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Abstract

Green jobs are a key aim of societal efforts to provide concrete contents to the long run effort to reconcile sustainability and development. The present article analyses the extent to which future growth of green jobs is influenced by microeconomic and sector/macro level factors. We carry out econometric analyses on European SME firms to assess the factors affecting the creation of green jobs in small and medium firms. We find that green product and service innovation is primarily relevant to support the creation of green jobs. This suggests that producing green products and services is an important factor affecting green jobs. The environmental management system is also positively related to job creation: the reorganization of a firm's activities imposed by Environmental Management System implementation requires the organizational structure as a whole to be reshaped, eventually including skills and competences. Innovations aimed at enhancing resource efficiency also augment the expected creation of green jobs. Sector factors and turnover/demand effects appear less relevant than specific eco innovation elements of the firm with the exception of the waste sector which supports the creation of green jobs. The study lays the foundations for future research on the development of green skills, competences and jobs in firms as a reaction to market and policy levers.

Keywords: green jobs, innovation, labour demand, sectors, product innovation, techno-organisational innovations.

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1 Introduction

Current European unemployment rates and the challenges posed by the new binding climate change and resource efficiency targets (EEA, 2013) pose serious question about how to effectively move the current path towards a green economy. The recession has fiercely reposed the question of how to turn 'normal' growth, which has shown to be somewhat unsustainable in economic, social and environmental terms, into green growth, which should bring together increasing labor productivity and wages, on the one hand, and increasing energy and environmental efficiency of production on the other. Within this reasoning, innovation is a pivotal force to sustain growth and development, and to decouple these from environmental impacts. The factor that may compensate for scale effects is technology: technological development can boost both labor and resource efficiency (EEA, 2014) which has been already showed in previous empirical literature (Horbach and Rennings, 2013). Through (policy induced) innovation, sustainable development policies may support employment creation (McNeill and Williams, 2007).

The environmental targets regarding greenhouse gas (GHG) fixed that the EU should decrease emissions by 20% with respect to 1990 levels by 2020, and -40% by 2030.[1] This environmental objective drives the policy efforts toward sustainable growth. Eco Innovations are at the core of the reasoning (Cainelli et al. 2015; Borghesi et al. 2015; Borghesi, Cainelli and Mazzanti, 2015): EI might reduce environmental impacts and increase competitiveness, which may include the development development of green jobs within the broader labour productivity - competitiveness enhancement (through higher efficiency in processes and/or product based value creation).

Against this background, a specific critical aspect of the future EU economic development is how SMEs, that are a large part of the EU economy, may bring together competitiveness and sustainability strategies, namely economic and environmental productivity/efficiency[2] (Grolleau, Mzoughi, Pekovic, 2012; Cainelli et al., 2013). One of the most concrete outcomes of an integrated strategy is the 'creation' of green jobs[3] and green skills (Gamesa, 2010; ILO,

[1] http://ec.europa.eu/clima/policies/g-gas/index_en.htm Last retrieved 19 July 2015

[2] See the OECD activities in the field of green jobs and skills (http://www.oecd.org/employment/greeningjobsandskills.htm.

[3] For definitions see OECD (2013, p. 50). The definition that is used in this paper follows more the ILO green job approach than the Eurostat perspective of 'employment in environmental goods and services sectors' (Bezdek et al., 2008 find green jobs are created in manufacturing and specialised and professional services, the net job effect of environmental protection investments is a net positive for the US).

2010[4]), that entail a greening/reskilling of the current workforce and creation of jobs/skills (Consoli et al., 2015). The term 'green job' is surely loose (Kouri and Clarke, 2014): so far it has been used both in relation to employment in activities related to pollution control, energy efficiency and waste management as well as in a broader sense, that is, for occupations in agriculture, industry, and services that contribute to preserving or restoring the quality of the environment[5]. One critical issue is whether green jobs are defined by the greenness of the industry (including also brown jobs) or by bottom-up classification of jobs through the analysis of tasks and competences in a given firm (Consoli et al., 2015).

