NCEE
NATIONAL CENTER FOR
ENVIRONMENTAL ECONOMICS

The Green Industry: An Examination of Environmental Products Manufacturing

Randy A. Becker and Ronald J. Shadbegian

Working Paper Series

Working Paper # 08-10
October, 2008

U.S. Environmental Protection Agency
National Center for Environmental Economics
1200 Pennsylvania Avenue, NW (MC 1809)
Washington, DC 20460
http://www.epa.gov/economics

The Green Industry: An Examination of Environmental Products Manufacturing

Randy A. Becker and Ronald J. Shadbegian

NCEE Working Paper Series

Working Paper # 08-10
October, 2008

The Green Industry:
An Examination of Environmental Products Manufacturing

Randy A. Becker[a] and Ronald J. Shadbegian[b]

September 2008

The authors have benefited from the helpful comments of Matthew Clark, Wayne Gray, Carl Pasurka, Sarah West, as well as numerous seminar and conference participants at the Center for Economic Studies, National Center for Environmental Economics, Western Economic Association meetings, and Southern Economic Association meetings. Note that the views expressed herein are those of the authors and do not necessarily reflect the views of either the U.S. Census Bureau or the U.S. Environmental Protection Agency. All results have been reviewed to ensure that no confidential information is disclosed. Otherwise, this work has not undergone the review accorded official Census Bureau publications. All errors are our own.

[a] Center for Economic Studies, U.S. Bureau of the Census, randy.a.becker@census.gov.
[b] National Center for Environmental Economics, U.S. Environmental Protection Agency, shadbegian.ron@epa.gov.

Abstract

The "green industry" is often noted in discussions of the costs and benefits of environmental policy, and it has been characterized as a unique industry with substantial potential for employment growth, well-paying jobs, and export opportunities. In this paper, we examine the characteristics and recent economic performance of the green industry, using establishment-level data on environmental products manufacturers (EPMs) from the 1995 Survey of Environmental Products and Services, together with data from the Annual Survey of Manufactures and various Census of Manufactures. Results suggest that there are some differences between EPMs and their non-EPM counterparts in the same industry, in terms of employment, employee compensation, exports, and productivity. However, we do not find any evidence that EPMs performed any better than otherwise similar plants, in terms of survival, employment growth, wage growth, and export growth. Our findings offer a more complex and nuanced portrayal of the green industry than is typical, and we suggest that this industry may not be as exceptional as is sometimes maintained.

Keywords: green industry, environmental products, employment, wages, exports, productivity, growth

Subject Matter Classifications: Environmental Policy, Economic Impacts

1. Introduction

It is not uncommon for discussions of the costs and benefits of environmental policy to note the "green industry" with its "green collar" jobs. For instance, in September 2007, the U.S. Senate Committee on Environment and Public Works held a hearing on "Green Jobs Created by Global Warming Initiatives." In such debates, some argue that environmental policies destroy more jobs than they create. Others argue that many jobs have been and can be created by heightened environmental standards, even on net. Those who claim that the net effect on jobs is positive often rely on the argument that the green industry has significant export potential and/or that the jobs created are inherently more domestic than the jobs that are destroyed.[1]

In any event, this industry has received attention from the highest levels of the U.S. government. Fostering this industry and promoting its exports were key objectives of the Clinton Administration's *National Environmental Technology Strategy*, fully unveiled in an April 1995 report (U.S. Government 1995). This sweeping initiative called to action numerous federal agencies. To take just one example, the Department of Commerce houses an Office of Energy and Environmental Industries whose mission specifically includes the "[promotion of] American commercial and economic interests related to international trade and investment in energy and environmental technologies (goods and services)." The green industry has also been a topic in the 2008 Presidential election, such as Senator Barack Obama's proposal for a Clean Technologies Deployment Venture Capital Fund.

---

[1] For example, construction jobs associated with nuclear power plant construction are inherently local, as are "green" service sector jobs.

In this paper, we do not measure the employment, revenue, and/or exports of the green industry, as others have attempted over the years (e.g., U.S. Environmental Protection Agency 1993, U.S. Census Bureau 1998a, Bezdek *et al.* 2008). Nor do we attempt to discern whether the employment gains in the green industry outweigh the jobs lost in regulated sectors. Instead, we offer the first comprehensive establishment-level analysis of environmental products manufacturers (EPMs). This industry has been characterized as unique, an engine for economic growth, a source of good high-paying jobs, and an industry with substantial export potential, but such portrayals are seldom accompanied by more than anecdotal evidence.[2] It is not obvious that EPMs should be very different than other manufacturers.

In this paper, we examine the characteristics and recent economic performance of manufacturers in the green industry, using establishment-level data on EPMs from the 1995 Survey of Environmental Products and Services (SEPS). The SEPS was a unique, one-time survey — conducted by the U.S. Census Bureau on behalf of the U.S. Environmental Protection Agency and the U.S. Department of Commerce's International Trade Administration — that asked businesses to report their employment and revenues associated with the manufacture of various environmental products and services, as well as the value of their exports, by product. We link this to data these establishments reported in the Annual Survey of Manufactures (ASM) and various Censuses of

[2] For discussion of the green industry, see for example Bezdek 1993, Bezdek *et al.* 2008, and the testimony offered at the aforementioned hearing before the U.S. Senate Committee on Environment and Public Works (http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=1b098dbe-802a-23ad-4c56-7889bcbf2eb8). Among the more ebullient statements regarding this industry's uniqueness and potential, an executive in the financial sector was quoted: "The development of a green economy creates a broad new set of opportunities. When I first started looking at this area, many people commented on how this will be as big as the Internet. But this is much bigger than the Internet. The only comparable example we can find is the Industrial Revolution. It will affect every business and every industry." (*New York Times*, March 26, 2008)

Manufactures (CMs).[3] This unique dataset allows us to compare the output, employment, wages & benefits, exports, and productivity, in both levels and growth rates, of plants that manufacture environmental products to those that do not.

Results suggest that there are some differences between EPMs and their non-EPM counterparts in the same industry. Overall, EPMs appear to employ fewer production workers, for a given level of output and factor intensity. In terms of wages and benefits, it appears that EPMs paid their production workers higher hourly wages and provided their employees more benefits, and those results are in part due to a more capital-intensive workplace. All else being equal, EPMs were significantly more likely to be exporters and their exports were approximately three times as much. In terms of subsequent economic performance (e.g., survival, employment growth, wage growth, export growth), we find little evidence that EPMs performed any better or worse than otherwise similar plants in their industry during the period 1992-2002, with the exception of lower production worker wage growth. In all cases, results from industry-specific regressions offer a more complex story, with many industries exhibiting no effects whatsoever, or effects that are different from the results using the pooled sample. We argue that the green industry may not be as exceptional as is sometimes maintained.

This paper proceeds as follows. In the next section, we discuss the data used in this research. Section 3 presents our empirical findings, and we then offer some concluding remarks in Section 4.

