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Empirical Results for Germany at the Firm Level

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The Impact of Innovation Activities on Employment in the Environmental Sector – Empirical Results for Germany at the Firm Level

Jens Horbach

December 2007

Abstract

The paper explores employment effects of environmental product innovations at the firm level. The empirical analysis is based on the establishment panel of the Institute for Employment Research (Nuremberg). A descriptive analysis shows that more than 50% of the firms in the environmental sector developed new products or improved existing products or services. The most dynamic environmental fields were analytics, consulting, measurement technology, waste disposal and recycling. A firm specialised in environmental research and development seems to have the best employment perspectives in the short and in the long run.

Our econometric analysis had to address a simultaneity problem because the decision of a firm on the realisation of innovations and on the enlargement or reduction of employment is mutually dependant. Therefore, we apply a bivariate probit model that allows estimating the two variables simultaneously.

The econometric results show that the influence of environmental innovation activities on the employment development is significantly positive. Furthermore, the quantitative importance of the new products with regard to the whole turnover of the firm is also important for employment growth. Within the bivariate probit model, the determinants of environmental innovation activities are also explored. They may be interpreted as indirect influences on the employment development of the firm. The results show that the improvement of the innovative capacities by R&D and further education measures and the existence of a high qualified human capital are significantly important for the development of new products in the environmental sector. A good strategy to improve the innovativeness of a firm seems to be a diversification of environmental product lines offered by the firm.

Keywords: Employment, Environmental Sector, Innovation Behaviour

JEL: Q52, Q55, J49, C25

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1. Introduction

The environmental sector, which can be defined as a branch that offers products and services used to prevent environmental damages is still regarded as a job creator in Germany. But this is only true for several environmental fields. Especially the so-called end-of-pipe technologies have lost much of their importance during the last decade (see Grundmann 2006 or Horbach 2003) accompanied by negative employment effects. Therefore, the development of new products and services seems to be more and more important for the employment dynamics in the environmental sector. Especially for the design of research and environmental policy, an empirical analysis of the relationship between innovations and employment in the environmental sector seems to be highly relevant.
In our analysis, we focus on the employment effects of environmental product innovations at the firm level. We use the establishment panel of the Institute for Employment Research (Nuremberg) – a rich and representative database for all German establishments with at least one employee subject to social security. The panel wave of 2005 contains a filter question that allows identifying firms belonging to the environmental sector so that a respective sample of more than 900 environmental firms is available.

The decision of a firm to realize innovations and to increase employment cannot be analyzed separately because on the one hand innovations lead to a higher competitiveness that may be connected with an increased product demand with positive effects on labour demand. On the other hand, a firm increases employment to realize the creation and production of new products. Therefore, simultaneous econometric estimation methods are adequate to deal with this endogeneity problem.

The paper is organised as follows: Section 2 discusses theoretical arguments regarding the relationship between environmental innovation and employment and contains a short overview of the relevant empirical literature. Section 3 describes the data basis and presents some descriptive results regarding the relationship between innovation and employment in the German environmental sector. An econometric analysis of the influence of innovation activities on employment using simultaneous econometric techniques follows in Section 4. A summary (Section 5) concludes the paper.

