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Weighing the Relative Importance of Environmental Regulation for Industry Location

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Abstract

This paper analyses empirically the extent to which environmental regulation is an influence on industry location in Europe. Particular focus is given to weighing environmental regulation vis-à-vis other location determinants, mainly the traditional Heckscher-Ohlin factor endowment forces. The analysis is based on a general empirical trade model that captures the theoretically-emphasized joint role of country and industry characteristics in determining industry location. The model is applied to data on 18 manufacturing industries from 13 European countries. The results indicate that while the oft elusive *pollution haven effect* can be uncovered, the relative strength of such an effect is smaller than other determinants of industry location. This is interpreted, à la M. Scott Taylor, as finding the *pollution haven effect* but failing to support the *pollution haven hypothesis*.

KEYWORDS: pollution haven hypothesis, comparative advantage, industry location

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1. Introduction

Does environmental regulation have a significant impact on industry location? This question is at the heart of the trade and environment debate. A positive answer to this question might give grounds to worry about a host of interrelated issues: the emergence of 'pollution havens' in environmentally lax countries; harm on competitiveness in environmentally strict countries and a consequent attempt by jurisdictions to undercut each other's environmental standards. Such issues have served as an additional impediment to the conclusion of the latest round of WTO trade liberalization that started in Seattle in 1999 (Wolfe 2004). Industrialists in the EU are also said to be worried about the extent to which the EU Emissions Trading Scheme impairs their competitiveness (Reinaud 2004). Similarly in the US, competitiveness concerns were raised during the debate on the impact of North American Free Trade. Critics argued that differential environmental standards across Canada, Mexico and US would result in massive capital flight to Mexico which would have more jobs but also more pollution.

The foregoing topics have received considerable attention in the academic literature and one by-product of this interest has been the formulation of the so-called Pollution Haven Hypothesis (PHH).[1] This hypothesis purports that trade liberalization results in a relocation of dirty goods production from countries with stringent environmental regulation to those with lax environmental regulation. While the hypothesis is intuitively plausible, reviews of the empirical literature have concluded that the evidence is mixed or that the correlation between environmental regulation and industry performance is weak (see, for e.g., Jaffe et al. 1995; Copeland and Taylor 2003; Mulatu et al. 2003). Taylor (2004) has further pointed out that empirical work on the PHH has been troubled by, among other things, the fact that researchers at times "confused" the PHH and the pollution haven effect. Pollution havens occur if "tightening of environmental regulation deters exports (or stimulates imports) of dirt goods" while, as has already been described above, the PHH is a *prediction* of trade patterns (Taylor 2004, p. 4). The two concepts are

[1] See, for example, a recent edited volume fully dedicated to the Pollution Haven Hypothesis (Fullerton 2006).

related since the "trade patterns prediction of the PHH can only be true if we have a strong pollution haven effect" (Taylor 2004, p. 4).

What underlies the distinction between the PHH and the pollution haven effect is the fact that differential stringency of environmental regulation is only one of several motives for trade such as relative factor endowment conditions. And hence for actual trade patterns to conform to the predictions of the PHH, the pollution haven motive (effect) must outweigh the other motives. This is the rationale for Taylor's call for empirical work "... to focus on weighing the relative strength of different motives for trade in dirty goods" (p. 22).

This paper presents a way of undertaking such an assessment with industry production data from Europe. We employ a general trade model that has recently appeared in the new economic geography literature, and has not previously been used in the pollution haven literature. The specific contribution of this econometric tool is the modeling of the theoretically-emphasized joint role of country and industry characteristics in the determination of the pattern of industry location. General equilibrium considerations mean that the model takes into account both high and low intensities (of industry attributes) and high and low abundance (of country characteristics). This nature of the model captures the spirit of recent findings in the literature that the impact of environmental regulation tends to be "heterogeneous both spatially and across industry" (Millimet and List 2004, p. 261; Mulatu et al. 2004).

The rest of the paper is organized as follows. Section 2 presents the econometric model. Section 3 describes the data. Section 4 discusses the empirical results and Section 5 concludes.

2. Theory and empirical model

The aim here is to investigate the relevance of various factors affecting industry location. In particular, we are interested in the determinants of the share of country *i* in the total manufacturing production of industry *k*; s_i^k, defined as: $s_i^k = z_i^k \Big/ \sum_i z_i^k$, where z_i^k measures the level of economic activity *k* at location *i*.

Trade theorists' discussions of industry location are informed by two strands of literature. Comparative advantage arguments based on the role of factor endowments can be derived from Heckscher-Ohlin (HO) models. Recent work has extended the standard HO models to accommodate environmental factors where cross-country differences in the stringency of environmental regulation play a role in trade patterns.[2] New economic geography (NEG), by contrast, stresses the importance of market access where there are increasing returns and linkage effects. NEG predicts that while activity will be dispersed at 'very high' and 'very low' transport costs there will be clustering when transport costs are 'intermediate'.[3] The HO and NEG theories should be regarded as complementary and their relative importance for industrial location outcomes is thus an empirical issue.

A recent study of the location of European industry by Midelfart-Knarvik et al. (2000b) is based on a general model that incorporated both types of effects, i.e. comparative advantage and market access. They estimate a model that takes account of the HO arguments by relating the factor intensities of industries to the factor endowments of countries. The NEG story is captured by examining the interactions between market potential and each of the share of intermediates in costs, the share of sales to industrial users and scale economies.

A simple and natural extension of Midelfart-Knarvik et al.'s (2000b) econometric model is to allow for the role of environmental factors, and therefore we develop a variant of their model. Countries are heterogeneous in various characteristics such as endowments of natural resources and skilled labor and proximity to markets. Similarly, industries differ in their various attributes such as the intensity of use of production factors like skilled labor, and their reliance on intermediate inputs. In equilibrium we expect that industries that value a regional characteristic highly will succeed in locating there. So, for example, all else equal we would expect an industry that is pollution intensive to be attracted to a country with a relatively lax environmental regulation. The rationale for the emphasis on the interaction of industry and country characteristics lies in the general equilibrium nature of the system. Therefore, the model's predictions of industry location entail only the interactions of country and industry characteristics.

[2] See, e.g., Copeland and Taylor, 1994, 1995; Antweiler, Copeland and Taylor (2001); and Copeland and Taylor (2003).

[3] See, e.g., Krugman and Venables, 1995.

