita pollution levels, all other things equal. The hypothesised composition and technique effect also find some confirmation in the results. In most regressions, a higher share of fossil fuels is associated with higher per capita pollution levels, whereas greater energy efficiency leads to lower pollution levels. The share of manufacturing is consistently estimated with a positive coefficient, but is mostly statistically insignificant. That our estimated results fit well with our theoretical expectations makes us confident in the model specification.

The hypothesised effect of left-wing party strength was found to be too simplistic. Similar to previous studies, I find that left-wing party strength is a statistically significant determinant of pollution levels in many cases, but contrary to previous studies I find that the direction of this effect depends on which aspect of left-wing party

strength one looks at. There is a need to distinguish between strength of left-wing parties in cabinets as opposed to left-wing party strength as a share of legislative seats. Furthermore, one needs to distinguish between parliamentary strength of traditional left-wing parties and that of green or left-libertarian parties. In the cases where cabinet strength tests significantly, the estimated effect is always a positive one on pollution levels. The opposite is true for the cases where traditional left-wing parliamentary strength tests significantly and for green or left-libertarian parliamentary strength, which tests significantly throughout.

This difference represents a rather striking result given the high correlation between left-wing cabinet strength and traditional left-wing parliamentary strength ($r = .63$).[3] It broadly confirms a result by Jahn (1998) who found that electoral strength of social democratic parties is positively associated with good environmental performance, whereas social democratic government power is not. One could interpret this to the effect that on the one hand left-wing dominated governments tend to follow more traditional expansionary economic growth and full employment policies with little regard for environmental pollution control. Parliaments with a high share of traditional left-wing legislative seats, on the other hand, are more open towards environmental demands and are more proactive in terms of pollution control. This result conforms with an informal, but often heard of, complaint by environmentalists that traditional left-wing parliamentarians are open towards environmental demands, in particular if in opposition to a ruling centrist or right-wing government, but that left-wing dominated governments are no better and sometimes worse than other governments. Clearly, these amount to no more than speculations. Also, given that left-wing cabinet strength and traditional left-

[3] Note, however, that neither of these two variables is correlated with parliamentary green or left-libertarian party strength.

wing parliamentary strength often become insignificant when standard errors are made robust towards clustering and in the reduced form estimations, this should caution us against making strong conclusions. More research is clearly needed into whether and if so why the ambiguous effect of left-wing cabinet and traditional left-wing parliamentary strength exists. This represents an important subject of future research and given the obvious limitations of quantitative research in this area, future research also needs be of a more qualitative and case-study nature.

The one result we can have strong confidence in is that green or left-libertarian parliamentary strength is unambigously and robustly associated with lower pollution levels for all five air pollutants looked at here. A strong green presence in parliament therefore has a statistically significant negative impact on air pollution levels. Given that green parties are minority parties in all countries, the effect is likely to work through forcing other parties and governments to take environmental demands seriously. This represents an important result as it demonstrates that the rise of green/left-libertarian parties in Western democracies does have a real impact on air pollution levels. To the best of my knowledge, this is the first quantitative study to demonstrate such a positive effect of the parliamentary presence of green/left-libertarian parties.

How strong is the effect of green or left-libertarian party strength on pollution levels? It depends on the pollutant. A one percentage point increase in the share of legislative seats is associated with a reduction in per capita pollution levels by about 0.7 per cent (CO_2), 5 per cent (SO_2), 1.3 per cent (NO_2, CO) and 1.9 per cent (VOC). The magnitude of the estimated effect is clearly far from negligible.[4] In comparison, where statistically significant, the comparable effect of traditional left-wing parliamentary

[4] Estimates refer to the fixed-effects estimations in regression I for each pollutant.

strength is relatively small at 0.1 per cent (CO_2), 0.5 per cent (NO_2) and 0.3 per cent (CO). The potentially positive effect of left-wing cabinet strength on pollution levels is so small as to be practically negligible even where it is statistically significant.

What about the effect of corporatism? In most cases, the corporatism variable tested insignificantly. In the case of carbon and nitrogen dioxide emissions it tested significantly, but with a positive sign. Note, however, that this result is not robust with respect to standard errors that allow for cluster effects. Also, the opposite effect occurs for carbon monoxide and volatile organic compound emissions in the reduced form estimations where *Vehicles*, *Fossil* and *Efficiency* were taken out as control variables. It is probably fair to say that there is no evidence that corporatism is systematically associated with lower air pollution levels. This stands in striking contrast to the statistically significant negative effect of corporatism on pollution levels reported in some earlier studies. Given that the present analysis uses a greater number of observations, more advanced estimation techniques and controls for unobserved country heterogeneity, we are confident that our estimations are more valid and that there is indeed no systematic negative impact of corporatism on pollution levels. It is probably a myth to believe that corporatism is good for the environment.

One of the caveats of our analysis is that we could test the effect of left-wing party strength and corporatism only on air pollution levels. Strictly speaking, from this evidence one cannot infer anything on whether a similar impact exists with respect to the many other aspects of environmental policy. On the other hand, we have no reason to presume that a similar effect does not exist. We merely cannot demonstrate it due to lack of data.