2. Theoretical arguments and empirical results for the impacts of environmental innovations on employment

In the following, the main theoretical arguments and empirical results from the literature on the relationship between environmental innovation and employment are summarized. It is important to note that this relationship comprises different dimensions. Firstly, the different impacts of product versus process innovations on employment have to be regarded. In general, the introduction of new products is expected to lead to a higher employment because market novelties may initiate the cycle of a product accompanied by a high consumer demand at the beginning and especially in the middle of the product life cycle (Vernon 1966, see also Peters 2005). But for several reasons, the overall impact of product innovations remains an empirical question. Firstly, the newly developed products may substitute old products so that the net employment effect may be unclear. Secondly, the innovating firm may exploit its temporary monopoly position obtained by the introduction of the product innovation. This may lead to a reduction in output and to a decline of employment (see also Hall et al. 2006).
Furthermore, the introduction of the new product may be accompanied by labour-saving process innovations. But even the often mentioned negative employment effects of process innovations may be compensated by lower prices made possible by them so that the effects of process innovations on employment are also theoretically undetermined.
Our empirical analysis focuses on the relevance of environmental product innovations for employment on the basis of a firm level database. Obviously, this kind of data does not allow to measure the overall impact of product innovations on employment because such an analysis would require information on a macroeconomic level. In fact, the success and the increase of the market share of the innovating firm may lead to a lower demand for the products of its competitors - an effect which can hardly be analyzed using firm level databases.

The main motivations of a firm to realize product innovations consists in increasing firm profit and/or market share and in reducing the competitive pressure. As we discussed above, if positive output effects are not compensated by a substitution of older products or a higher labour-productivity of accompanying process innovations, employment within the firm may increase. Therefore, innovation activities may be understood as a vehicle to increase the market share and the employment of a firm. For a deeper understanding of the effects of innovation on employment, the determinants of the innovation activities itself are also relevant as

indirect influence factors for employment (for a detailed discussion of these factors see Section 4.1 and Horbach (in press)).

Concerning empirical analyses, there are many studies exploring the relationship between general innovations and employment but there is only little corresponding literature for the environmental sector.

Most studies in Germany focussing on general innovations[1] found a stimulation effect of product innovations on labour demand (see e.g. RWI 2005, Peters 2005, Smolny 1998, 2002, Rottmann, Ruschinsky 1998, Lachenmaier, Rottmann 2007). Similar results were detected for the UK (van Reenen 1997) and for France (Greenan, Guellec 2000).

In general, studies concentrating on environmental product innovations also detect positive effects of product innovations on employment (Bijman, Nijkamp 1988, Pfeiffer, Rennings 1999, Rennings, Zwick 2001, Horbach 2003, Harabi 2000, Rennings 2003). Rennings and Zwick (2001: 34) find "…a small but positive effect on employment at the firm level." The positive effect relates to both product and service innovations. Regarding the other determinants of the employment development in this study including more than 1500 firms from five European countries, the market share as an innovation goal, innovation size and the strictness of environmental regulation are significant for employment changes. Subsidies or grants for the innovation did not have any employment impact.

The paper of Pfeiffer and Rennings (1999:1) shows that "… cleaner production leads in more firms to a net creation of jobs than end-of-pipe technologies." The authors also detect a positive bias for skilled and high-skilled labour whereas the demand for unskilled labour decreases.

3. Descriptive Analysis of the Environmental Sector based on the Establishment Panel of the Institute for Employment Research

The analysis of the relationship of environmental product innovation and employment is based on two waves (2004 and 2005) of the establishment panel of the Institute for Employment Research in Nuremberg. The establishment panel was founded in 1993 to get a representative picture of German establishments who have at least one employee subject to social security. The establishment panel is characterized by very high response rates of more than 70%.

[1] For studies on the European level see e. g. Antonucci, Pianta 2002 or Pianta 2000.

The 2005 wave contains a filter question that allows determining whether the firm belongs to the environmental sector or not. The environmental sector comprises goods and services preventing environmental damages in different fields such as air or water pollution (see also table 1 for the whole classification used in the questionnaire). A share of 6.9% (1117 firms) of all the firms in the sample of the wave 2005 declared to belong to the environmental sector. Unfortunately, the questionnaire of 2005 did not contain questions on the innovative behaviour of firms so that the panel wave of 2004 had to be used. The combination of the two panel waves led to a reduction of the number of cases of environmental firms (904 firms) in our sample because the firms that entered the panel only in 2005 could not be taken into consideration. Hence, a firm belonging to the environmental sector in 2005 would be defined as innovative if it had developed a new product or service or if it had improved or further developed a product during the last two years preceding 2004.