Formally, Midelfart-Knarvik et al.'s model is written as a reduced form equation as:

$$\ln(s_i^k) = \alpha \ln(pop_i) + \sum_j \beta[j](y[j]_i - \gamma[j])(x[j]^k - \chi[j]) + \varepsilon_i^k \qquad (1)$$

where *i* indexes countries and *k* indexes industries. As defined above, s_i^k is the share of country *i* in the total European manufacturing production of industry *k*; pop_i is the share of Europe's population living in country *i*; $y[j]_i$ is the level of the *jth* country characteristic in country *i*; $x[j]^k$ is the industry *k* value of the industry characteristic that corresponds to country characteristic *j*. Thus, the interaction forces are represented by the terms in the summation. Finally α, $\beta[j]$, $\gamma[j]$ and $\chi[j]$ are coefficients to be estimated.

For a better illustration of the meaning of the model consider a particular characteristic, say, skilled labor. So $x[skilled\ labor]^k$ is skilled-labor intensity of industry *k* and $y[skilled\ labor]_i$ is skilled-labor abundance of country *i*. The following interpretation can then be given to the model: First, there exists an industry with a *cut-off* level of skilled-labor intensity $\chi[skilled\ labor]$ such that its location is independent of the skilled-labor abundance of a country. Second, there exists a *cut-off* level of skilled-labor abundance $\gamma[skilled\ labor]$ such that the country's share of any industry is independent of the skilled-labor intensity of the industry. Third, if $\beta[skilled\ labor] > 0$, then industries with skilled-labor intensity greater than the *cut-off* point $\chi[skilled\ labor]$ will be induced to locate near countries with skilled-labor abundance greater than the *cut-off* point, i.e. $\gamma[skilled\ labor]$. Estimation of the model will produce the following key parameters for each interaction variable: $\gamma[j]$, $\chi[j]$ and $\beta[j]$ with *j* running over seven interactions. If for example, skilled labor is an important determinant of location patterns, we should see a large value of $\beta[skilledlabor]$.

Expanding the relationship in (1) we obtain the estimating equation as follows:

$$\ln(s_i^k) = c + \alpha \ln(pop_i) + \sum_j (\beta[j]y[j]_i x[j]^k - \beta[j]\gamma[j]x[j]^k - \beta[j]\chi[j]y[j]_i) + \varepsilon_i^k \qquad (2)$$

Estimation of (2) produces all the parameters of interest. The coefficient of the size variable α is straightforward, and *c* is a constant term. The estimated coefficients of the country characteristics, $y[j]$ and the industry characteristics, $x[j]$ are estimates of $-\beta[j]\chi[j]$ and $-\beta[j]\gamma[j]$, respectively, and so are expected to have negative signs. The estimated coefficients of the *interaction* variables, $y[j]x[j]$ would be estimates of $\beta[j]$, which are expected to be positive. This is the crucial set of parameters in the model. The relative magnitude and statistical significance of this coefficient on, say, for example, *agricultural production*agricultural input intensity* provides us with a measure of the importance of this factor endowment in influencing industry location.[4]

We estimate the role of the interactions of the country characteristics and industry attributes, presented in Table 1, for industry location. For ease of reading, the interaction variables to be considered as explanatory variables are written out here: 1) Agricultural production as % GDP and agricultural input intensity;[5] 2) Secondary & higher education as % population and skilled labor intensity; 3) Researchers & Scientists as % of labor force and R&D intensity; 4) Environmental standard laxity and pollution intensity; 5) Market potential and intermediate input use; 6) Market potential and sale to industry; 7) Market potential and plant size.

The first three are associated with the traditional HO trade model, whereas the fourth one is the environmental variable which is the main concern in this paper.[6] The last three represent the NEG concerns of the model, namely the pull of centrality interacting with scale economies, and forward and backward linkages. The main hypothesis regarding this pull of centrality is that a firm's location decision involves consideration of market access besides production costs.[7]

< Table 1 about here >

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[4] If we divide the country characteristics coefficients, $-\beta[j]\chi[j]$ by $\beta[j]$ we obtain estimates of the *cut-off* points for each industry characteristic. Similarly, dividing the coefficients of the industry characteristics, $-\beta[j]\gamma[j]$, by $\beta[j]$ gives estimates of the *cut-off* points for each country characteristic.

[5] Following Midelfart-Knarvik et al (2000b), the rationale for taking the variable Agricultural production as % GDP instead of the underlying conventional factor inputs such as land is that, since our concern is the pattern of manufacturing, agriculture can be considered as an exogenous measure of the 'endowment of agriculture'.

[6] Capital is ignored because of the assumption of capital mobility across Europe.

[7] See, e.g., Venables, 1996.

3. Data

Descriptions of the construction of our variables and data sources are presented in Table 1. Hence, the discussion here is limited to some other relevant issues not contained in the table and further description of the main variables of interest in this paper, .i.e. the environmental variables. As is common in research of this type, our data for all explanatory variables (except for the size variable, i.e. population) are non time-varying. Data on each of the country characteristics pertain to "around the year 1990" and are obtained from Midelfart-Knarvik et al., 2000b. Input-output data (i.e. agricultural intensity, intermediate input intensity and industry sale) are constructed as (output) weighted averages of the data for Denmark, Germany, France and the UK for 1990. The environmental standard laxity variable is constructed as the inverse of the *Environmental Sustainability Index* which is constructed jointly by World Economic Forum, Yale Center for Environmental Law and Policy, and Center for International Earth Science Information Network, Columbia University. This index refers to the year 2001 and is based on a set of five "core" components (such as environmental system and social and institutional capacity) with a total of 22 indicators (such as air quality and regulation & management). Each of these indictors in turn combines two to six variables for a total of 67 underlying variables (such as Urban SO2 concentration and Civil and Political Liberties).[8]

We use two alternative measures of pollution intensity. The first measure is taken from Low and Yeats (1992) who provide estimates of pollution abatement and control costs as a share of the value of industry output in the USA for the year 1988. The second measure is based on the Toxic Release Inventory (TRI) data compiled by the US Environmental Protection Agency. The TRI data catalogues releases of various types of emissions into air, water, land and underground for each manufacturing industry group in the US. Such emissions measured by weight for the year 1990-1995 are averaged and normalized by the value of industry shipments for the year 1992.[9] As in the case of the pollution intensity variable, we have experimented with an alternative measure of the

[8] This index is also used in Javorcik and Wei (2004).
[9] Our second measure of pollution intensity is also used in Javorcik and Wei (2004). These authors also employ an alternative measure of pollution intensity similar to our first measure, i.e. based on pollution abatement expenditure.

variable of environmental regulation stringency from the Global Competitiveness Report 2001-2002, published by the World Economic Forum. The results were not satisfactory, and hence we did not pursue that variable further. The full data on all the explanatory variables are reported in the appendix in Tables A.1 and A.2.