This article aims to identify and assess the instruments that can help firms, in particular Small and Medium Enterprises that account for a large share of the EU economy, to increase labor demand in relation to green jobs. We focus on the role of eco-innovation adoption as well as market and structural factors. The key research question revolves around the job creation role of (i) green product and service innovation, (ii) organizational innovations, (iii) process innovations that enhance resource efficiency, knowing from theory and past evidence that the three types of innovations may increase or decrease employment through direct and indirect effects. The paper coherently exploits a large dataset of European SME and large firms to analyze the extent to which future growth of green jobs are influenced by micro and sector level factors.

The paper is structured as follows. Section 1 presents the review of relevant literature. Section 2 describes the hypothesis and the method. Section 3 details the data and Section 4 presents the results. Section 5 concludes.

2 Employment, innovation and the green economy

The academic works have largely interacted with the international organisations' attention to the green economy and job creation. As a key example, the OECD (2012) stressed that (1) supporting green skills is integral to the transition to a low carbon economy, (2) developing green skills is part of a broader challenge to increase the strategic management capabilities of SMEs, (3) investing in R&D is essential to anticipate the gaps in knowledge which the green economy challenge poses. On the other hand, it seems evident now that the low carbon economy will have a pretty neutral effect on the labour force in terms of total employment (UNEP, 2011), with specific impacts unevenly spread across countries, regions and types of

[4] Referring to 'Skills for Green Jobs' Technical Validation Workshop International Labour Organization/CEDEFOP May 17, 2010, Geneva, Switzerland.

[5] Consoli et al. (2015) discuss the various definitions of green jobs from various institutions and try to provide a more solid grounding to the definition of green skills using the task-based approach.

workers. Job growth in low carbon activities is expected to offset losses in brown sectors, though the skills involved in greener (new) activities are possibly different from those now required in contracting sectors.

Green jobs are an important piece of the relationships that might exist between (green) innovation and the creation of jobs (Deschenes, 2013), that goes back to the key issue on the 'jobs versus the environment' debate (McKevoy et al. 2000). The economic literature has analysed whether the costs posed by environmental strategies and policies might turn into technological developments, organisational changes and value creation that lead to a net effect on employment[6].

There is still a lack of specific evidence on the (eco) innovation effects on employment and in particular green jobs. Fankhauser et al. (2008) suggest that jobs could be stimulated by the shifts to higher labor intensity sectors in the short term, where the higher intensity of labor might be a feature of the first period of the green economy path. Young and green technologies may in fact be (temporarily) more labor intensive due to short term capital fixity (Gagliardi et al., 2014). In the medium and long run, economic adjustments are difficult to gauge, given the strong structural adjustments required by climate policy targets. Micro and macro-economic effects might link green growth to job creation, among others factors innovation can have a positive or negative effect on the creation of employment (we refer to Pianta, 2005 for an extensive survey on the classical question 'does technology destroy or create jobs). One seminal piece of work is van Reenen (1997), who shows that technological progress pushes jobs (in British firms) with effects that are persistent over time, and more relevant than industry spillover effects and wages among other factors.

There is a large strand of literature in innovation studies that analyses the effect of innovation in the creation of employment. This literature mainly uses and exploits different types of data based on EU firm based surveys. Antonucci and Pianta (2002) analyse the EU CIS waves with the aim to assess the relevance of differentiating employment effects generated by process and product technological innovations. A relatively more structural change oriented perspective on the role of product and process innovation over the economic cycle (growth and downturns) is offered by Lucchese and Pianta (2012). Mastrostefano and Pianta (2009) using CIS data assess the effects of innovations on employment. They stress the role of both short term labor market effects and long run structural change dynamics, the importance of considering various

[6] Recalling that social welfare is composed of environmental and economic values, that might be characterised by trade off or synergies. Employment is then an additional complementary social goal. The role of technology is crucial for linking environmental, economic and employment dynamics (Costantini and Mazzanti, 2013; Fankhauser et al., 2008).