Following this definition, a distribution of innovative and non-innovative firms in our sample by different environmental sectors is shown in table 1.

Table 1: Improvement of products/services or totally new products/services in the environmental sector

Environmental fields	Firms in the Environmental Sector (in %)		
	Innovative firms	Other firms	Total
Prevention of water pollution, waste water treatment	47.6	52.4	100
Waste disposal, Recycling	55.2	44.8	100
Prevention of air pollution, climate protection	54.8	45.2	100
Noise abatement	52.8	47.2	100
Removal of hazardous waste, soil protection	47.7	52.3	100
Measurement technology	55.3	44.7	100
Analytics, consulting	60.4	39.6	100
Environmental research and development	52.6	47.4	100
Other environmental fields	44.8	55.2	100
Total	52.3	47.7	100

Source: Establishment panel of IAB (2004/2005), own calculations.

In total, more than 50% of the environmental firms developed or improved new products or services. The most dynamic fields regarding this distribution were analytics, consulting, measurement technology, waste disposal and recycling. More end-of-pipe oriented technologies like the prevention of water pollution seem to be less innovative. This picture is confirmed when we only regard totally new products. Especially measurement technologies and, not surprisingly, environmental research and development get high values (see table 2).

Table 2: Development of totally new products/services in the environmental sector

Environmental fields	Firms in the Environmental Sector (in %)		
	Innovative firms	Other firms	Total
Prevention of water pollution, waste water treatment	11.0	89.0	100
Waste disposal, recycling	11.2	88.8	100
Prevention of air pollution, climate protection	14.8	85.2	100
Noise abatement	8.3	91.7	100
Removal of hazardous waste, soil protection	12.3	87.7	100
Measurement technology	21.3	78.7	100
Analytics, consulting	9.4	90.6	100
Environmental research and development	16.2	83.8	100
Other environmental fields	15.6	84.4	100
Total	13.1	86.9	100

Source: Establishment panel of IAB (2004/2005), own calculations.

To recognize the employment dynamics of the environmental sector, the questions on employment development until June 2006 and 2010 are cross tabulated by environmental sectors. In accordance to the results of the innovative behaviour of the environmental firms, environmental research and development seems to have very good employment perspectives in the short (table 3) and in the long (table 4) run. Until 2010, measurement technologies and analytics and consulting can also be described as dynamic sectors.

Table 3: Employment expectations by environmental sectors until June 2006.

Environmental fields („most important environmental field“)	Employment development until June 2006 in %				
	Increasing	Constant	Decreasing	Unclear	Total
Prevention of water pollution, waste water treatment	10.5	58.1	24.1	7.3	100
Waste disposal, recycling	13.2	60.9	19.5	6.4	100
Prevention of air pollution, climate protection	14.7	61.4	15.8	8.2	100
Noise abatement	6.7	66.7	24.4	2.2	100
Removal of hazardous waste, soil protection	1.4	70.4	19.7	8.5	100
Measurement technology	13.6	61.4	17.0	8.0	100
Analytics, consulting	13.1	62.3	16.4	8.2	100
Environmental research and development	20.9	58.1	16.3	4.7	100
Other environmental fields	17.2	59.4	14.1	9.4	100
Total	12.7	61.3	18.7	7.3	100

Source: Establishment panel of IAB (2005), own calculations.

Table 4: Employment expectations by environmental sectors until 2010

Environmental Sectors („most important environmental field“)	Employment development until 2010 in %				
	Increasing	Constant	Decreasing	Unclear	Total
Prevention of water pollution, waste water treatment	16.3	38.4	23.2	22.1	100
Waste disposal, recycling	15.0	38.3	19.2	27.4	100
Prevention of air pollution, climate protection	17.1	35.4	18.2	29.3	100
Noise abatement	11.1	48.9	6.7	33.3	100
Removal of hazardous waste, soil protection	8.8	44.1	16.2	30.9	100
Measurement technology	20.5	37.5	17.0	25.0	100
Analytics, consulting	21.3	37.7	21.3	19.7	100
Environmental research and development	20.9	41.9	9.3	27.9	100
Other environmental fields	16.4	39.8	13.3	30.5	100
Total	16.2	38.6	17.9	27.2	100

Source: Establishment panel of IAB (2005), own calculations.