4. Results and discussion

We estimate Equation (2) for each of the years 1990-1994, and also for the average value of the dependant variable over this period (shown as average LHS), using in all cases Ordinary Least Squares pooling across industries. The choice of the 1990-1994 sample period was dictated by the periods for which most of the explanatory variables are readily available. The results are presented in Tables 2.a and 2.b pertaining to pollution intensity variables 1 and 2, respectively. The results in these two tables are quite similar; hence we base our discussion mainly on the results in Table 2.a.

The estimated coefficients of the intercept term and the size variable appear in the first two rows followed by the coefficients of the five regional characteristics, $y[j]$, the seven industry characteristics, $x[j]$ and finally the seven interaction variables, $\beta[j]$. The size variable, i.e. population always has the expected sign and is significant. It is meant to control for size differences in the sample of countries. The estimated coefficients imply that, all else equal an increase in the share of population for the average country (in the sample) would lead to about a proportionate increase in its production share of the *average* industry.

< Tables 2.a and 2.b about here >

As has already been noted, since this is a general equilibrium model our focus is on the coefficients of the interaction variables that capture the joint role of regional and industry characteristics in the location of industry (see Midelfart-Knarvik et al. 2000a, 2000b). However, we cannot directly read the coefficients off of Table 2.a. and make any inference because it is a multiplicative interaction model. For example, to take the negative coefficient of the environmental standard laxity in Table 2.a and conclude that regulatory laxity has a reductive effect on production shares is unwarranted because this coefficient presumably measures the effect of laxity when pollution intensity is zero which does not make much sense. In other words, what we are dealing with here are conditional hypotheses in the form of: 'the impact of environmental regulation on production share depends on the pollution intensity of the industry concerned'.[10] Thus, taking the environmental variable as an example, the marginal effect of environmental standard laxity would be calculated as follows: (For clarity let us label the environmental variables and their coefficients as: ESL = environmental standard laxity; PI = pollution intensity; β_1 = coefficient of ESL; β_2 = coefficient of PI; and β_3 = coefficient of the interaction variable ESL*P).

$$\partial s_i^k \big/ \partial ESL = \beta_1 + \beta_3 PI \qquad (3)$$

with the standard error: $\sqrt{\operatorname{var}(\beta_1) + PI^2 \operatorname{var}(\beta_3) + 2PI \operatorname{cov}(\beta_1 \beta_3)}$

The results of this exercise for each of the country characteristics evaluated at the largest value of the respective industry attribute are reported in Table 2.c.[11] The exercise is performed for each of the sample periods and for average LHS, but only the latter is reported in Table 2.c to avoid clutter and also because the results are fairly similar.

< Table 2.c about here >

All estimated coefficients reported in Table 2.c are expected to have positive signs. Thus, the result with respect to environmental standard laxity, for example, suggests that industries that are relatively more pollution intensive (like Industrial chemicals and Drugs & medicines) are attracted to countries which have relatively lax environmental standards (like Belgium and Greece). Specifically, the coefficient suggests that: for the most pollution intensive industry in the sample a one unit increase in the index of environmental standard laxity in a country will result in 0.015 proportionate rate of increase in the production share of that industry. The same interpretation holds for skilled labor and R&D variables.

[10] See Brambor et al. (2006) and Wooldridge (2006, pp. 204-206) for issues surrounding multiplicative interaction models.

[11] The usual practice is to evaluate interaction effects at the mean and upper/ lower quartiles. But we chose here the largest values because we know that if we cannot find a significant effect at the largest value, then our hypothesis would not hold.

For an illustration of the conditional hypothesis we are dealing with in the foregoing we present Figure 1 (based on the results for Average LHS and pollution intensity 1) which depicts how the effect of environmental standard laxity on production share is conditioned by the extent of the pollution intensity of production. The upward sloping solid line shows how the marginal effect of environmental standard laxity increases as pollution intensity rises. Any point on this line is given by Equation (3) above.

< Figure 1 about here >

95% confidence intervals around the line permit us to evaluate at which values of pollution intensity environmental standard laxity would have a statistically significant impact on production shares. Pollution intensity has a statistically significant effect when the upper and lower bounds of the confidence interval are both above (or below) the zero line.[12] The effect of environmental standard laxity on production shares becomes significant once pollution intensity reaches about 1.86 (note that the largest value in the sample is 2.17 which happens to be the 75th percentile as well). This result alone indicates that: while the so called pollution haven effect is present, it is significant only at relatively large levels pollution intensity. Furthermore, at lower levels of pollution intensity, the influence of environmental standard would be overwhelmed by the other forces. We will come back below to this issue of comparison of the relative strength of the various forces of industry location.

The agricultural variable does not have the expected sign but it is not significant. This result suggests that Agricultural input abundance is a very weak force for industry location such that even for the most agricultural input intensive industry (in the sample) it does not have any positive influence on its location.

Likewise the NEG variable of market potential is not significant. Midelfart-Knarvik et al. (2000b) report significant estimates for the market potential variable but their findings do not seem to be particularly robust as can be seen from Midelfart-Knarvik et al. (2000a).

To explore the interaction terms further we estimated a stripped down version of the model involving only the traditional HO variables together with the environmental

[12] See Brambor et al. (2006) and Preacher et al. (2003). Figure 1 is produced using the online computer programme of the latter.

variable. A formal test of comparing the full model with the model of only the HO variables (including the environmental variable) amounts to a test of whether the estimates of the coefficients of the NEG variables are jointly zero. If so, the stripped down model is to be preferred. For our variant of the model where the dependant variable is Average LHS, the F statistic (F [7, 187]) for the hypothesis of an HO model is found to be 1.62 (and 1.81 with pollution intensity variable 2). From the F table the critical value at the 5 percent significance level is 2.01, hence the null hypothesis that the HO model is appropriate cannot be rejected.[13]

The results of the stripped down model involving the HO variables together with the environmental variable are reported in Tables 3.a and 3.b.[14] With the exception of one country and one industry characteristics, all estimated coefficients are highly significant throughout in both tables. Table 3.c reports the marginal effects and their standard errors. The interpretation of the results is the same as above, Tables 2.a-2.c for the full model.

< Tables 3.a -3.c about here >

Overall, what the results suggest is that industry location in Europe is influenced to varying degrees by factor endowment conditions including the stringency of environmental regulation.