Acknowledgement

I would like to thank three anonymous reviewers for many helpful comments.

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Table 1. Detailed information on left-wing party strength and corporatism variables.

Country	Major traditional left-wing parties	Major green/left-libertarian parties	Degree of corporatism	
			1980-89	1990-99
Australia	Labour, Communist, Australia Party	Greens	3.375	3.000
Austria	Socialist, Communist	United Greens, Green Alternative	4.625	4.625
Belgium	Socialists, Communists	Ecologists, Live Differently (Agalev)	3.625	3.750
Canada	New Democratic, Communist	Green Party	1.750	1.875
Denmark	Left Socialists, Communists, Social Democrats	Socialist's People's Party, Green Party	3.875	4.250
Finland	People's Democratic League/Communist, Social Democrats, Worker's League/Social Democratic League	Green League, Ecology Party	4.250	4.375
France	Communists, Socialists, miscellaneous smaller parties	Greens, Ecologists	2.250	2.250
Germany	Communist, Social Democrats, Party of Democratic Socialism	Greens (Alliance 90/Greens), Ecologists	4.125	4.125
Greece	Panhellenic Socialist Movement, Communist, Greek Left, Progressive Left Coalition	Green Lists, Ecologists Alternative	1.625	2.000
Ireland	Workers, Labour, Sein Fein, Clanna Talmhan, Clanna Pablachta	Greens	2.375	2.625
Italy	Communists, Socialists, Left Democrats, miscellaneous smaller parties	Greens, Radical Party	2.750	3.000
Japan	Communists, Socialists, Democratic Socialists	Ecology Party	3.625	3.625
Netherlands	Labour, Communists	Green Progressive Accord/Green Left, The Greens	4.000	4.000
New Zealand	Labour, Communist	Values Party/Green Party	2.125	2.375
Norway	Labour, Communists	Socialist People's/Left Party, Greens, People's List for Environment and Solidarity	4.625	4.625
Portugal	Socialist, Communist, Democratic Renewal, Democratic Movement, United Democratic Coalition/People's Alliance, Popular Democratic Union	Greens	2.375	2.375
Spain	Communist, Socialist, United Left, Herri Batasuma, miscellaneous small parties	Green List (LV), Ecological Greens (LVE)	1.875	2.000
Sweden	Communists, Social Democrats	Greens	4.625	4.625
Switzerland	Social Democrats, miscellaneous small parties	Progressives, Greens, Alternative Greens	4.375	4.375
United Kingdom	Labour	Ecology/Green Party	1.750	2.000
United States	none	Green Party	2.125	2.125

Source: Swank (2002) for party information; Siaroff (1999) for corporatism.

Table 2. Results for carbon dioxide emissions.

	Ia	IIa	Ib	IIb
GDP	0.826	0.866	0.526	0.635
	(11.32)***	(11.58)***	(5.02)***	(7.04)***
	(5.95)***	(6.50)***	(4.40)***	(6.12)
Vehicles	0.096	0.098	0.288	0.255
	(2.23)**	(2.29)**	(4.64)***	(4.33)***
	(1.04)	(1.09)	(3.48)***	(3.41)***
Manufact	0.335	0.115	0.680	0.316
	(1.34)	(0.48)	(1.95)	(0.93)
	(0.54)	(0.20)	(1.21)	(0.64)
Fossil	1.893	1.783	1.500	1.286
	(15.99)***	(18.22)***	(5.57)***	(6.64)***
	(8.21)***	(9.65)***	(5.18)***	(6.35)***
Efficiency	-0.780	-0.723	-0.566	-0.601
	(11.07)***	(11.71)***	(4.95)***	(6.64)***
	(6.35)***	(7.33)***	(3.76)***	(6.56)***
Leftcabinet	0.000	0.000	-0.000	-0.000
	(1.86)*	(1.79)*	(0.78)	(0.77)
	(1.12)	(1.22)	(0.54)	(0.56)
Leftseat	-0.001	-0.001	-0.001	-0.001
	(2.34)**	(2.31)**	(1.44)	(1.56)
	(1.28)	(1.43)	(0.92)	(1.06)
Greenseat	-0.007	-0.005	-0.006	-0.006
	(3.84)***	(3.09)***	(3.48)***	(3.00)***
	(2.62)***	(2.19)**	(3.31)***	(3.22)***
Corporatism		0.057		0.082
		(2.29)**		(2.20)**
		(0.88)		(2.58)**
R-sq within	.7761	.7695	.6568	.6470
R-sq between	.6297	.7572	.6112	.7964
R-sq overall	.6371	.7574	.6121	.7917
Observations	420	420	231	231
Hausman test		2.86		4.94
		Pr. > F = 0.0306		Pr. > F = 0.0023

Note: Dependent variable is logged pollution per capita. Coefficients of constant and time period dummies not reported.
* significant at .10 level. ** .05 level. *** .01 level.

Table 3. Results for sulphur dioxide emissions.