innovation types, the relevance of analysing the diversified effects across high and low innovative industries. An important research question analysed is the role of sector technological related effects on the creation of employement (Bogliacino and Pianta 2010[7]) with particular emphasis to macro effects (Lucchese and Pianta, 2012). Regarding the role of (eco) innovation effects on creation of green jobs () are still in their infancy. Horbach and Rennings (2013) show that innovative firms are characterized by the creation of employment. In particular, once they adopt green process technologies. They suggest cost savings induced by this type of process innovation improve the competitiveness of firms which in turn increases employment. Gagliardi et al (2014) focus on employment and 'patents', namely invention rather than innovation adoption. They do find positive and significant effects of green patents and total patents on employment for the Italian case study. We do extend the scope of the research by looking at the EU by looking at the effect of both the creation of green product and process and the decision to implement environmental friendly process of production within the firm.

Albrizio et al. (2014) from the OECD have recently re-emphasised the need to focus on the 'economic effects' of environmental policy and innovation strategies (Cainelli et al., 2011; Mazzanti and Montini, 2010; Ghisetti and Rennings, 2014), a research line that has been relatively overlooked with respect to the more consolidated literature that addresses the drivers of eco-innovations and patents (Popp, 2002; Horbach, 2008). Recent works have also interestingly analysed, limited to the French case, the correlation between Environmental Standards and a firm's recruitment on the one hand and the workers' attitudes on the other as a type of firm's performance (Lanfranchi and Pekovic, 2014; Grolleau et al., 2012). This is relevant since the creation of jobs is going to produce qualified occupations if skills upgrading and workers' attitudes are enhanced. Profitability and productivity also depend on those intangible human resource factors, which are eventually complements to the adoption of eco-innovation (Antonioli et al., 2013).

3 Research hypotheses and methods

Relying on the above framework, we analyse the effect of eco-innovation adoption by firms on the probability to create green jobs in the future. Green job demand is enhanced by the adoption of techno-organisational innovations since extended / new skills are needed and – regarding both process and product innovation – market share and/or market value of products might

[7] The effect of value creation product innovations, cost competitiveness process innovations, demand and industry dynamics are analysed for 8 countries by using the usual CIS framework as the empirical setting.

expand, by direct and indirect mechanisms[8] (Harrison et al., 2014)[9]. We define three distinct hypotheses:

(1) Innovation 'value' effect: Product innovations may support green jobs through the enhancement of value creation: net positive effects are expected at least in the short-medium run from the time of adoption

(2) *'Re-organisation' effect:* Adopting organizational innovation strategies such as EMS and ISO increases expected green job demand due to the need to re-organize the entire firm's 'innovation' structure, wherein specific green recruitment and green training are key complement elements to this organisational type of innovation (Antonioli et al., 2013; Wagner, 2013) [10] or they might increase the competitiveness of the firms which lead to increase in job creation (Horbach and Rennings, 2013);

(3) '*Efficiency' effect:* If on the one hand, Process innovations direct effects may reduce labor demand due to efficiency enhancements within the firm (Rennings et al., 2004 find a negative effect attached to end of pipe technologies), on the other hand reducing environmental costs, e.g. improving resource efficiency, can lower product prices and enhance cost based competitiveness. This effect can then boost future green job demand, through specific channels that might be empirically tested (e.g. carbon efficiency, resource efficiency, energy efficiency etc.).

We define our econometric specification on the basis of a consolidated literature that studies the link between innovation and employment by using firms' data (van Reenen, 1997). Here we mainly refer to the specification used by Pianta (2002).