4. Empirical results for the impacts of innovation activities on employment and performance

4.1 Environmental innovation and employment development

In the following, the impact of environmental product innovation on employment will be explored by using econometric methods. A major problem is that, in most cases, the decision of a firm on the realisation of innovations and on the enlargement or reduction of employment is mutually dependant. Therefore, environmental innovation can not be treated as exogenous variable for the explanation of employment development but the two variables have to be estimated simultaneously. Nevertheless, we would like to find out the impact of environmental innovation on employment so that the application of a recursive bivariate probit model is adequate (see below).

The establishment panel of the Institute for Employment Research allows including a rich set of control variables to explore the relationship between environmental innovation and employment. The variables can be described as follows (for an exact definition of each variable see the appendix):

Employment denotes the development of the number of employees of the firm from 2003 to 2005. Because of the non-normal distribution of the respective continuous variable containing many extreme values we used a dummy variable denoting a positive versus a negative or stagnating employment development.

In addition to the employment development in the past, we also analysed the employment expectations of the firm until 2010 *(ExpectedEmployment)* (see Section 4.2).

Envinnovation is a dummy variable that describes the product innovation activities of the firm. The variable gets the value one if the firm belonging to the environmental sector improved or developed new products from 2002 to 2004.

Age is a control variable to capture the age of a firm. It gets the value one if the firm was founded after 1990. Younger firms with new products may be more dynamic with respect to employment.

Capacity denotes the capital utilization in 2004, measured by an indicator variable “to produce more output, more personnel and/or physical capital would have been required, yes or no”. If the capacity utilization is low, an increase of employment may not be expected.

The variable *demand* captures the influence of product demand on employment. To reduce endogeneity problems we use the one-year lagged development of turnover as indicator. A higher product demand is expected to trigger employment.

The variable *envdivers* describes the number of different environmental fields offered by the firm. This variable allows testing the hypothesis if the diversification of firms is advantageous for more innovation success.

Envorganisation captures the existence of environmentally related organisational changes within the firm. These organisational changes such as the introduction of environmental audits often provide the necessary information for environmental process innovations that may lead in some cases to the development of new environmental products.

Furthereducation indicates the support of additional education measures for employees by the firm and is expected to improve the innovative capacities of the firm. These capacities are also enforced by *R&D* activities. Furthermore, environmental innovation activities are supported by a high qualification of the staff of a firm: *Highqual* describes the share of employees with a university degree to capture these human capital effects. *Innoquant* measures the importance of new products using the share of new products with regard to turnover.

Exports describes the share of exports on turnover and can be interpreted as an indicator for international competitiveness.

The dummy variable *region* controls for structural differences between East- and West-Germany. *Size* describes the size of the firm by the number of employees in 2005. *Subsidies* measures the influence of the existence of subsidies for wages or investment. The variable *tarif* measures the existence of a collective wage agreement or not. It is included because the willingness to take on new employees may be reduced by the restrictions imposed by wage agreements.

In a first step, we analyse the relationship between environmental innovation and employment using discrete choice analysis. We estimate the following model (for a detailed description of the model see Greene 2003, p.715):

$$(1)\; employment_i = \theta\, envinnovation_i + x_i'\alpha + \varepsilon$$

$$(2)\; envinnovation_i = y_i'\beta + \mu$$

This model is different from the "normal" bivariate probit model because the second dependent variable, envinnovation, appears on the right-hand side of the first equation.[2] Because of identification problems the two sets of exogenous variables x_i and y_i can contain common variables but they are not allowed to be identical (see Greene 2003 and Frondel et al. in press). For our problem, this so-called recursive bivariate probit model is ideal because it allows addressing the possible endogeneity of the decision of a firm to increase employment and to

[2] Greene (2003, p. 715/716) shows that the endogenous character of one of the right-hand side variables of the first equation can be ignored.

realize environmental product innovations. Furthermore, this model allows including environmental innovation as an explanatory variable despite its endogenous character so that the direct effects of innovation on employment are also analysed.