As has already been hinted at in the introduction, our main aim is to evaluate the relative strength of environmental regulation stringency in influencing industry location. The results of the environmental variable discussed on the basis of Figure 1 above in itself shows that while environmental stringency matters for the location of very dirty (i.e. pollution intensive) industries, it is not the case for non-pollution intensive ones. This also means that other country characteristics also exert influence on industry location, and that the pollution haven hypothesis might be called into question.

In what follows we explicitly address this issue of the relative strength of the influence of the various forces of industry location, in particular the traditional HO factors vis-à-vis the environmental factor. Towards answering this question we consider

[13] The same test is applied to each individual year in the sample, and the same results are obtained, except for the year 1990 for which the test statistics is 2.29.

[14] A similar test of whether or not we can exclude the agricultural variables shows that we cannot exclude them. The F statistic (F [3, 194]) for the hypothesis of the exclusion of the agricultural variables is found to be 20.41 (and 20.44 with pollution intensity variable 2). From the F table the critical value at the 5 percent significance level is 3.80, hence the null hypothesis is rejected.

two simple exercises that are capable of giving some feel for the relative strength of the various determinants of industry location. One exercise is based on estimated Beta Coefficients and the other is on the basis of predicted production shares. The results are reported in Tables 4 and 5, respectively.

In Table 4 we report Beta Coefficients that are adjusted regression coefficients, which are all in the same unit (and thus are comparable). Beta coefficients are defined as: $beta(i) = {s_{xi}}/{s_y}\, \hat{\beta}_i$, where $\hat{\beta}_i$ is the estimated coefficient of variable i while s_{xi} and s_y are, respectively the sample standard deviations of the right-hand side variable x_i and the dependant variable y in Equation (2).[15] Expressed in this manner, the estimated coefficients are standardized and hence comparable since we are measuring the effects on the dependant variable in terms of standard deviation units. Note that once again the coefficients are calculated for the largest sample values of the respective industry attributes (as in the case of the results reported in 3.c).[16] The coefficient of the environmental variable suggests, for the sample year of 1990, that relaxing the environmental standard (index) by one standard deviation would change production shares by 0.193 (or by 0.184, with pollution intensity variable 2) standard deviations. Similar interpretation holds for the other variables. It can be seen from the table that the magnitude of the effect of the environmental variable is comparable to the individual effects of the other variables.

In Table 5 we show the share of the most intensive industry (in each of the four inputs) in the most and least abundant countries of the respective input, in three cases: actual, predicted and counterfactual. The counterfactual answers the question: if the most abundant country in a particular factor were to have the level of endowment of the least abundant country what would be its share? The reverse also holds for the case of the least abundant country. Our aim is to compare the predicted with the counterfactual in order to bale able to make comparisons on the relative strength of the various factor inputs. Thus,

[15] This amounts to a regression with the variables standardised, i.e., each variable's mean in the sample subtracted off and then divided by its standard deviation.

[16] Actually, the only difference between the coefficients reported in Table 3.c and those in Table 4 is that in the latter, both the left and right hand side variables are standardised to permit comparison across the coefficients.

taking the environmental variable as an example what we see in Table 5 is as follows.[17] 4.8% of the most pollution intensive industry's production (Industrial chemicals) is actually and also predicted to be in the country with the most lax environmental standard (Belgium), and only 0.7% (the actual figure being 1.0%) of this production would be in the country with the most stringent environmental regulation (Finland). The corresponding counterfactual figures are shown to be 2.7% and 1.3%, respectively. The difference between the two sets of predicted and the counterfactual shares are shown to be, respectively 2.1 and -0.6 percentage points. The interpretation is that, if Belgium's environmental standard were to become as stringent as that of Finland, then its predicted share of the most pollution intensive industry would go down by 2.1 percentage points from 4.8% to 2.7%. Similar calculations are done with respect to the other three variables. A comparison across the differences (shown in the last rows of the table) should then give us a feel for the relative strength of each of the forces in industry location. Again the environmental variable is not a predominant force influencing industry location.

The outcome of these two exercises suggests that while variations in environmental stringency and pollution intensity are considerable influence on location decisions, the other traditional HO factors are also strong influence individually, and jointly are likely to dominate the influence of the environmental factor.

5. Concluding remarks

This paper is an empirical analysis of the extent to which environmental regulation is an influence on industry location in Europe. Particular focus is given to weighing environmental regulation vis-à-vis other location determinants, mainly the traditional HO factor endowment forces.

The analysis is based on a general empirical trade model. It has a distinctive feature in that it models the theoretically-emphasized joint role of country and industry characteristics in determining industry location. The model is applied to data on 18 manufacturing industries (ISIC Rev.2 codes) from 13 European countries. This dataset covers countries with stringent environmental regulation like Finland and Sweden on the

[17] Again the reported results are based on the estimated coefficients of the regression reported in Table 3.a. and where the dependant variable is the average of 1990-1994 (i.e. average LHS).

one hand and countries with relatively lax environmental regulation such as Greece and Belgium on the other. With respect to sectors, the dataset includes the most pollution intensive industries such as Industrial Chemicals as well as relatively cleaner sectors such as Radio, TV & Communication Equipment.

The results indicate that while the oft elusive *pollution haven effect* can be uncovered, the relative strength of such an effect is smaller than other determinants of industry location. This might be interpreted, á la M. Scott Taylor, as finding the *pollution haven effect* but failing to support the *pollution haven hypothesis*.

The analysis presented here is of an explorative nature. Future work will have to look into the further development of the framework to better weigh the relative strength of environmental regulation in determining industry location. In particular, future research will have to focus on the issue of endogeneity of environmental policy in this framework.

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Table 1. Variable definitions and data source

Variable	Definition	Source
Size variable		
Population	Share of EU population living in country *i*	OECD
Country characteristics		
Agricultural production as % GDP	Value of agricultural output as a share of GDP	Midelfart-Knarvik et al. (2000b)
Secondary & higher education as % population	Share of population aged 25-59 with at least secondary education	Midelfart-Knarvik et al. (2000b)
Researchers & Scientists as % of labor force	Researchers per 10 000 labor force	Midelfart-Knarvik et al. (2000b)
Environmental standard laxity	The inverse of Environmental Sustainability Index	World Economic Forum, Yale Center for Environmental Law and Policy, and CIESIN (http://www.ciesin.columbia .edu/indicators/ESI)
Market potential	Indictors of market potential based on GDP (in £)	Midelfart-Knarvik et al. (2000b)
Industry characteristics		
Agricultural input intensity	Total use of agricultural input as a share of value of production	OECD input-output table
Skilled labor intensity	Average pay in industry relative to the pay in manufacturing as whole	OECD STAN database
R&D intensity	Research & development expenditure as a share of value added	OECD ANBERD
Pollution intensity 1	Pollution abatement and control costs as a share of the value of industry output in the USA	Low and Yeats (1992)
Pollution intensity 2	Weight of releases of toxic substances normalized by value of shipments	US Environmental Protection Agency
Intermediate input use	Total use of intermediates as a share of value of production	OECD input-output table
Sales to Industry	Sales to domestic industry (as intermediates and exports) as a share of value of production	OECD input-output table
Plant size	Indictor of economies scale: number of employees per plant	Pratten (1988)

Notes: The 13 countries and 18 sectors (ISIC Rev.2 codes) with the values of their respective characteristics are reported in the appendix in Tables A.1 and A.2. Of the 18 sectors, the Petroleum & coal products and other manufacturing sectors are excluded because the former is virtually a natural resource sector and the latter is a 'residual' sector which may not be plausibly described as a particular sector.