The stochastic form of the labor demand equation is the following, where the term INNOV (a set of innovation factors) replaces the unobserved technology variables[11].

$$l_{i,t+2} = \alpha + \beta_1 INNOV_i + \beta_2 Y_i + \beta_3 \frac{w_j}{p_j} + \beta_4 y_j + \varepsilon_i \qquad (1)$$

[8] In the medium run, product innovations may nevertheless reduce market competitiveness, thus changing market structures. Output reduction could reduce labor demand at industry level due to more monopolistic behavior.

[9] They model and analyse the employment growth of process and product innovations in the UK, Spain, Germany, and France.

[10] Borghesi et al. (2015) suggest the key role of both organisational and technological innovations to enhance the overall performance of EU sectors towards the low carbon economy.

[11] This is common to neo-classic and more heterodox approaches of labor demand estimation.

Where $l_{i,t+2}$ is labor demand (of green jobs)[12] of firm i in time t+2, Y is the economic component (output and turnover) that drives demand. In order to measure wage components, we use two variables: the growth of the value added of the employment per sector and as addition the sectoral dummies, which control for various idiosyncratic factors. $\frac{w_j}{p_j}$ is the measure of sectoral productivity growth which is our measure of wages and y_j are the sectoral dummies[13] and Y_i is a set of variable that measures the organizational characteristics of the firms.

The main purpose here is to analyse the extent to which *future* growth of green jobs[14] is influenced by micro-economic and sector/macro level factors, such as technological and organizational (e.g. EMS) innovation adoption in firms, sector features. The timespan of reference is defined according to the Eurobarometer survey over 2011-12[15].

4 Description of the dataset

In order to test the main research hypothesis and estimate the labor demand in (1), we do exploit original European firms data, that permits an assessment of the factors affecting the creation of green jobs in small and medium firms is used (Eurobarometer survey, EU Commission)[16]. The sample was collected between January and February 2012 and includes about 9,233 firms. The dataset contains a large number of variables that permit the measurement of the innovative activities of firms and in particular the relative importance of green products and services in terms of turnover and the past experience of green innovation. The data include both SMEs and some firms with more than 250 employees[17]. There are different sets of data namely (1) information related to the improvement of resource efficiency, (2) the motivation that lead firms

[12] We know that in this partial equilibrium framework we cannot provide evidence on the net effect on jobs (creation of green jobs and eventual destruction of other jobs). This is scope for future research.
[13] Since we don't possess wage data at the firms' level for the present sample of SMEs, we introduce Labor productivity at the sectoral level to capture this effect through a sector dynamics. We note that in the stagnation period under analysis, labor supply is elastic (flat), thus wage increases are of secondary importance.
[14] The survey allows for lags between correlated factors, with the question on green jobs posed at time T+1 (2012) with respect to other examined factors (2011 and before).
[15] 2012 was a recession year, with GDP decreasing in the EU by 0.4%, in the Eurozone by 0.7%. Unemployment increased to 10.3 in 2012 in the EU from the 9.5 2011 level.
[16] De Wit and Kok (2014) exploits a European Commission survey to analyse the seminal hypotheses 'do SMEs create more jobs?'.
[17] "as SMEs account for approximately 99% of all enterprises and 2/3 of employment across the OECD, their transition to sustainable practices is key to the large scale uptake of a green growth model" (OECD, 2013, p.25).

to improve environmental footprint of their activities (3) the use of environmental management systems and (4) the set of firms' organizational characteristics.

As concerned the number of green jobs that firms intend to create in the next two years in average firm aims to create about eight new jobs about 50% of the sample does not aim to create green job. The large majority of the firms employs already employees about 88% of the sample.

About 42% of the sample includes firms with fewer than 9 employees, 32% of the firms have between 10 and 49 employees, 18% of the firms have between 50 and 249 employees and 7% have more than 250 employees. The dependent variable is the number of green jobs that the firms expects to create in the next two years. The statistical evidence shows that about 49% of the firms in the sample will create more than 1 green job in the next year.

[Table 1]

To test the main research hypothesis, we consider the following information the questionnaire offers (see table 2 for main descriptive stats).