The results of our estimations can be summarized as follows (see table 5):

Regarding the direct determinants of employment development, the influence of environmental innovation activities (*envinnovation*) on employment is significantly positive. Firms in the environmental sector that developed new products or modified products from 2002 to 2004 increased their employment from 2003 to 2005 – a result that is in line with the existing literature on this topic (see Section 2).

Furthermore, a high quantitative importance of the new products with regard to the whole turnover of the firm is positively relevant (*innoquant*) for employment.

As expected from theory, a high product *demand* leads to a significantly better employment performance of the firm.

Our bivariate probit model also allows an analysis of the determinants of environmental innovation activities that may be interpreted as indirect influences on the employment development within the firm. The improvement of the innovative capacities of the firm is significantly important for the development of new products in the environmental sector. *R&D* activities as input significantly promote environmental innovation activities.

Further education measures as another instrument enhances the human capital stock of a firm, the respective variable is significantly positive. These results are also confirmed by the significant influence of a *high quali*fication of the firms´ staff on environmental innovation.[3] Furthermore, the results show that West German firms (*region*) seem to be more innovative in the environmental sector.

A good strategy to improve the innovativeness of a firm seems to be a diversification of environmental product lines offered by the firm – the respective variable *envdivers* is positively significant. This result may be explained by the fact that the experiences of the firms in several environmental fields allow for more flexibility e.g. to recognize and to follow new trends in the environmental market.

[3] One may argue that environmental innovation and the qualification level of the employees may be both treated as endogenous. For that reason a bivariate probit model with the variables envinnovation and highqual as endogenous variables was estimated. The results confirmed that the variable highqual can be treated as exogenous variable. The likelihood-ratio test for the hypothesis of rho = 0 could not be refused.

Table 5: Employment Development from 2003 to 2005 and Environmental Innovation					
Variables	Employment	Envinnovation	Sector Dummies	Employment	Innovation
Age	0.10 (0.86)	-0.05 (-0.44)	Sec2	0.53 (1.83)$^{+}$	-0.38 (-1.31)
Demand	0.23 (3.27)**	-	Sec4	0.24 (0.48)	1.13 (2.02)*
Capacity	0.13 (1.27)	-0.07 (-0.60)	Sec5	0.10 (0.35)	0.51 (1.98)*
Endivers	-	0.07 (1.70)$^{+}$	Sec6	0.24 (0.90)	0.28 (1.15)
Envinnovation	0.61 (2.15)*	-	Sec7	0.02 (0.06)	-0.18 (-0.78)
Envorganisation	-	0.13 (0.81)	Sec8	0.36 (1.38)	0.29 (1.22)
Exports	0.00 (1.16)	-	Sec9	0.91 (2.19)*	0.09 (0.21)
Furthereducation	-	0.34 (2.73)**	Sec12	-1.38 (-2.08)*	1.12 (1.77)$^{+}$
Highqual	-0.23 (-0.77)	0.72 (2.43)*	Sec13	-0.29 (-0.41)	-
Innoquant	0.03 (2.59)**	-	Sec14	0.20 (0.78)	0.41 (0.17)
R&D	-	1.16 (8.36)**	Sec15	-0.02 (-0.07)	0.29 (1.08)
Region	0.17 (1.34)	0.25 (1.97)*			
Size	-0.00 (-1.05)	0.00 (1.56)			
Subsidies	0.19 (1.69)$^{+}$	0.09 (0.79)			
Tarif	-0.10 (-0.93)	-			
Number of observations: 781. Wald χ^2 (42) = 274.94. Z-statistics are given in parentheses; $^{+}$, * and ** denote significance at the 10%, 5% and 1% level, respectively. Rho = -0.27. Likelihood-ratio test of rho=0: χ^2 (1) = 1.96631 Prob > χ^2 = 0.1608					

4.2 Environmental innovation and employment expectations

In a second step, we explore the relationship between innovations and employment expectations in the environmental sector. In fact, the results of the respective bivariate probit model are similar to the model with the employment development in the past.