Table 2.a. Regression results of the full model (with pollution intensity variable 1)

Variable	1990	1991	1992	1993	1994	Average LHS
Constant	-4.214 ***	-3.705 ***	-3.692 ***	-3.579 ***	-3.400 ***	-3.535 ***
	(1.077)	(1.056)	(1.067)	(1.085)	(1.117)	(1.072)
Population	1.050 ***	1.064 ***	1.055 ***	1.020 ***	1.018 ***	1.040 ***
	(0.041)	(0.041)	(0.041)	(0.041)	(0.042)	(0.041)
Agricultural production as % GDP	-0.139 ***	-0.142 ***	-0.138 ***	-0.144 ***	-0.161 ***	-0.142 ***
	(0.033)	(0.032)	(0.032)	(0.033)	(0.034)	(0.033)
Secondary & higher education as % population	-0.017	-0.019 *	-0.018	-0.020 *	-0.021 *	-0.019 *
	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)	(0.015)
Researchers & Scientists as % labor force	0.001	-0.002	-0.003	-0.001	-0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Market potential	0.037	0.031	0.040	0.040	0.023	0.036
	(0.044)	(0.043)	(0.044)	(0.045)	(0.046)	(0.044)
Environmental stand. laxity	-0.014 **	-0.010 *	-0.008	-0.009	-0.011 *	-0.011 *
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)
Agricultural input intensity	0.671	0.666	0.771	0.217	0.157	0.487
	(1.016)	(1.046)	(1.031)	(1.046)	(1.080)	(1.036)
Skilled labor intensity	-0.016 **	-0.018 **	-0.018 **	-0.018 **	-0.018 **	-0.017 **
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
R&D intensity	-0.348	-0.115	-0.636	-0.916	-1.161	-0.655
	(1.303)	(1.231)	(1.244)	(1.284)	(1.318)	(1.253)
Pollution intensity	1.097 ***	0.927 ***	0.860 ***	0.845 **	0.938 **	0.933 ***
	(0.354)	(0.344)	(0.365)	(0.391)	(0.405)	(0.367)
Intermediate input use	0.622	0.346	0.387	0.195	0.037	0.309
	(0.936)	(0.921)	(0.927)	(0.960)	(0.976)	(0.936)
Sales to industry	1.103 **	1.083 **	0.998 **	1.105 **	1.114 **	1.075 **
	(0.513)	(0.522)	(0.530)	(0.551)	(0.559)	(0.529)
Plant size	-0.040 *	-0.037 *	-0.032	-0.020	-0.019	-0.029
	(0.027)	(0.028)	(0.029)	(0.029)	(0.030)	(0.028)
Agricultural production * Agricultural input intensity	0.253 *	0.282 **	0.256 *	0.375 **	0.402 ***	0.314 **
	(0.160)	(0.166)	(0.163)	(0.168)	(0.171)	(0.163)
Secondary & higher education * Skilled labor intensity	0.0002	0.0002 *	0.0002 *	0.0002 *	0.0002 *	0.0002 *
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Researchers & Scientists * R&D intensity	0.035 **	0.030 *	0.039 **	0.044 **	0.050 ***	0.040 **
	(0.020)	(0.019)	(0.019)	(0.020)	(0.021)	(0.019)
Environmental stand. laxity * Pollution intensity	0.014 ***	0.012 **	0.011 **	0.011 **	0.012 **	0.012 **
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Market potential * Sales to industry	-0.056	-0.055	-0.048	-0.063	-0.060	-0.056
	(0.046)	(0.047)	(0.048)	(0.049)	(0.049)	(0.047)
Market potential * Intermediate input use	-0.068	-0.047	-0.053	-0.036	-0.023	-0.045
	(0.079)	(0.078)	(0.078)	(0.081)	(0.082)	(0.078)
Market potential * Plant size	0.003 *	0.003	0.002	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	208	208	208	208	208	208
Adj. R^2	0.84	0.85	0.85	0.83	0.83	0.84

Notes: Heteroskedasticity-robust standard errors in parenthesis. * is significant at 10% level. ** is significant at 5% level. *** is significant at 1%.

Table 2.b. Regression results of the full model (with pollution intensity variable 2)