2. Data

[3] The establishment-level data in the SEPS, ASM, and CM are confidential, collected and protected under Title 13 of the U.S. Code. Restricted access to these data can be arranged through the U.S. Census Bureau's Center for Economic Studies (CES). See http://www.ces.census.gov/ for details.

The SEPS was an attempt to systematically measure the size of the environmental sector in the United States, which it broadly defined as "the manufacture of products, performance of services and the construction of projects used, or that potentially could be used, for measuring, preventing, limiting, or correcting environmental damage to air, water, and soil" as well as "services related to the removal, transportation, storage, or abatement of waste, noise, and other contaminants." The obvious challenge faced by a survey such as this is measuring production, employment, and exports when there are no (SIC, and now NAICS) industries that are specifically and exclusively "environmental."[4] Therefore a first step was to create a list of environmental products and services that would be in-scope to the survey.[5] Once this was accomplished, manufacturing plants reporting the production of these or similar products in the 1992 Census of Manufactures were identified and added to the sampling frame.[6] However, not all manufacturing plants received the "long form" in the 1992 CM and therefore were not asked about the specific products they manufactured. Moreover, some establishments may have begun producing the selected products after 1992, or may have in fact opened for business after 1992. Therefore, the SEPS sampling frame was supplemented with establishments classified in the same SIC industry to which the selected products are primary. (Note that these SIC industries encompass many non-environmental products as well.) The final sample was then drawn from this frame. For additional details on the scope of the survey, frame creation, sampling, and survey limitations, see U.S. Bureau of the Census (1998a,

---

[4] The Standard Industrial Classification (SIC) system was replaced by the North American Industrial Classification System (NAICS) in 1997.

[5] For details on this process, see the Federal Register notice from September 1, 1995 entitled "Proposed Classification System for Environmental Technologies Goods and Services" (Vol. 60, No. 170, pp. 45702-45704).

[6] The sampling of companies (potentially) engaged in environmental services and environment-related construction was done differently than that of manufacturing plants. For the purposes of this paper, we focus our discussion and attention exclusively on manufacturing.

1998b). Appendix A contains a list of the (general) manufactured products targeted by the SEPS (Table A-1) and the list of the 24 four-digit SIC industries in the manufacturing sector to which these products are primary (Table A-2).

Establishments selected for the SEPS were asked to report on their activities related to environmental products, and in particular, whether they manufactured such products in 1995, the number of employees dedicated to such production, the wages paid to them, and the total value of shipments of these products.[7] They were also asked to provide more specific, product-level data (i.e., for the selected products, listed in Appendix A), including the total value of shipments of the product, how much of those shipments were meant for environmental purposes (if known), and how much of the product was exported (if known). Copies of the survey forms (and instructions) can be found in U.S. Bureau of the Census 1998a, along with details on response rates, estimation methods, and tables of aggregated data.

For the purposes of our research, we worry about how accurately establishments are able to report some of this information. The difference between an environmental product and non-environmental product is not always very clear and often depends on the purchaser's final use of it, which we cannot assume the manufacturer always knows. However, even if this distinction could be made, the task of separately reporting the value of these shipments, as well as the labor and wages associated with this production, is most assuredly a very difficult one. Therefore, in this paper we use just a single data item from the SEPS – the item that we think plants are best able to report – an indicator of whether or not they manufactured products designed for environmental purposes.

[7] A few general, ASM-type questions were also asked, including plant-wide total employment, total wages, and total value of shipments.

Specifically, we use the response to Item 3A on the survey which asks: "Did this company manufacture any products for environmental use during calendar year 1995? *(See Item 4 for examples of these products.)*" Response options included Yes, No, and Don't know.

In this paper we focus exclusively on SEPS's manufacturing establishments. The SEPS sampled 3,203 manufacturing plants, of which 2,114 returned a survey form with sufficient data. Because our research questions center critically on measures including output, productivity, employment, wages, and exports, we also need our plants to be in the contemporaneous Annual Survey of Manufactures (ASM), which serves as the source for these data items. Of these 2,114 SEPS manufacturers, 833 are also in the 1995 ASM with usable data.[8] To provide a sense of this sample we note that over 30% of these plants (knowingly) manufactured environmental products while approximately 10% were unsure. The average plant in our dataset has over 350 employees and roughly $125 million in shipments. Given the construction of this research sample, we note that these figures are not necessarily representative of the plants and industries in the SEPS, or the manufacturing sector in general. This sample of 833 plants accounted for approximately 60% of the $14.4 billion of the products produced for environmental purposes (as reported in U.S. Bureau of the Census 1998a).

Some of our analyses in the next section employ this pooled sample, while others focus separately on the six industries list in Table A-3 in the appendix. We limit our industry-specific analyses to just these six industries because we require large enough sample sizes for regression analysis (i.e., n>50) as well as "sufficient" variation in our

---

[8] This also includes a restriction that plants were in the 1992 Census of Manufactures, which is the source for capital asset data.

variable of interest (i.e., whether or not the plant is an EPM). Collectively, these six industries have 383 total observations—46% of the full (pooled) sample.

3. Results

Here we explore the impact that manufacturing environmental products has on plant-level characteristics and economic performance.

3.1. Employment

In the next two subsections, we assess whether plants that manufacture environmental products create more jobs—or at least better, higher-paying jobs—than their counterparts who do not manufacture such products. To begin, in Table 1A we examine the relationship between manufacturing environmental products and some basic plant characteristics, including three different measures of plant employment as well as plant characteristics correlated with employment. Here, each plant-level characteristic is used as the dependent variable in a simple regression on a dummy variable (EPM) indicating the plant knowingly manufactured environmental products, a dummy variable (U_EPM) indicating a plant was unsure if it manufactured such products, and a set of four-digit SIC industry dummy variables. We only report the coefficients and standard errors on the EPM dummy variable in the table.

The results in Table 1A show that, relative to other establishments in their four-digit SIC industry, manufacturing plants that produced products for environmental purposes appear no different in terms of their total plant employment, production workers, and non-production workers. They were also not statistically different in terms of their output (value of shipments or value added), their capital assets, their corporate structures (multi- vs. single-establishment firms), or their ages (as measured from their first Census of Manufactures appearance). We will note that the requirement that establishments be in the ASM eliminates many smaller establishments from our sample. Nonetheless, identical regressions using the more inclusive 1992 CM also fail to find statistically significant differences in any of these plant characteristics.[9] Therefore, it does not appear that EPMs are the small, young, single-establishment businesses that are sometimes suggested, at least not relative to other plants in the same industry.