Younger firms (*age*) are more likely to have positive employment expectations. That is not surprising because especially in emerging markets such as renewable energies, young firms dominate the markets so that the coefficient of the variable *age* is positively significant.

Table 6: Employment Expectations until 2010 and Environmental Innovation					
Variables	Expected Employment	Envinnovation	Sector Dummies	Expected Employment	Innovation
Age	0.39 (2.84)**	-0.04 (-0.36)	Sec2	-0.33 (-0.97)	-0.38 (-1.34)
Demand	-0.02 (-0.20)	-	Sec4	-0.38 (-0.74)	1.16 (2.15)*
Capacity	0.17 (1.48)	-0.05 (-0.48)	Sec5	-0.50 (-1.73)+	0.55 (2.13)*
Endivers	-	0.08 (2.22)*	Sec6	-0.14 (-0.51)	0.30 (1.23)
Envinnovation	1.04 (4.16)**	-	Sec7	-0.30 (-1.09)	-0.17 (-0.73)
Envorganisation	-	0.16 (1.07)	Sec8	-0.15 (-0.54)	0.30 (1.28)
Exports	0.01 (1.80)+	-	Sec9	0.35 (0.81)	0.09 (0.20)
Furthereducation	-	0.30 (2.51)**	Sec12	-1.05 (-1.73)+	1.18 (1.88)+
Highqual	0.19 (0.62)	0.76 (2.57)**	Sec13	-0.04 (-0.02)	-
Innoquant	0.01 (1.09)	-	Sec14	-0.26 (-0.96)	0.03 (0.11)
R&D	-	1.17 (8.49)**	Sec15	-0.84 (-2.34)*	0.30 (1.12)
Region	0.26 (1.76)+	0.26 (2.10)*			
Size	-0.00 (-2.32)*	0.00 (1.42)			
Subsidies	-0.02 (-0.19)	0.10 (0.85)			
Tarif	-0.16 (-1.41)	-			
Number of observations: 781. χ^2 (42) = 310.84. Z-statistics are given in parentheses; +, * and ** denote significance at the 10%, 5% and 1% level, respectively. Rho = -0.54. Likelihood-ratio test of rho=0: χ^2 (1) = 8.13; Prob > χ^2 = 0.00.					

The impact of environmental innovations (*envinnovation*) on employment expectations is also highly significant. Interestingly, a high product demand in the past is not relevant for employment expectations.

Environmental innovation itself is - as in our model in Section 4.1 - determined by *further education* measures, *high qual*ification of the personnel, *R&D* as innovation input and the diversification of environmental activity fields (*endivers*).

5 Summary

The paper explores employment effects of environmental product innovations at the firm level. While there are many analyses dealing with general innovations, the number of studies analysing the environmental sector is restricted. In general, these studies detect positive effects of environmental product innovations on employment.

In our empirical analysis, we use the establishment panel of the Institute for Employment Research (Nuremberg) – a rich and representative database for all German establishments with at least one employee subject to social security. The panel wave of 2005 contains a filter ques-

tion that allows identifying firms belonging to the environmental sector so that a respective sample of more than 900 environmental firms is available.