Variable	1990	1991	1992	1993	1994	Average LHS
Constant	-4.097 ***	-3.622 ***	-3.612 ***	-3.504 ***	-3.305 ***	-3.446 ***
	(1.049)	(1.031)	(1.043)	(1.062)	(1.094)	(1.048)
Population	1.050 ***	1.064 ***	1.055 ***	1.020 ***	1.018 ***	1.040 ***
	(0.041)	(0.041)	(0.041)	(0.041)	(0.042)	(0.041)
Agricultural production as % GDP	-0.139 ***	-0.142 ***	-0.138 ***	-0.144 ***	-0.161 ***	-0.142 ***
	(0.033)	(0.032)	(0.032)	(0.033)	(0.033)	(0.032)
Secondary & higher education as % population	-0.017	-0.019 *	-0.018	-0.020 *	-0.021 *	-0.019 *
	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)	(0.015)
Researchers & Scientists as % labor force	0.000	-0.002	-0.003	-0.002	-0.002	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Market potential	0.037	0.031	0.040	0.039	0.022	0.035
	(0.043)	(0.043)	(0.043)	(0.045)	(0.046)	(0.044)
Environmental stand. laxity	-0.011 **	-0.008 *	-0.006	-0.007	-0.008	-0.008 *
	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Agricultural input intensity	0.632	0.636	0.745	0.196	0.132	0.459
	(1.039)	(1.065)	(1.047)	(1.061)	(1.098)	(1.055)
Skilled labor intensity	-0.016 **	-0.018 **	-0.017 **	-0.017 **	-0.017 **	-0.017 **
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
R&D intensity	-0.312	-0.077	-0.603	-0.902	-1.165	-0.634
	(1.279)	(1.210)	(1.228)	(1.271)	(1.307)	(1.237)
Pollution intensity	0.368 ***	0.310 ***	0.279 **	0.267 **	0.298 **	0.305 ***
	(0.122)	(0.116)	(0.123)	(0.130)	(0.134)	(0.124)
Intermediate input use	0.691	0.415	0.455	0.257	0.087	0.371
	(0.946)	(0.934)	(0.940)	(0.977)	(0.993)	(0.950)
Sales to industry	1.128 **	1.108 **	1.018 **	1.125 **	1.134 **	1.097 **
	(0.508)	(0.520)	(0.528)	(0.551)	(0.560)	(0.528)
Plant size	-0.044 *	-0.041 *	-0.035	-0.024	-0.022	-0.032
	(0.027)	(0.028)	(0.028)	(0.029)	(0.029)	(0.028)
Agricultural production * Agricultural input intensity	0.261 *	0.289 **	0.262 *	0.381 **	0.408 ***	0.321 **
	(0.162)	(0.167)	(0.163)	(0.169)	(0.172)	(0.164)
Secondary & higher education * Skilled labor intensity	0.0002	0.0002 *	0.0002 *	0.0002 *	0.0002 *	0.0002 *
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Researchers & Scientists * R&D intensity	0.037 **	0.032 **	0.041 **	0.046 **	0.052 ***	0.042 **
	(0.019)	(0.018)	(0.018)	(0.020)	(0.021)	(0.019)
Environmental stand. laxity * Pollution intensity	0.005 ***	0.004 **	0.004 **	0.003 **	0.004 **	0.004 **
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Market potential * Sales to industry	-0.057	-0.056	-0.049	-0.063 *	-0.061	-0.057
	(0.045)	(0.047)	(0.047)	(0.049)	(0.049)	(0.047)
Market potential * Intermediate input use	-0.064	-0.044	-0.050	-0.033	-0.019	-0.042
	(0.078)	(0.077)	(0.077)	(0.080)	(0.081)	(0.078)
Market potential * Plant size	0.003	0.002	0.002	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	208	208	208	208	208	208
Adj. R^2	0.84	0.85	0.85	0.83	0.83	0.84

Notes: Heteroskedasticity-robust standard errors in parenthesis. * is significant at 10% level. ** is significant at 5% level. *** is significant at 1%.

Table 2.c. Marginal effects and standard errors of multiplication terms

Variable	Average LHS (with pollution intensity variable 1)	Average LHS (with pollution intensity variable 2)
Agricultural abundance	-0.061	-0.059
	(0.041)	(0.043)
Skilled labor abundance	0.018 *	0.018 *
	(0.012)	(0.012)
R&D abundance	0.013 ***	0.013 ***
	(0.005)	(0.005)
Environmental stand. laxity	0.015 **	0.014 **
	(0.008)	(0.008)
Market potential	-0.008	-0.009
	(0.045)	(0.044)

Notes:
The results are based on the results for Average LHS reported in Tables 2.a and 2.b.

Heteroskedasticity-robust standard errors in parenthesis. * is significant at 10% level. ** is significant at 5% level. *** is significant at 1%.

Marginal effects and their standard errors are calculated at the largest value of the respective industry attribute.

Table 3.a. Regression results of stripped model – HO variables only (with pollution intensity variable 1)

Variable	1990	1991	1992	1993	1994	Average LHS
Constant	-3.528 ***	-3.111 ***	-3.025 ***	-3.010 ***	-3.052 ***	-3.174 ***
	(0.891)	(0.888)	(0.899)	(0.903)	(0.918)	(0.890)
Population	1.050 ***	1.065 ***	1.063 ***	1.024 ***	1.011 ***	1.042 ***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.035)	(0.034)
Agricultural production as % GDP	-0.141 ***	-0.144 ***	-0.147 ***	-0.148 ***	-0.152 ***	-0.145 ***
	(0.023)	(0.022)	(0.022)	(0.023)	(0.023)	(0.022)
Secondary & higher education as % population	-0.020 *	-0.021 *	-0.019 *	-0.020 *	-0.023 *	-0.020 *
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Researchers & Scientists as % of labor force	0.000	-0.003	-0.004	-0.002	-0.001	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Environmental stand. laxity	-0.014 **	-0.010 *	-0.008	-0.009	-0.011 *	-0.010 *
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Agricultural input intensity	-0.145	-0.095	0.014	-0.347	-0.409	-0.203
	(0.855)	(0.894)	(0.881)	(0.891)	(0.922)	(0.882)
Skilled labor intensity	-0.016 **	-0.019 **	-0.018 **	-0.017 **	-0.017 **	-0.017 **
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)
R&D intensity	-1.999 **	-1.654 *	-2.082 **	-2.274 **	-2.485 **	-2.102 **
	(1.190)	(1.042)	(1.027)	(1.024)	(1.068)	(1.035)
Pollution intensity	1.131 ***	0.955 ***	0.878 ***	0.835 **	0.934 ***	0.945 ***
	(0.336)	(0.324)	(0.345)	(0.376)	(0.385)	(0.347)
Agricultural production * Agricultural input intensity	0.335 ***	0.335 ***	0.311 **	0.384 ***	0.396 ***	0.352 ***
	(0.135)	(0.142)	(0.139)	(0.137)	(0.141)	(0.136)
Secondary & higher education * Skilled labor intensity	(0.0002) *	0.0002 **	0.0002 **	0.0002 *	0.0002 *	0.0002 *
	0.0001	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Researchers & Scientists * R&D intensity	0.043 **	0.037 **	0.045 **	0.050 ***	0.056 ***	0.047 ***
	(0.022)	(0.020)	(0.020)	(0.020)	(0.021)	(0.020)
Environmental stand. laxity * Pollution intensity	0.015 ***	0.012 ***	0.011 **	0.010 **	0.012 **	0.012 **
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)
N	208	208	208	208	208	208
Adj. R2	0.84	0.84	0.84	0.83	0.82	0.84

Notes: Heteroskedasticity-robust standard errors in parenthesis. * is significant at 10% level. ** is significant at 5% level. *** is significant at 1%.