TABLE 1A – ABOUT HERE

Table 1B presents results from more sophisticated employment equations, similar to those estimated by Bernard and Jensen 1995, also using ASM/CM data. In particular, we estimate:

(1) $$\text{Log(EMPLOY)} = \lambda_0 + \lambda_1\text{*EPM} + \lambda_2\text{*U\_EPM} + \lambda_3\text{*Log(VS)} + \lambda_4\text{*Log(CAPITAL/EMP)} + \lambda_5\text{*Log(MAT/EMP)} + \lambda_6\text{*Log(PWHOURS/PWEMP)} + \lambda_7\text{*EXPORTER} + \lambda_8\text{*MULTI} + \sum\lambda_a\text{*AGE} + \sum\lambda_{ind}\text{*SIC4} + \sum\lambda_s\text{*STATE} + e$$

where EMPLOY represents one of the three measures of employment, EPM is a dummy variable indicating that a plant knowingly manufactured environmental products, U_EPM is a dummy variable indicating a plant was unsure if it manufactured environmental products, VS is output (the value of shipments), CAPITAL is the value of capital assets, EMP is the total number of employees, MAT is the value of material inputs, PWHOURS is the total number of production worker hours at the plant, PWEMP is the number of production workers, EXPORTER is a dummy variable indicating a plant exported at least

[9] These results are available from the authors upon request.

some of its output, MULTI is a dummy variable indicating a plant belonged to a multi-establishment firm, AGE is a series of seven categorical variables to designate the plant's age/vintage, SIC4 is a set of four-digit SIC industry dummies, and STATE is a set of state dummy variables.

The results in Table 1B show that, for a given level of output, and controlling for capital and material intensity and other plant-level characteristics, manufacturers of environmental products employed fewer workers — and in particular, fewer production workers. All else being equal, such establishments employed 10.3% fewer production workers than otherwise similar plants in the same industry that did not manufacture environmental products.[10]

TABLE 1B – ABOUT HERE

Results from industry-specific regressions (reported in Table B-1 in the appendix) are not a straightforward extension of the pooled results. In particular, simple regressions show that EPMs in General Industrial Machinery, n.e.c. (SIC 3569) were larger in all three employment dimensions, but estimates of Equation (1) show that these EPMs actually had significantly *lower* total employment, and there was no statistical difference in their production and non-production workers. Industry-specific estimates of Equation (1) also show the EPMs in Concrete Products Except Block and Brick (SIC 3272) employed fewer workers, and in particular, fewer non-production workers.

3.2. Wages and Benefits

[10] Here and throughout the paper, the marginal effect of a dummy variable when the dependent variable is measured in logs is calculated as $\exp(\alpha) - 1$, as suggested by Halvorsen and Palmquist 1980.

We now turn to wages and benefits, using four different plant-level measures of employee compensation: average annual salary for all employees, average annual benefits for all employees, average hourly wages for production workers, and average annual salary for non-production workers. In Table 2A, as in Table 1A, each measure of employee compensation is simply a function of EPM, U_EPM, and a set of four-digit SIC industry dummy variables. We only report the coefficients and standard errors on the EPM dummy variable in this table. We find that, relative to other establishments in their four-digit SIC industry, EPMs paid their production workers 4.5% higher hourly wages and provided all their employees 12.3% more benefits. There is no statistical difference in the salaries paid to non-production workers however.

TABLE 2A – ABOUT HERE

Table 2B presents results from more sophisticated wage equations. In particular, we estimate:

(2) $Log(COMP) = \beta_0 + \beta_1*EPM + \beta_2*U\_EPM + \beta_3*Log(EMP) + \beta_4*Log(CAPITAL/EMP) + \beta_5*Log(MAT/EMP) + \beta_6*Log(PWHOURS/PWEMP) + \beta_7*EXPORTER + \beta_8*MULTI + \sum\beta_a*AGE + \sum\beta_{ind}*SIC4 + \sum\beta_s*STATE + e$

where COMP represents one of the four forms of employee compensation.[11] The results in Table 2B show that the premiums seen in Table 2A – in benefits and production workers' hourly wage – disappear once we control for plant size, capital and material intensity, and the other plant characteristics. A simple regression (on EPM, U_EPM, and a set of our-digit SIC industry dummy variables) reveals that EPMs had capital-to-labor ratios that were 12.8% higher, and re-estimating Equation (2) without capital intensity

[11] Similar equations were estimated by Bernard and Jensen 1995, also using ASM/CM data.

leads to conclusions similar to those in Table 2A. That is, it appears that EPMs paid their production workers higher hourly wages and provided their employees more benefits, and those results are in part due to (or correlated with) a more capital-intensive workplace. On the other hand, the results on salaries paid to non-production workers are not quite statistically significant (p=0.115) but suggest that EPMs may actually pay some of their employees less well, relative to otherwise similar plants in the same industry.

TABLE 2B – ABOUT HERE

Results from industry-specific regressions (reported in Table B-2 in the appendix) are, again, not a clear-cut extrapolation of the pooled results. The effects are heterogeneous across the six industries analyzed. The simple regression shows that EPMs in General Industrial Machinery, n.e.c. (SIC 3569) had significantly higher (+12.7%*) production worker wages, an effect that increases (+19.6%*) once we control for plant size, capital and material intensity, and the other plant characteristics. Interestingly, capital-to-labor ratios were not significantly higher for EPMs in this industry or any of the other five. EPMs in Concrete Products Except Block and Brick (SIC 3272) had higher production worker wages, but only after controlling for the additional plant-level characteristics. Meanwhile, the simple regression shows that EPMs in Industrial Instruments for Measurement, Display, and Control of Process Variables (SIC 3823) had significantly *lower* (–11.9%*) production worker wages, an effect that becomes insignificant once we add the additional plant-level characteristics. Finally, the simple regression shows that EPMs in Fabricated Plate Work [Boiler Shops] (SIC 3443) had significantly lower (–15.3%**) salaries paid to non-production workers, an effect that decreases further (–23.9%*) once we control for plant size, capital and material intensity, and the other plant characteristics. SICs 3561 and 3826 exhibit no significant EPM effects in any of the wage/benefit regressions.

3.3. Exports

We now turn to exports, a key point of discussion regarding the green industry. In Table 3A, as in Table 1A and 2A, each of three measures of exports is simply a function of EPM, U_EPM, and a set of four-digit SIC industry dummy variables. We only report the coefficients and standard errors on the EPM dummy variable in this table. The results in Table 3A show that, relative to other establishments in their four-digit SIC industry, EPMs had exports that were 240% higher. When exports are measured per employee or as a share of plants' total shipments, EPMs' exports were 232% higher and 196% higher, respectively.