Our descriptive results show that more than 50% of the environmental firms developed or improved new products or services. The most dynamic environmental fields were analytics, consulting, measurement technology, waste disposal and recycling. More end-of-pipe oriented technologies like the prevention of water pollution seem to be less innovative. This picture is confirmed when we only regard totally new products. Especially measurement technologies and, not surprisingly, environmental research and development get high values. In accordance to these results, environmental research and development seems to have the best employment perspectives in the short and in the long run.

Our econometric analysis had to address a simultaneity problem because the decision of a firm on the realisation of innovations and on the enlargement or reduction of employment is mutually dependant. Therefore, we applied a bivariate probit model that allows estimating the two variables simultaneously.

The econometric results show that the influence of environmental innovation activities on the employment development is significantly positive. Furthermore, the quantitative importance of the new products with regard to the whole turnover of the firm is also important for employment growth. As expected, a high product demand leads to a better employment performance.

Within the bivariate probit model the determinants of environmental innovation activities are also explored. They may be interpreted as indirect influences on the employment development of the firm. The results show that the improvement of the innovative capacities by R&D and further education measures and the existence of a high qualified human capital stock are significantly important for the development of new products in the environmental sector. A good strategy to improve the innovativeness of a firm seems to be a diversification of environmental product lines offered by the firm.

The results for a second bivariate probit model capturing the relationship between innovations and employment expectations in the environmental sector are very similar to those of the model including the employment development in the past.

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APPENDIX: Description and descriptive Statistics of the Variables

Variables	Description	Mean	Std. Dev.
Employment	1 Increasing development of the number of employees from 2003 to 2005 0 Decreasing or constant development of the number of employees from 2003 to 2005	0.36	0.48
Envinnovation	1 Environmental product innovations from 2002 to 2004 0 No product innovations	0.52	0.50
Expected Employment	1 Higher expected employment in 5 years 0 Constant or lower expected employment in 5 years	0.16	0.37
Age	Foundation of the firm after (1) or before 1990 (0)	0.51	0.50
Demand	Development of turnover from 2003 to 2004 (in %)	0.13	0.70
Capacity	Capacity utilization in 2004, measured by an indicator variable "to produce more output, more personnel and/or physical capital would have been required, yes (1) or no (0)"	0.33	0.47
Endivers	Number of different environmental fields offered by the firm	2.07	1.44
Envorganisation	Existence of environmentally related organisational changes (1 yes, 0 no)	0.15	0.35
Exports	Share of exports on turnover in %	9.09	20.52
Furthereducation	Support of additional education measures for employees (1 yes, 0 no)	0.76	0.43
Highqual	Share of employees with university degree	0.13	0.21
Innoquant	Share of new products with regard to turnover in %	1.35	6.74
R&D	Realisation of R&D activities or not (1 yes, 0 no)	0.26	0.44
Region	1 West-Germany 0 East-Germany	0.59	0.49
Size	Number of employees in 2005	233.13	1649.0
Subsidies	Subsidies for wages or investment (1 yes, 0 no)	0.34	0.47
Tarif	Collective wage agreement (1 yes, 0 no)	0.53	0.50

Table 8 (continued)

Sector Dummies	1 yes, 0 no for all sector dummies	Mean	Std. Dev.
Sec1	Agriculture, forestry	0.03	0.18
Sec2	Mining, energy and water supply	0.06	0.24
Sec3	Food products and beverages	0.003	0.06
Sec4	Consumer goods	0.01	0.11
Sec5	Production goods	0.12	0.32
Sec6	Investment goods	0.15	0.36
Sec7	Construction sector	0.18	0.39
Sec8	Retail and wholesale trade	0.15	0.36
Sec9	Transport and communication	0.02	0.14
Sec10	Banking and assurances	0.001	0.03
Sec11	Restaurants and accommodation	0.001	0.03
Sec12	Education sector	0.01	0.11
Sec13	Health and social services	0.01	0.08
Sec14	Other services especially for enterprises	0.17	0.38
Sec15	Other services	0.07	0.26
Sec16	Non governmental organisations	0.004	0.07
Sec17	Public services	0.002	0.05

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