Table 3.b. Regression results of stripped model – HO variables only (with pollution intensity variable 2)

Variable	1990	1991	1992	1993	1994	Average LHS
Constant	-3.486 ***	-3.096 ***	-3.011 ***	-2.999 ***	-3.020 ***	-3.151 ***
	(0.886)	(0.883)	(0.895)	(0.899)	(0.913)	(0.886)
Population	1.050 ***	1.065 ***	1.063 ***	1.024 ***	1.011 ***	1.042 ***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.035)	(0.034)
Agricultural production as % GDP	-0.141 ***	-0.144 ***	-0.147 ***	-0.148 ***	-0.153 ***	-0.145 ***
	(0.023)	(0.022)	(0.022)	(0.023)	(0.023)	(0.022)
Secondary & higher education as % population	-0.020 *	-0.021 *	-0.019 *	-0.020 *	-0.022 *	-0.020 *
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Researchers & Scientists as % of labor force	0.000	-0.003	-0.004	-0.002	-0.001	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Environmental stand. laxity	-0.012 **	-0.009 *	-0.006	-0.007	-0.009 *	-0.008 *
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Agricultural input intensity	-0.078	-0.029	0.075	-0.289	-0.354	-0.142
	(0.874)	(0.908)	(0.892)	(0.900)	(0.934)	(0.895)
Skilled labor intensity	-0.015 **	-0.017 **	-0.016 **	-0.015 **	-0.016 **	-0.016 **
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
R&D intensity	-2.279 **	-1.918 **	-2.331 **	-2.521 ***	-2.734 ***	-2.359 **
	(1.158)	(1.017)	(1.003)	(1.002)	(1.045)	(1.009)
Pollution intensity	0.374 ***	0.314 ***	0.280 ***	0.258 **	0.291 ***	0.303 ***
	(0.108)	(0.103)	(0.110)	(0.121)	(0.123)	(0.111)
Agricultural production * Agricultural input intensity	0.335 ***	0.335 **	0.312 **	0.385 ***	0.397 ***	0.352 ***
	(0.138)	(0.143)	(0.141)	(0.139)	(0.143)	(0.138)
Secondary & higher education * Skilled labor intensity	0.0002 *	0.0002 **	0.0002 **	0.0002 *	0.0002 *	0.0002 *
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Researchers & Scientists * R&D intensity	0.044 **	0.038 **	0.046 ***	0.052 ***	0.057 ***	0.048 ***
	(0.022)	(0.019)	(0.019)	(0.020)	(0.021)	(0.019)
Environmental stand. laxity * Pollution intensity	0.005 ***	0.004 ***	0.004 **	0.003 **	0.004 **	0.004 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	208	208	208	208	208	208
Adj. R2	0.83	0.84	0.84	0.83	0.82	0.84

Notes: Heteroskedasticity-robust standard errors in parenthesis. * is significant at 10% level. ** is significant at 5% level. *** is significant at 1%.

Table 3.c. Marginal effects and standard errors of multiplication terms

Variable	Average LHS (with pollution intensity variable 1)	Average LHS (with pollution intensity variable 2)
Agricultural abundance	-0.054	-0.054
	(0.029)	(0.030)
Skilled labor abundance	0.020**	0.019**
	(0.011)	(0.011)
R&D abundance	0.014***	0.015***
	(0.006)	(0.006)
Environmental stand. laxity	0.015***	0.014***
	(0.007)	(0.007)

Notes:
The results are based on the results for Average LHS reported in Tables 3.a and 3.b.

Heteroskedasticity-robust standard errors in parenthesis. * is significant at 10% level. ** is significant at 5% level. *** is significant at 1%.

Marginal effects and their standard errors are calculated at the largest value of the respective industry attribute.