TABLE 3A – ABOUT HERE

In Table 3B, we present results from more complex export equations. In the absence of a formal model of the determinants of exports, we simply use an empirical specification similar to ones typically used to analyze output (see Section 3.4). More specifically we estimate two separate equations, one of the probability of exporting and the other of the value of exports:

(3) $Pr(EXPORTER) = \eta_0 + \eta_1*EPM + \eta_2*U\_EPM + \eta_3*Log(EMP) + \eta_4*Log(CAPITAL) + \eta_5*Log(MAT) + \eta_6*(NPEMP/EMP) + \eta_7*MULTI + \sum\eta_a*AGE + \sum\eta_{ind}*SIC4 + e$

(4) $Log(EXPORTS) = \gamma_0 + \gamma_1*EPM + \gamma_2*U\_EPM + \gamma_3*Log(EMP) + \gamma_4*Log(CAPITAL) + \gamma_5*Log(MAT) + \gamma_6*(NPEMP/EMP) + \gamma_7*MULTI + \sum\gamma_a*AGE + \sum\gamma_{ind}*SIC4 + e$

where NPEMP/EMP measures the proportion of the workforce that was not engaged in production (a common measure of "skill"). We estimate three versions of Equation (4), each using a different dependent variable: log of the value of exports; log of the value of exports per employee; and log of the share of exports in total shipments.[12]

The results in Table 3B tell a story similar to the less complex regressions. In particular, we find that EPMs were significantly more likely to be exporters (column 1) and the total value of their exports was 205% higher than non-EPMs (column 2). When exports are measured per employee or as a share of plants' total shipments, EPMs' exports were 208% higher and 192% higher, respectively. Results from industry-specific regressions (reported in Table B-3 in the appendix) suggest that, of the six industries analyzed, only Pumps and Pumping Equipment (SIC 3561) exhibit statistically significant effects. In particular, EPMs in that industry had exports that were approximately 400% higher, relative to plants that did not manufacture environment-related products. Interestingly, when excluding this industry from the pooled sample, EPM status still had a statistically significant positive effect on exports. This suggests that the export effect extends beyond just SIC 3561.

TABLE 3B – ABOUT HERE

3.4. Productivity

In this section, we explore productivity. Simple regressions of the sort presented in Tables 1A, 2A, and 3A, suggest that EPMs had higher labor productivity rates, with 11.3% and 15.0% more output per employee, as measured by value of shipments and value added, respectively. These findings may in part be due to higher capital-to-labor

[12] Capital and materials are measured *per employee* in these last two cases.

ratios (discussed in Section 3.2). To explore this possibility, we estimate some traditional Cobb-Douglas production functions. In particular, Table 4 contains results from 3-factor Cobb-Douglas labor productivity regressions, of which the most complex takes the form:

(5) $Log(VS/EMP) = \alpha_0 + \alpha_1*EPM + \alpha_2*U\_EPM + \alpha_3*Log(EMP) + \alpha_4*Log(CAPITAL/EMP) + \alpha_5*Log(MAT/EMP) + \alpha_6*(NPWEMP/EMP) + \alpha_7*EXPORTER + \alpha_8*MULTI + \sum\alpha_a*AGE + \sum\alpha_{ind}*SIC4 + e$.

Controlling *only* for industry effects, column 1 shows output elasticities on labor, capital, and materials of 0.34, 0.14, and 0.49, respectively, with statistically significant decreasing returns to scale.[13] The indicators of environmental products manufacture (EPM and U_EPM) are added in the regression in column 2 and show that EPMs had output that was 6.7% greater than plants that did not manufacture environmental products. Meanwhile, those plants that were uncertain whether or not they manufactured products for environmental purposes had similarly higher labor productivity; not surprisingly this effect was estimated with less precision. The final regression, in column 3, adds four plant characteristics commonly thought to have potential impacts on productivity.[14] Here, the manufacture of environmental products is associated with 5.6% (significantly) higher productivity.[15] It therefore appears that manufacturers of environmental products enjoy some sort of productivity premium, even after controlling for factor intensities and a host of other establishment-level characteristics.

TABLE 4 – ABOUT HERE

[13] A labor productivity equation in the form of $(Q/L) = A\cdot L^{\alpha+\beta+\gamma-1}(K/L)^{\beta}(M/L)^{\gamma}$ is derived from a standard Cobb-Douglas production function of the form $Q = A\cdot L^{\alpha}K^{\beta}M^{\gamma}$. The coefficient on log(EMP), therefore, is $\alpha+\beta+\gamma-1$.

[14] Of these four additional plant characteristics, we find that only the skill measure had a significant (positive) effect on labor productivity.

[15] In the output form of this Cobb-Douglas function, as opposed to the labor productivity version that is presented, EPM has a statistically significant effect of +6.0%.

To explore this result further, we turn to industry-specific productivity regressions, employing the empirical specification found in column 3 of Table 4. Of the six industries analyzed (see Table B-4 in the appendix), only one — General Industrial Machinery, n.e.c. (SIC 3569) — yielded a statistically significant, positive coefficient on our EPM variable, with an implied productivity premium of 11.8%. The industries with the next strongest effects are Concrete Products Except Block and Brick (SIC 3272) and Measurement, Display, and Control of Process Variables (SIC 3823), where the point estimates on the productivity premium is 10.7% and 9.7%, respectively, but neither is quite statistically significant. Meanwhile, the other three industries have estimates that are essentially zero. It therefore appears that the 5.6% productivity premium found in Table 4 is an "average" of rather heterogeneous effects. Further analysis reveals that the magnitude and statistical significance of this result from Table 4 is also highly dependent upon the presence of SIC 3569 in the sample. For example, when we exclude this industry from the pooled sample, the productivity premium falls to 4.1% and becomes statistically insignificant (p=0.153).

Earlier, we documented that at least some EPMs appear to have employed fewer workers of certain types, all else being equal, and that capital-to-labor ratios were sometimes different for EPMs. This perhaps suggests that, despite being in the same four-digit SIC industry, environmental products may be very distinct products, manufactured with somewhat different production technologies, and possibly subject to completely different market prices (Foster *et al.* 2008). Bernard and Jensen 1995 make a somewhat similar point in discussing potential differences between exporters and non-exporters within an industry. For SIC 3569, we re-estimate our labor productivity regression with interaction terms between the EPM dummy and each of the three factors of production. We find that the interaction term involving materials per employee is statistically significant (and negative), suggesting that the production function for environmental products in this industry is indeed different. On the other hand, the three interaction terms are not quite *jointly* significant. The apparent productivity premium, for the EPMs that exhibit it, remains curious.