1. PRODUCT INNOVATIONS, 'VALUE' EFFECT. We exploit two questions of the survey questionnaire: one is asking whether firms have introduced a green product or services (31% of firms), the other, whether firms will introduce green products or services (9%).
2. ENVIRONMENTAL MANAGEMENT SYSTEMS, 'ORGANISATIONAL' EFFECT, as organizational innovative practices. The dummy variable EMS indicates if the firm has used any environmental management system, like EMAS and ISO14000 in the period that precedes green job creation. There are about 26% of the firms that use one of these practices.
3. PROCESS INNOVATION, 'EFFICIENCY' EFFECT. We proxy process innovation by two factors that captures the resource efficiency increase of a firm's strategies which result from the factor analysis (see Table 1 below and section §3.1). While product innovations highlight the role of value creation out of innovation, (cost) efficiency is the content of process innovations.

In order to estimate the effect of wages which is important to estimate the demand of labor, we use the variable *GrowthValueaddedEmp* which measures the growth of the ratio between the sector value added and the sector. We also include the sectoral dummies as they measure the peculiarity of each sector.

The questionnaire contains detailed information related to the type of environmental resource efficiency firms use to reduce the footprint of their economic activities. These include seven dummy variables, namely Saving water, Saving energy, Using renewable energy, Saving Materials, Minimising waste, Selling your scrap and Recycling (descriptive statistics in Annex A, Table A1).

We apply a factor analysis on the matrix generated after the polyphonic correlation which leads us to identify the factors that affect the introduction of environmental resource efficiency practises. In order to verify the internal consistency of the set of variables we apply Cronbach's alpha test which is equal to 0.69.

We identify two factors: SAVING and MINIMISING_RECYCLING. SAVING includes the variable Saving Water and Saving energy which counts respectively for the fact that firms declare that they save water and energy in their activities. MINIMISING_RECYCLING includes the variable Minimising waste and recycling which counts respectively for the fact that firms declare that they reduce waste and perform recycling activities.

[Table 2]

5 Econometric evidence

In the empirical model, the dependent variable is a count variable that measures the creation of new jobs in the next 2 years. The Poisson regression is a baseline model for count data (Hausman et al., 1984). However, the results of the Poisson specification compared to the negative binomial model shows that the standard errors reflecting efficiency gain due to better model identification (Cameron and Trivedi, 2009) and the test of over-dispersion, confirms the application of the negative binomial specification.

An estimation of the labor demand for green jobs shows that the introduction of Green products and services positively correlates to the creation of new green jobs. This result corroborates a specific green realm – and at EU level - some previous findings on the link between employment and green (product) innovation in Germany (Rennings et al., 2004[18]; Horbach, 2010). It suggests that the introduction of service and product services stimulates the expected

[18] They find on the basis of a German firm's dataset that 'the most important environmental innovation is a product or service innovation which has a significantly positive effect on the probability of an increase in employment'.

creation of new jobs: the increased demand is associated with the new skills required, and especially with the increased economic value product innovations generate in niche markets where the willingness to pay for new green products is higher (Gagliardi et al., 2014). The search for a high willingness to pay in relatively new markets is one of the strategies to cope with economic stagnation. This is a key fact for the EU in the present situation. Innovation, and especially eco-innovations, may emerge as the key factor that is capable of sustainably reconciling green growth, development and job creation. As the EEA (2014) recently stressed : "Given the relatively low share of firms that adopt EI in many countries there is room for higher eco-innovation adoption and diffusion in the EU, especially in laggard countries". The increase in the share is potentially an engine of future green job creation[19].

Regarding the effect of the introduction of an environmental management system, it also positively influences the probability of creating green jobs in the short term future. The use of these innovative ecological techno-management practices allows firms to safeguard and enhance the quality of the management within the firm. This result reconfirms the important correlation between human resource management, which means green training but also new labor demand, and broad innovation changes, in terms of 'greening' and reorganizing firm's practices (see Wagner, 2015, who analysed employee satisfaction and the adoption of environmental management systems in the EU). The introduction of green process might also increase the competitiveness as it ensures increase efficiency corroborating the previous results of Rennings and Horbach (2013). Since EMS and (product) innovation might be complements or correlated factors, future research may study the effect of complementarity adoption of innovations on (green) job creation (Gilli et al. 2014).