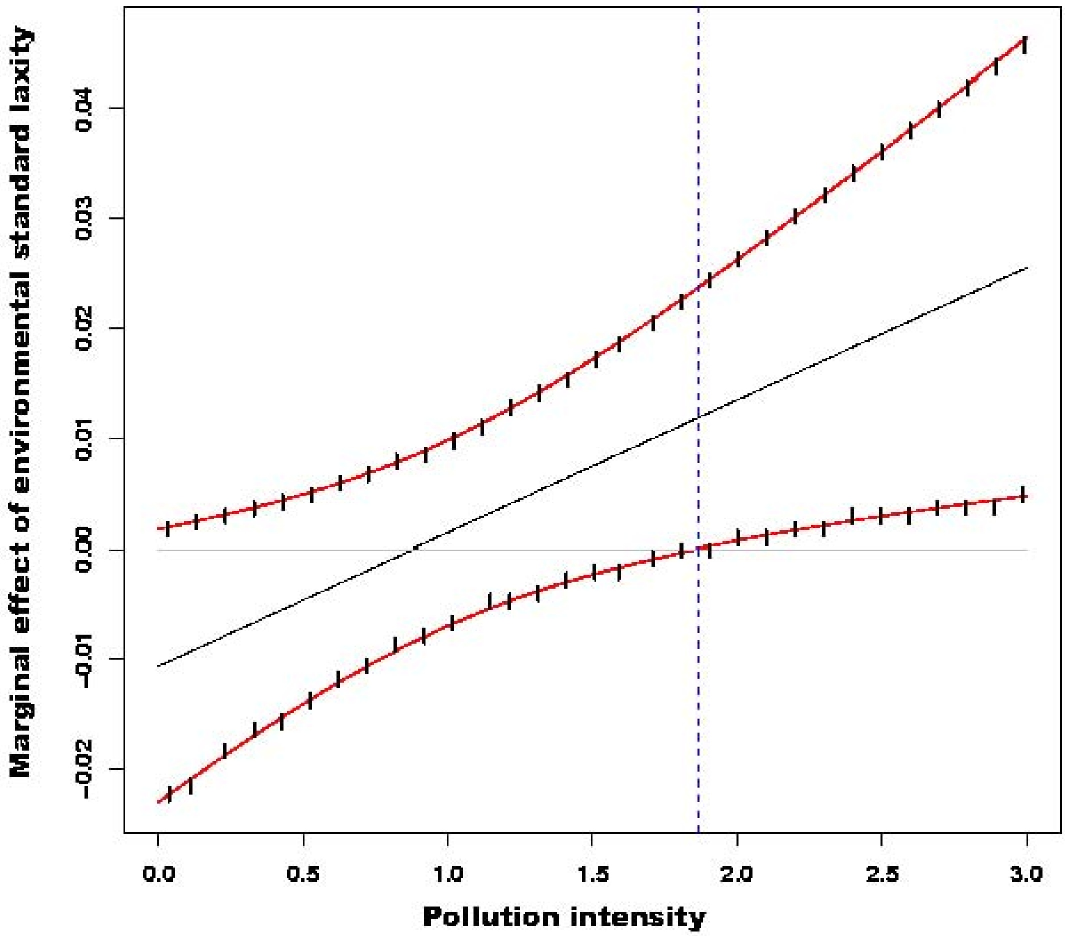
Table 4. Beta coefficients

Variables	1990	1991	1992	1993	1994	Average LHS
			With pollution intensity variable 1			
Agricultural abundance	-0.608	-0.645	-0.745	-0.542	-0.558	-0.604
Skilled labor abundance	0.176	0.241	0.244	0.214	0.199	0.217
R&D abundance	0.169	0.114	0.136	0.176	0.207	0.161
Environmental stand. laxity	0.193	0.168	0.175	0.149	0.160	0.168
			With pollution intensity variable 2			
Agricultural abundance	-0.606	-0.643	-0.743	-0.540	-0.556	-0.602
Skilled labor abundance	0.178	0.243	0.243	0.212	0.196	0.217
R&D abundance	0.173	0.117	0.140	0.179	0.211	0.156
Environmental stand. laxity	0.184	0.161	0.163	0.133	0.141	0.381

Table 5. Actual, predicted & counterfactual production shares

	Agricultural input	**Skilled labor input**	**R&D input**	**Environmental input**
Most intensive industry	Food, beverages & tobacco	Drugs & medicines	Radio, TV & communicati on equipment	Industrial chemicals
		Actual shares (%)		
1. Most abundant country & its production share	Greece: *1.7*	Denmark: *1.7*	Sweden: *2.7*	Belgium: *4.8*
2. Least abundant country & its production share	Belgium: *5.6*	Portugal: *1.3*	Greece: *0.3*	Finland: *1.0*
		Predicted shares (%)		
3. Most abundant country	*2.1*	*1.4*	*3.5*	*4.8*
4. Least abundant country	*3.1*	*0.9*	*0.4*	*0.7*
		Counterfactual shares (%)		
5. Most abundant country	*3.7*	*0.9*	*1.5*	*2.7*
6. Least abundant country	*1.7*	*1.5*	*1.0*	*1.3*
	% point difference between predicted & counterfactual shares			
(3) – (5)	**-1.6**	**0.5**	**3.3**	**2.1**
(4) – (6)	**1.4**	**-0.5**	**-0.3**	**-0.6**

Note: Estimates are based on the regression reported in Table 3.a and where the dependant variable is the average value of the production shares over 1990-1994, i.e. Average LHS, and with pollution intensity variable 1.



95% confidence interval. Pollution intensity has a statistically significant impact whenever the upper and lower bounds of the confidence interval are both above (or below) the zero line.

Figure 1. The marginal effect of environmental standard laxity on production shares

Table A.1. List of countries with the values of their characteristics

Country	Population (average, 1990-1994)	Agricultural production as % GI	Secondary & higher education % population	Research & Scientists % labor force	Market potential	Environmental regulation stringency[1]
Austria	2.1	3.2	75.1	34	12303.0	67.9
Belgium	2.7	1.9	60.6	53	13264.0	44.1
Denmark	1.4	4.5	82.1	58	6627.8	67.0
Finland	1.4	6.6	72.6	67	3642.1	80.5
France	15.9	3.5	62.7	60	12380.0	65.8
Germany	21.9	3.0	82.1	59	13073.0	64.2
Greece	2.8	12.5	49.3	20	2335.7	53.1
Italy	15.5	4.1	41.4	32	8715.1	54.3
Netherlands	4.1	4.0	65.9	46	12840.0	66.0
Portugal	2.7	7.3	23.8	31	3193.8	61.4
Spain	10.6	5.4	35.1	32	4993.2	59.5
Sweden	2.4	3.4	76.7	78	5810.5	77.1
UK	15.7	2.0	55.3	50	12226.0	64.1

Notes: definitions of variables and data sources are presented in Table 1.
[1]*Environmental standard laxity* is therefore the inverse of these figures.

Table A.2. List of sectors with the values of their characteristics

ISIC Rev.2 codes	Agricultural intensity	Skill intensity	R&D intensity	Pollution intensity 1	Pollution intensity 2	Intermediate input intensity	Industry sales	Plant size
Food, beverages & tobacco	0.2579	90.2	0.0131	0.3275	0.1217	0.6152	0.2600	2.23
Textiles, apparel & leather	0.0055	70.6	0.0055	0.3109	0.6337	0.4169	0.2652	0.38
Wood products & furniture	0.0426	75.5	0.0022	0.5273	0.9499	0.4833	0.4002	1.80
Paper, paper products & printing	0.0035	109.6	0.0070	0.6031	1.1395	0.4534	0.6878	1.40
Industrial chemicals	0.0005	134.9	0.0658	2.1700	5.4826	0.4521	0.4065	5.71
Drugs & medicines	0.0001	140.7	0.2871	1.7100	5.4826	0.4131	0.2070	5.71
Petroleum & coal products	0.0000	201.5	0.0407	0.7240	0.7752	0.3339	0.4045	15.10
Rubber & plastic products	0.0029	104.8	0.0221	0.4420	1.4784	0.3688	0.5971	3.50
Non-metallic mineral products	0.0002	103.0	0.0120	0.8556	0.6576	0.4653	0.7484	0.98
Iron & steel	0.0001	121.7	0.0266	1.6100	4.1136	0.5411	0.6730	6.26
Non-ferrous metals	0.0000	107.6	0.0265	1.0975	4.1136	0.3945	0.5166	15.00
Metal products	0.0001	91.4	0.0101	0.4883	0.8901	0.4328	0.5504	0.65
Non-electrical machinery	0.0001	133.8	0.2890	0.3827	0.1695	0.4579	0.2144	10.00
Electrical apparatus, nec.	0.0001	114.1	0.0793	0.3320	0.3765	0.4290	0.3785	4.67
Radio, TV & communication equipment	0.0001	114.4	0.3566	0.2350	0.3765	0.3979	0.2158	14.50
Transport equipment	0.0001	119.5	0.0966	0.3671	0.4287	0.4814	0.1786	3.00
Professional goods	0.0002	103.6	0.0818	0.2657	0.3090	0.3802	0.1704	0.50
Other manufacturing	0.0002	74.5	0.0285	0.2817	0.6487	0.4084	0.1977	0.30

Notes: definitions of variables and data sources are presented in Table 1. The sectoral classification involves slight modifications from the standard ISIC Rev.2 codes, namely that sub-sectors of transport equipment and of non-electrical machinery are aggregated because of missing data for some countries.