3.5. Growth and Survival

Finally, we explore the growth performance of EPMs over the period of 1992 to 2002. First, we will note that approximately 17% of the establishments in this sample failed to survive to 2002. Probit regressions (available from the authors upon request) show no difference between EPMs and non-EPMs in the probability of survival.[16] Meanwhile, Table 5 contains results from OLS regressions of the growth rates in the listed plant characteristics, where the dependent variables take the form

$$\frac{(y_{2002} - y_{1992})}{\frac{1}{2}(y_{1992} + y_{2002})}.$$

It has been noted that this measure of growth has a number of desirable properties, including symmetry about 0, boundedness and finiteness, and an accommodation for births and deaths, which take on the extreme values of +2 and –2, respectively (e.g., see Davis, Haltiwanger, and Schuh 1996). Each regression controls for four-digit SIC industry as well as other plant characteristics from the base year (i.e., 1992), but are

[16] In the analyses that follow, the wage and productivity results condition on plant survival, while employment, output, and export results do not (i.e., the change is to zero).

otherwise similar to the respective regressions from Tables 1B, 2B, 3B, and 4. Table 5 reports only the coefficients and standard errors on the 1995 EPM dummy variable.[17,18]

TABLE 5 – ABOUT HERE

Overall, there is no evidence here that EPMs had higher growth in employment, wages, exports, output, or productivity. We find that the only statistically significant effect that EPM has on growth rates is a *negative* effect on the wage growth of production workers.[19] Of the six industries analyzed separately, this negative production worker wage growth appears to be limited to General Industrial Machinery, n.e.c. (SIC 3569) — an interesting result in light of our earlier finding that EPMs in this industry actually paid their production workers significantly more in 1995. When we exclude this industry from the pooled sample, the negative effect decreases in magnitude and becomes statistically insignificant (p=0.196).

4. Conclusion

There do appear to be some differences between EPMs and their non-EPM counterparts in the same industry. Overall, EPMs appear to employ fewer production workers, for a given level of output and factor intensity. However, most of the industries analyzed do not exhibit any employment differences. In some industries, EPMs employ fewer workers of all types or fewer non-production workers. It is notable that EPMs are never found to employ *more* workers for a given level of output and factor intensity. In

[17] See footnote to the table for specific details.

[18] We do not know whether EPMs continue to be EPMs throughout this time period and/or whether some non-EPMs perhaps become EPMs.

[19] We will note that this negative effect on the growth of production worker wages is relatively robust to other formulations of growth rate, including the traditional percentage change ($y_{2002}/ y_{1992} - 1$), as well as the difference in log values ($ln(y_{2002}) - ln(y_{1992})$).

terms of employee compensation, it appears that EPMs paid their production workers higher hourly wages and provided their employees more benefits, and those results are in part due to a more capital-intensive workplace. The industry-specific stories are more complicated however, with EPMs in some industries exhibiting a production worker wage premium *even after controlling for capital-to-labor ratio* (and other plant-level determinants of wages), while EPMs in other industries paid their workers significantly less. All else being equal, EPMs were significantly more likely to be exporters and their exports were approximately three times as much, but this seems localized to certain industries (products), with most industries analyzed exhibiting no effect whatsoever. Finally, we find that EPMs performed no better or worse than non-EPMs in terms of survival, employment growth, export growth, output growth, or productivity growth, between 1992 and 2002. The one effect we do find here is a decline in production worker wages – an effect that appears to be attributable to one particular industry.

The results of this paper suggest that – counter to the intimations of some – the green industry (as defined here) is not particularly unique, in comparison to closely related products. Nor does it appear that EPMs are smaller, younger, or more likely to be single-establishment enterprises, relative to other plants in the same industry. Assertions that the green industry is a source of good high-paying jobs certainly beg the question: relative to what? The results here offer a more complex and nuanced portrayal than is typical. And whatever export advantage EPMs may have enjoyed in 1995 has clearly not translated into uncommon export growth, employment growth, wage growth, or productivity growth. In fact, the green industry's economic performance from 1992 to 2002 appears to have been remarkably ordinary. This is not inconsistent with the results of Bernard and Jensen 1995, who find that exporting status is a poor predictor of long-run (11 year) wage and employment growth. Our point here is not to disparage the green industry in any way. Rather, we merely suggest that this industry may not be as exceptional as is sometimes maintained.

References

Bernard, Andrew B. and J. Bradford Jensen. "Exporters, Jobs, and Wages in U.S. Manufacturing: 1976-1987," *Brookings Papers on Economic Activity: Microeconomics*, 1995, 67-119.

Bezdek, Roger H. "Environment and Economy: What's the Bottom Line?" *Environment*, 35(7), 6-32, September 1993.

Bezdek, Roger H., Robert M. Wendling, Paula DiPerna. "Environmental Protection, the Economy, and Jobs: National and Regional Analysis," *Journal of Environmental Management*, 86(1), 63-79, January 2008.

Davis, Steven J., John C. Haltiwanger, and Scott Schuh. *Job Creation and Destruction*. Cambridge, MA: MIT Press, 1996.

Foster, Lucia, John Haltiwanger, and Chad Syverson, "Reallocation, Firm Turnover, and Efficiency: Selection on Productivity of Profitability?" *American Economic Review*, 98(1), 394-425, March 2008.

Greenhouse, Steven. "Millions of Jobs of a Different Collar," *New York Times*, March 26, 2008.

Halvorsen, Robert, and Raymond Palmquist. "The Interpretation of Dummy Variables in Semilogarithmic Equations," *American Economic Review*, 70(3), 474–475, June 1980.

U.S. Bureau of the Census. *Survey of Environmental Products and Services*. February 1998(a). (http://yosemite.epa.gov/ee/epa/eermfile.nsf/vwAN/EE-0403-1.pdf/$File/EE-0403-1.pdf)

U.S. Bureau of the Census. "Measuring the Environmental Industry in the United States in the 1995 Survey of Environmental Products and Services," *Joint ECE/EUROSTAT Work Session on Methodological Issues of Environment Statistics*, Working Paper No. 2, September 1998(b).

U.S. Environmental Protection Agency. *International Trade in Environmental Protection Equipment: An Assessment of Existing Data*. July 1993.

U.S. Government. *Bridge to a Sustainable Future: National Environmental Technology Strategy*. April 1995.

TABLE 1A
Regressions of Plant Characteristic on Environmental Products Manufacturing Status†

Dependent variable	EPM coefficient	R^2
Total employment	–0.0047 (0.0839)	0.3975
Production workers	–0.0359 (0.0914)	0.3781
Non-production workers	+0.0701 (0.0948)	0.4121
Value of shipments	+0.1026 (0.0913)	0.5504
Value added	+0.1353 (0.0982)	0.5118
Capital assets	+0.0975 (0.1126)	0.5651
Multi-establishment firm (=1)	+0.0193 (0.0288)	0.1888
Age in years	–0.6801 (1.2270)	0.0345

† Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively. N=833. Regressions control for four-digit SIC industry and the event that the establishment does not know whether it manufactured such products. Dependent variables are in natural logs, except for multi-establishment firm status and age. OLS is employed in all cases, except for age. A Tobit specification is used in the case of age, with a right-censoring point of 32 years, affecting about 37% of establishments in this sample. A pseudo R^2 statistic is reported for the Tobit regression.