Focusing on 'process innovation' factors, the factor 'Minimize waste' is significant once the growth of value added is not considered. The results show that enhancing resource efficiency, does not seem to increase green jobs[20]. Overall, positive indirect effects – cost reduction - here compensate for the eventual negative direct effects of process innovation on employment.

As far as the other factors of labor demand are concerned, we first note that turnover is overall less relevant than a firm's size to explain labor demand (the table does not present coefficients to increase readability), while age is not relevant at all. Second, labor productivity is not

[19] We introduce in the econometric specification two terms that capture a sort of path dependency, namely the stock of green jobs at time T. The two factors 'Present 10-50emp' and 'Present 50emp' are dummies that Take value 1 if a firm hires between 10 and 50 employees, and more than 50, qualified as green jobs. This stock effect is always significant and positive: this means that in the period just after the recession the firms that, other things being equal, already occupied green jobs present a higher probability of creating new green jobs.

[20] We just note that 'minimizing waste' is positive in the coefficient and statistically significant at 10% when the labor productivity covariate is omitted.

significant in our estimates. The result is coherent with the limited relevance of real wages as a determinant of jobs in market equilibria that are distant from full employment.

Overall, path dependency – the stock of green jobs - and techno-organisational innovations largely explain the probability of creating green jobs, compared to sector elements. It is worth noting that among sectors, waste shows a higher probability of green job recruitment.

6 Conclusions

This paper analyses the extent to which the future growth of green jobs in SMEs in the EU is influenced by internal to the firm (micro) and sector related (meso) factors. Among the former we focus on the adoption of eco-innovation: product and process technological innovations, and organisational innovations (EMS). The focus is on the short term period, wherein SMEs adopt strategies to cope with a post-recession phase and the challenges posed by the Green economy targets. The empirical evidence is based on a wide and rich cross section EU27 dataset that covers EU SMEs over 2011-2012.

An econometric analysis of labor demand highlights the fact that the adoption of green product innovation, as well as organizational innovations, are pretty relevant to supporting the creation of green jobs . Process innovations aimed at increasing efficiency in the use of resources turn out to be less relevant, if at all. This means that the positive (direct for product, indirect for process) effects on employment are higher than or equal to the negative effects on job creation, such a labor saving technologies on the one hand and output reduction if market structure becomes less competitive on the other hand.

Overall, path dependency – the stock of green jobs - and techno-organisational innovations – product and organisational innovations - drive the green job dynamics in the EU. The changes in SMEs' green jobs during the post-recession phase in the EU seem linked more to green strategic components of firms rather than sector and structural factors.

Green products might potentially reconcile value creation, then transformed into job creation and environmental efficiency per se, at the level of consumption and/or production phases. EMS is also positively related to job creation: the costly and challenging reorganization of a firm's activities imposed by EMS implementation, requires the organizational structure as a whole to be reshaped, including skills and competences. This is interesting because EMS and product innovations are often found to influence economic performances, such as productivity. Research should thus further analyse the potential impact of green product innovations and EMS on value, productivity and employment, in order to investigate the extent to which labour

productivity may increase following the potential joint value-employment effects of green innovations.

Further empirical research should be oriented towards the construction of panel datasets based on surveys and on the definition of firm-based and sector-based environmental policy indicators, in order to investigate the policy-innovation-economic performance relationship in more detail. In addition, the 'quality' of green jobs should be assessed, in terms of wages and workers' conditions. Again, specific surveys and data mergers are necessary for such purposes.