	I	II
GDP	2.001	1.464
	(9.08)***	(7.39)***
	(4.08)***	(3.10)***
Vehicles	0.444	0.345
	(2.20)**	(1.89)*
	(0.83)	(0.76)
Manufact	1.436	1.805
	(1.63)	(2.39)**
	(0.57)	(0.82)
Fossil	1.156	1.835
	(2.96)***	(5.89)***
	(1.42)	(2.46)**
Efficiency	-1.586	-1.350
	(5.09)***	(5.86)***
	(2.23)**	(3.13)***
Leftcabinet	-0.000	-0.001
	(0.99)	(0.99)
	(0.69)	(0.68)
Leftseat	0.001	0.003
	(0.44)	(1.35)
	(0.22)	(0.63)
Greenseat	-0.051	-0.051
	(5.89)***	(5.74)***
	(2.74)***	(2.44)**
Corporatism		-0.080
		(1.10)
		(0.61)
R-sq within	.8027	.7940
R-sq between	.3190	.5633
R-sq overall	.4261	.6272
Observations	360	360
Hausman test		2.55
		Pr. > F = 0.0546

Note: Dependent variable is logged pollution per capita. Coefficients of constant and time period dummies not reported.
* significant at .10 level. ** .05 level. *** .01 level.

Table 4. Results for nitrogen dioxide emissions.

	I	II
GDP	1.216	1.184
	(11.80)***	(11.69)***
	(7.35)***	(9.27)***
Vehicles	0.274	0.210
	(3.62)***	(2.81)***
	(1.47)	(1.38)
Manufact	0.926	0.630
	(2.70)***	(1.83)
	(1.02)	(0.74)
Fossil	1.225	1.153
	(7.47)***	(9.23)***
	(3.43)***	(4.10)***
Efficiency	-0.888	-0.863
	(7.88)***	(9.49)***
	(3.96)***	(5.41)***
Leftcabinet	0.000	0.000
	(2.52)**	(2.13)**
	(1.47)	(1.31)
Leftseat	-0.005	-0.004
	(5.80)***	(4.44)***
	(2.60)***	(2.25)**
Greenseat	-0.013	-0.011
	(4.29)***	(3.71)***
	(2.49)**	(2.24)**
Corporatism		0.107
		(2.87)***
		(1.53)
R-sq within	.7009	.7049
R-sq between	.6242	.6417
R-sq overall	.6178	.6366
Observations	360	360
Hausman test		3.48
		Pr. > F = 0.0168

Note: Dependent variable is logged pollution per capita. Coefficients of constant and time period dummies not reported.
* significant at .10 level. ** .05 level. *** .01 level.

Table 5. Results for carbon monoxide emissions.

	I	II
GDP	0.442	0.490
	(2.49)**	(3.22)***
	(1.42)	(2.11)*
Vehicles	0.276	0.276
	(2.16)**	(2.31)**
	(1.33)	(1.46)
Manufact	1.110	0.741
	(1.53)	(1.09)
	(0.80)	(0.60)
Fossil	1.068	0.525
	(2.24)**	(1.65)
	(1.67)*	(1.46)
Efficiency	-0.960	-0.878
	(5.24)***	(5.41)***
	(3.49)***	(4.34)***
Leftcabinet	0.000	0.000
	(1.67)*	(1.45)
	(1.02)	(0.97)
Leftseat	-0.003	-0.002
	(2.86)***	(2.44)**
	(2.02)**	(1.97)*
Greenseat	-0.013	-0.013
	(2.17)**	(2.22)**
	(2.54)**	(2.62)**
Corporatism		0.002
		(0.03)
		(0.03)
R-sq within	.7689	.7662
R-sq between	.3342	.4368
R-sq overall	.3593	.4596
Observations	180	180
Hausman test		1.05
		Pr. > F = 0.4356

Note: Dependent variable is logged pollution per capita. Coefficients of constant and time period dummies not reported.
* significant at .10 level. ** .05 level. *** .01 level.

Table 6. Results for volatile organic compound emissions.

	I	II
GDP	0.655	0.730
	(3.66)***	(4.73)***
	(2.70)***	(2.71)**
Vehicles	0.511	0.463
	(4.05)***	(3.80)***
	(2.16)**	(1.92)*
Manufact	0.455	0.058
	(0.77)	(0.09)
	(0.47)	(0.05)
Fossil	2.026	0.768
	(3.84)***	(2.19)**
	(2.32)**	(1.94)*
Efficiency	-0.697	-0.650
	(3.80)***	(4.41)***
	(2.59)**	(3.21)***
Leftcabinet	0.000	0.000
	(0.60)	(0.05)
	(0.43)	(0.04)
Leftseat	-0.001	0.000
	(0.63)	(0.20)
	(0.38)	(0.14)
Greenseat	-0.019	-0.020
	(3.75)***	(3.85)***
	(3.16)***	(2.78)**
Corporatism		0.008
		(0.10)
		(0.09)
R-sq within	.7294	.7174
R-sq between	.0449	.2361
R-sq overall	.0644	.2661
Observations	180	180
Hausman test		2.46
		Pr. > F = 0.0615

Note: Dependent variable is logged pollution per capita. Coefficients of constant and time period dummies not reported.
* significant at .10 level. ** .05 level. *** .01 level.