TABLE 1B
Employment Regressions†

	Total employment	Production workers	Non-prod. workers
Environmental products manufacturer (=1)	–0.0651** (0.0260)	–0.0979** (0.0429)	+0.0169 (0.0560)
Unsure of environmental products manufacturing (=1)	–0.0448 (0.0382)	–0.0294 (0.0629)	–0.0038 (0.0823)
Value of shipments	+0.9148** (0.0126)	+0.8992** (0.0208)	+0.9021** (0.0272)
Capital assets per employee	–0.0989** (0.0169)	–0.0858** (0.0278)	–0.0784** (0.0363)
Materials per employee	–0.4608** (0.0159)	–0.4336** (0.0262)	–0.4874** (0.0342)
Hours per production worker	–0.0351 (0.0607)	–0.0099 (0.1000)	–0.0488 (0.1307)
Exporter (=1)	+0.0463 (0.0315)	+0.0724 (0.0518)	+0.0492 (0.0677)
Multi-establishment firm (=1)	+0.0541 (0.0340)	+0.0307 (0.0559)	+0.0149 (0.0731)
Plant age categories	*yes*	*yes*	*yes*
Four-digit SIC industry effects	*yes*	*yes*	*yes*
State effects	*yes*	*yes*	*yes*
R-squared	0.9521	0.8826	0.8300
Number of observations	829	829	829

† The dependent variables, value of shipments, capital intensity, material intensity, and hours per production worker are in natural logs. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively.

TABLE 2A
Regressions of Employee Compensation on Environmental Products Manufacturing Status†

Dependent variable	EPM coefficient	R^2
Average salary (all employees)	+0.0209 (0.0209)	0.4000
Average voluntary benefits (all employees)	+0.1156** (0.0563)	0.3436
Average hourly wage of production workers	+0.0440* (0.0248)	0.3717
Average salary of non-production workers	–0.0378 (0.0285)	0.2282

† Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively. N≈829 (depending on non-missing values). Regressions control for four-digit SIC industry and the event that the establishment does not know whether it manufactured such products. Dependent variables are in natural logs. OLS is employed in all cases.

TABLE 2B

Wage and Benefits Regressions[†]

	All employees		Production workers	Non-prod. workers
	Average salary	Average benefits	Average hourly wage	Average salary
Environmental products manufacturer (=1)	+0.0146 (0.0201)	+0.0812 (0.0539)	+0.0326 (0.0236)	–0.0461 (0.0292)
Unsure of environmental products manufacturing (=1)	+0.0328 (0.0295)	+0.1287 (0.0787)	–0.0162 (0.0347)	+0.0299 (0.0428)
Employees	+0.0279** (0.0100)	+0.0906** (0.0269)	+0.0260** (0.0118)	+0.0410** (0.0147)
Capital assets per employee	+0.0539** (0.0128)	+0.1301** (0.0344)	+0.0630** (0.0150)	+0.0310* (0.0188)
Materials per employee	+0.0487** (0.0121)	+0.1372** (0.0323)	+0.0492** (0.0142)	+0.0494** (0.0176)
Hours per production worker	+0.1934** (0.0469)	+0.2574** (0.1255)	–0.4420** (0.0551)	–0.0470 (0.0681)
Exporter (=1)	+0.0341 (0.0243)	+0.0816 (0.0650)	+0.0013 (0.0286)	+0.0771** (0.0355)
Multi-establishment firm (=1)	–0.0601** (0.0263)	+0.2588** (0.0700)	–0.0460 (0.0309)	–0.1036** (0.0382)
Plant age categories	*yes*	*yes*	*yes*	*yes*
Four-digit SIC industry effects	*yes*	*yes*	*yes*	*yes*
State effects	*yes*	*yes*	*yes*	*yes*
R-squared	0.5435	0.5073	0.5331	0.3050
Number of observations	829	824	829	825

[†] The dependent variables, the three factors of production, and hours per production worker are in natural logs. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively.

TABLE 3A
Regressions of Exports on Environmental Products Manufacturing Status†

Dependent variable	EPM coefficient	Pseudo R^2
Value of exports	+1.2231** (0.3903)	0.1190
Value of exports per employee	+1.1993** (0.3553)	0.1127
Exports as share of total shipments	+1.0862** (0.3492)	0.1099

† Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively. N=833. Regressions control for four-digit SIC industry and the event that the establishment does not know whether it manufactured such products. Dependent variables are in natural logs. A Tobit specification is used in the case of value of exports, with a left-censoring point of *ln*(0.5) chosen for establishments reporting zero exports, reflecting the fact that reported values are in thousands of dollars. With rounding, reported zeros may well reflect exports up to $500. In the cases of value of exports per employee and exports as a share of total shipments, a censored normal regression specification is employed. This is a generalization of the standard Tobit model that allows the censoring point to vary by observation. In particular, left-censoring occurs at $ln(0.5/\text{employees}_i)$ and $ln(0.5/\text{shipments}_i)$, respectively. Nearly 25% of establishments in this sample reported zero exports and were thus left-censored in these three regressions.

TABLE 3B
Exports Regressions†

	Probability of exporting	Value of exports	Value of exports per employee	Exports as a share of shipments
Environmental products manufacturer (=1)	+0.6956**	+1.1146**	+1.1252**	+1.0701**
	(0.1739)	(0.3404)	(0.3408)	(0.3387)
Unsure of environmental products manufacturing (=1)	+0.5575**	+1.1112**	+1.1057**	+1.0337**
	(0.2673)	(0.5015)	(0.5017)	(0.4988)
Employees	+0.3384**	+1.0225**	+0.9847**	+1.0265**
	(0.1238)	(0.2887)	(0.1689)	(0.1680)
Capital assets	–0.0664	+0.0399		
	(0.0890)	(0.2097)		
Capital assets per employee			–0.0691	–0.2213
			(0.2316)	(0.2305)
Materials	+0.2185**	+0.9112**		
	(0.0870)	(0.2074)		
Materials per employee			+0.9420**	+0.4538**
			(0.2075)	(0.2061)
Non-production workers per employee	+0.3557	+1.4559*	+1.4590**	+1.3092
	(0.3901)	(0.8370)	(0.8370)	(0.8321)
Multi-establishment firm (=1)	+0.4818**	+0.9310**	+0.9503**	+0.9139*
	(0.1999)	(0.4716)	(0.4692)	(0.4666)
Plant age categories	*yes*	*yes*	*yes*	*yes*
Four-digit SIC industry effects	*yes*	*yes*	*yes*	*yes*
Pseudo R-squared	0.3657	0.1646	0.1322	0.1263
Number of observations	833	833	833	833

† A probit specification is used to examine the probability of exporting (column 1), and sample observations and dummy variables are dropped if the latter perfectly predict the former. In the other regressions, the dependent variables are in natural log, as are the factors of production (in all regressions): employees, capital assets (per employee), and materials (per employee). A Tobit specification is used in the case of value of exports (column 2), with a left-censoring point of *ln*(0.5) chosen for establishments reporting zero exports, reflecting the fact that reported values are in thousands of dollars. With rounding, reported zeros may well reflect exports up to $500. In the cases of value of exports per employee and exports as a share of total shipments (columns 3 and 4), a censored normal regression specification is employed. This is a generalization of the standard Tobit model that allows the censoring point to vary by observation. In particular, left-censoring occurs at $ln(0.5/\text{employees}_i)$ and $ln(0.5/\text{shipments}_i)$, respectively. Nearly 25% of establishments in this sample reported zero exports and were thus left-censored in the regressions of columns 2, 3, and 4. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively.

TABLE 4
Cobb-Douglas Labor Productivity Regressions[†]

	(1)	(2)	(3)
Environmental products manufacturer (=1)		+0.0646**	+0.0544**
		(0.0256)	(0.0258)
Unsure of environmental products manufacturing (=1)		+0.0640*	+0.0580
		(0.0377)	(0.0378)
Employees	–0.0272**	–0.0272**	–0.0308**
	(0.0115)	(0.0115)	(0.0129)
Capital assets per employee	+0.1397**	+0.1380**	+0.1313**
	(0.0164)	(0.0164)	(0.0165)
Materials per employee	+0.4949**	+0.4945**	+0.4934**
	(0.0156)	(0.0155)	(0.0157)
Non-production workers per employee			+0.1603**
			(0.0641)
Exporter (=1)			+0.0277
			(0.0318)
Multi-establishment firm (=1)			+0.0134
			(0.0340)
Plant age categories	*no*	*no*	*yes*
Four-digit SIC industry effects	*yes*	*yes*	*yes*
R-squared	0.8644	0.8658	0.8690
Number of observations	833	833	833

[†] The dependent variable is value of shipments per employee. This variable and the three factors of production are in natural logs. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively.

TABLE 5
Regressions of 1992–2002 Growth Rates†

Dependent variable	EPM coefficient	R^2
Total employment growth	–0.0383 (0.0827)	0.2780
Production worker growth	–0.0487 (0.0851)	0.2734
Non-production worker growth	–0.0674 (0.0919)	0.2594
Growth in average salary (all employees)	–0.0117 (0.0247)	0.2616
Growth in average hourly wage of production workers	–0.0580* (0.0322)	0.3417
Growth in average salary of non-production workers	+0.0282 (0.0437)	0.2077
Value of exports growth	+0.0313 (0.1165)	0.2049
Value of exports per employee growth	+0.0903 (0.1110)	0.2274
Exports as share of total shipments growth	+0.0607 (0.1093)	0.2267
Value of shipments growth	–0.0001 (0.0920)	0.1859
Value of shipments per employee growth	+0.0309 (0.0481)	0.1639
Value added growth	+0.0108 (0.1126)	0.1437
Value added per employee growth	–0.0857 (0.1239)	0.1280

† Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively. Dependent variables are growth rates in the form of $(y_{2002} - y_{1992}) \div ½(y_{1992} + y_{2002})$. Cases with imputed data in either 1992 or 2002 are dropped. N≈715 in regressions that do not condition on plant survival (employment, output, exports), and N≈599 in regressions that do condition on plant survival (wages, productivity). OLS is employed in all cases. All regressions control for four-digit SIC industry, the event that the establishment does not know whether it manufactured environmental products, a multi-establishment firm indicator, and plant age categories. In addition, the employment growth regressions control for *ln*(value of shipments), *ln*(capital assets per employee), *ln*(materials per employee), *ln*(hours per production worker), exporter status, and state effects, all in 1992. The wage growth regressions are similar, except that they substitute in *ln*(employees) for *ln*(value of shipments). Meanwhile, the productivity growth regressions control for *ln*(employees), *ln*(capital assets per employee), *ln*(materials per employee), non-production workers per employee, and exporter status, all in 1992. The regressions involving value of shipments and value added growth are similar, except that they substitute in *ln*(capital assets) and *ln*(materials). The export growth regressions are similar to these, except that they eliminate the exporter status variable, and growth in exports per employee or as a share of shipments is a function of *ln*(capital assets per employee) and *ln*(materials per employee) rather than *ln*(capital assets) and *ln*(materials).

APPENDIX A

Products and Industries

TABLE A-1
General Manufactured Products Targeted by the SEPS†

Air Treatment
Particulate emissions collectors
Gaseous emissions control systems and devices
Catalytic converters
Onboard monitoring and control systems
Gas detectors
Gas separating equipment
Odor control equipment
Other air treatment equipment

Water and Wastewater Treatment
Desalination equipment
Storage tanks and process vessels (including pressure)
Industrial separators (including centrifuges)
Level and flow lean detectors and sensors
Fluid filters (including housings)
Sewage treatment equipment
Pack tower aerators
Deionization equipment
Automated sampling equipment
Manual sampling equipment
Pumps
Other water and wastewater equipment
Water treatment boiler compounds
Water treatment cooling tower compounds
Other water and wastewater compounds

Solid Waste
Storage containers (including metal and concrete)
Incinerators (including metal and concrete)
Compactors
Tank trucks
Dump trucks
Other trucks
Tire shredding machinery
Scrap bailing machinery
Spill clean-up and containment equipment
Gas management equipment
Pit and landfill liners

Energy Conservation
Solar collectors (including active and passive)
Wind energy conversion (including turbines, turbine sets, windmill, and parts)
Residential photovoltaics

Industrial heat exchangers
Nuclear heat exchangers
Industrial wood-fired boilers
Methanol (including natural and synthetic)
Ethanol

Noise Pollution Control
Highway barriers

Monitoring and Analysis
Freezers and refrigerators
Microtomes
Laboratory separators (including centrifuges)
Chromotography instrument (including gas, liquid, and other)
Mass spectrometers
Industrial process monitoring devices
Radiation detection devices
Flow measurement devices
Continuing supply devices
Other scientific and analytical instruments

† Source: U.S. Bureau of the Census (1998a).

TABLE A-2
Manufacturing Industries Included in the SEPS[†]

SIC code	Industry name
2861	Gum and Wood Chemicals
2869	Industrial Organic Chemicals, nec
2899	Chemicals and Chemical Preparations, nec
3081	Unsupported Plastics Film and Sheet
3272	Concrete Products, Except Block and Brick
3412	Metal Shipping Barrels, Drums, Kegs, and Pails
3433	Heating Equipment, Except Electric and Warm Air Furnaces
3443	Fabricated Plate Work (Boiler Shops)
3511	Steam, Gas, and Hydraulic Turbines, and Turbine Generator Set Units
3559	Special Industry Machinery, nec
3561	Pumps and Pumping Equipment
3564	Industrial and Commercial Fans and Blowers and Air Purification Equipment
3567	Industrial Process Furnaces and Ovens
3569	General Industrial Machinery and Equipment, nec
3589	Service Industry Machinery, nec
3599	Industrial and Commercial Machinery and Equipment, nec
3674	Semiconductors and Related Devices
3713	Truck and Bus Bodies
3714	Motor Vehicle Parts and Accessories
3821	Laboratory Apparatus and Furniture
3823	Industrial Instruments for Measurement, Display, and Control of Process Variables and Related Products
3824	Totalizing Fluid Meters and Counting Devices
3826	Laboratory Analytical Instruments
3829	Measuring and Controlling Devices, nec

[†] Source: U.S. Bureau of the Census (1998a). nec = note elsewhere classified

TABLE A-3
Industries (and Environmental Products) in the Industry-specific Analyses

SIC code	Industry name and its main environmental products†
3272	Concrete Products, Except Block and Brick
	Sewage treatment equipment
	Highway barriers
	Other water and wastewater equipment
	Other water and wastewater compounds
	Storage containers (including metal and concrete)
3443	Fabricated Plate Work (Boiler Shops)
	Industrial heat exchangers
	Storage tanks and process vessels (including pressure)
	Particulate emissions collectors
	Gaseous emissions control systems and devices
	Industrial separators (including centrifuges)
	Sewage treatment equipment
	Spill clean-up and containment equipment
	Industrial wood-fired boilers
	Nuclear heat exchangers
3561	Pumps and Pumping Equipment
	Pumps
	Other water and wastewater equipment
	Sewage treatment equipment
	Other air treatment equipment
3569	General Industrial Machinery and Equipment, nec
	Fluid filters (including housings)
	Particulate emissions collectors
	Sewage treatment equipment
	Desalination equipment
	Scrap bailing machinery
	Industrial separators (including centrifuges)
	Other air treatment equipment
	Compactors
	Other water and wastewater equipment
	Gas separating equipment
3823	Industrial Instruments for Measurement, Display, and Control of Process Variables and Related Products
	Industrial process monitoring devices
	Flow measurement devices
	Level and flow leak detectors and sensors
	Gas detectors
3826	Laboratory Analytical Instruments

Other scientific and analytical instruments
Chromatography instruments (including gas, liquid, and other)
Gas detectors
Mass spectrometers
Industrial process monitoring devices

---

† The products listed are not an exhaustive list of the environmental products the industry is observed to produced. Products in bold are explicitly classified as belonging to said industry; those not in bold are primary to a different industry.

APPENDIX B

Additional Results

TABLE B-1
Industry-specific Employment Regressions[†]

	Total employment	Production workers	Non-prod. workers
Concrete Products, Except Block and Brick (SIC 3272)	–0.2601*	–0.1880	–0.7045**
	(0.1419)	(0.2236)	(0.3063)
Fabricated Plate Work (Boiler Shops)–0.1152 (SIC 3443)	+0.0134	–0.3023	
	(0.1580)	(0.1944)	(0.2681)
Pumps and Pumping Equipment (SIC 3561)	+0.0227	–0.0984	+0.1426
	(0.0954)	(0.1592)	(0.1772)
General Industrial Machinery and Equipment, n.e.c. (SIC 3569)	–0.1914**	–0.1995	–0.1749
	(0.0685)	(0.1345)	(0.2058)
Industrial Instruments for Measurement, Display, and Control of Process Variables (SIC 3823)	–0.0584	–0.0185	+0.0280
	(0.1027)	(0.2174)	(0.1726)
Laboratory Analytical Instruments (SIC 3826)	–0.0099	+0.2511	+0.0747
	(0.1249)	(0.2165)	(0.2602)

[†] The empirical specifications are identical to those in Table 1B. Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively.

TABLE B-2
Industry-specific Wage and Benefits Regressions[†]

	All employees		Production workers	Non-prod. workers
	Average salary	Average benefits	Average hourly wage	Average salary
Concrete Products, Except Block and Brick (SIC 3272)	+0.2311* (0.1097)	+0.4749 (0.3899)	+0.2077** (0.0762)	+0.1961 (0.3033)
Fabricated Plate Work (Boiler Shops) (SIC 3443)	–0.0750 (0.1004)	–0.0304 (0.2585)	+0.0472 (0.1278)	–0.2140* (0.1157)
Pumps and Pumping Equipment (SIC 3561)	+0.0367 (0.0906)	+0.0572 (0.2854)	+0.1323 (0.1347)	–0.1215 (0.1045)
General Industrial Machinery and Equipment, n.e.c. (SIC 3569)	+0.1404* (0.0792)	+0.0720 (0.1633)	+0.1788** (0.0891)	+0.0493 (0.0962)
Industrial Instruments for Measurement, Display, and Control of Process Variables (SIC 3823)	+0.0057 (0.0620)	–0.0040 (0.2413)	–0.0860 (0.0760)	+0.0397 (0.0803)
Laboratory Analytical Instruments (SIC 3826)	+0.0106 (0.0935)	+0.1193 (0.1947)	–0.1116 (0.0921)	+0.0076 (0.1109)

[†] The empirical specifications are identical to those in Table 2B. Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively.

TABLE B-3
Industry-specific Exports Regressions†

	Value of exports	Value of exports per employee	Exports as a share of shipments
Concrete Products, Except Block and Brick (SIC 3272)	(D)	(D)	(D)
Fabricated Plate Work (Boiler Shops) (SIC 3443)	+0.6554 (1.0857)	+1.0350 (1.1483)	+1.0166 (1.1405)
Pumps and Pumping Equipment (SIC 3561)	+1.5995** (0.6962)	+1.5936** (0.6916)	+1.6155** (0.6998)
General Industrial Machinery and Equipment, n.e.c. (SIC 3569)	+0.2473 (0.5829)	+0.2660 (0.5789)	+0.1685 (0.5815)
Industrial Instruments for Measurement, Display, and Control of Process Variables (SIC 3823)	+0.7150 (1.0459)	+0.7602 (1.0471)	+0.6691 (1.0510)
Laboratory Analytical Instruments (SIC 3826)	–0.0545 (0.6432)	–0.1249 (0.6524)	–0.1284 (0.6379)

† The empirical specifications are identical to those in Table 3B. Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively. Results for SIC 3272 are withheld to avoid disclosing data for individual companies.

TABLE B-4
Industry-specific Cobb-Douglas Labor Productivity Regressions†

	EPM coefficient	R^2	N
Concrete Products, Except Block and Brick (SIC 3272)	+0.1018 (0.0677)	0.7056	52
Fabricated Plate Work (Boiler Shops) (SIC 3443)	–0.0051 (0.0880)	0.6878	58
Pumps and Pumping Equipment (SIC 3561)	+0.0166 (0.0746)	0.7235	52
General Industrial Machinery and Equipment, n.e.c. (SIC 3569)	+0.1112* (0.0625)	0.6282	99
Industrial Instruments for Measurement, Display, and Control of Process Variables (SIC 3823)	+0.0922 (0.0847)	0.6558	69
Laboratory Analytical Instruments (SIC 3826)	+0.0096 (0.1030)	0.7156	53

† The empirical specifications are identical to that on column 3 of Table 4. Coefficients on the environmental products manufacturing dummy are reported. Standard errors are in parentheses. Statistical significance at the 10% and 5% level are indicated by single and double asterisks, respectively.