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Table 1. Descriptive statistics

Variable	Description	Mean	Std. Dev.	Min	Max
Nb green job	Number of green job created in the next 2 years	8.720	38.065	0	800
Green Product	Takes value 1 if firm has introduced a green product or services, 0 otherwise	.2970	.457	0	1
Present 10-50 emp	Takes value 1 if firm hires between 10 and 50 employees qualified as green jobs	.084	.278	0	1
Present more than 50emp	Takes value 1 if firm hires more than 50 employees qualified as green jobs	.031	.173	0	1
MOTIVATION TO REDUCE ENVIRONMENTAL FOOTPRINT (Efficiency factors)					
Factor Saving	Takes value 1 if firm wants to anticipate future changes in legislation motivates resource efficiency, 0 Otherwise	-.004	.838	-1.353	1.097
Factor Minimize waste	Takes value 1 if anticipation of future professional /product standards motivates resource efficiency, 0 Otherwise	-.002	.809	-1.352	1.220
USE OF ENVIRONMENTAL MANAGEMENT SYSTEMS					
EMS	Takes value 1 if firm uses environmental management system (such as EMAS, ISO14000), 0 otherwise	.307	.461	0	1
CARATERISTICS OF THE FIRM					
turnover1	Takes value 1 if firm's turnover is less than 100 000 euro, 0 otherwise	.151	.358	0	1
turnover2	Takes value 1 if firm's turnover is More than 100 000 to 500 000 euro, 0 otherwise	.214	.410	0	1
turnover3	Takes value 1 if firm's turnover is More than 500 000 to 2 million euro,0 otherwise	.205	.404	0	1
turnover4	Takes value 1 if firm's turnover is More than 2 to 10 million euro, 0 otherwise	.158	.365	0	1
turnover5	Takes value 1 if firm's turnover is More than 10 to 50 million euro, 0 otherwise	.089	.284	0	1
turnover6	Takes value 1 if firm's turnover is More than 50 million euro, 0 otherwise	.042	.201	0	1
Age	Categorical variable[21]	9.838	3.203	1	14
Size 2	Takes value 1 if firm has between 10 to 49 employees, 0 otherwise	.321	.467	0	1
Size 3	Takes value 1 if firm has between 50 to 249 employees, 0 otherwise	.185	.389	0	1
Size 4	Takes value 1 if firm has 250 or more employees, 0 otherwise	.074	.261	0	1
SECTORAL DUMMIES					
Manufacturing	Takes value 1 if firm belongs to **Manufacturing**	.268	.442	0	1

[21] Takes value 1 if the firm stays in the business one year or less, 2 if the firm stays in the business for 2 years, 3 if the firm stays in the business for 3 years, 4 if the firm stays in the business for 4 years, 5 if the firm stays in the business for 5 years, 6 if the firm stays in the business for 6 years, 7 if the firm stays in the business for 7 years, 8 if the firm stays in the business for 8 years, 9 if the firm stays in the business for 9 years, 10 if the firm stays in the business 10-19 years, 11 if the firm stays in the business for 20-29 years, 12 if the firm stays in the business for 30-39 years, 13 if the firm stays in the business for 40-49 years, 14 if the firm stays in the business more than 50 years.

	sector, 0 otherwise				
Electricity, gas, steam	Takes value 1 if firm belongs to **Electricity, gas, steam sector,** 0 otherwise	.013	.112	0	1
Water supply, sewerage, waste management	Takes value 1 if firm belongs to **Water supply, sewerage, waste management sector,** 0 otherwise	.019	.136	0	1
Construction	Takes value 1 if firm belongs to **construction sector,** 0 otherwise	.187	.390	0	1
Wholesale and retail trade, repair	Takes value 1 if firm belongs to **Wholesale and retail trade, repair sector,** 0 otherwise	.239	.426	0	1
Transportation and storage	Takes value 1 if firm belongs to **Transportation and storage sector,** 0 otherwise	.054	.226	0	1
Accommodation and food service activities	Takes value 1 if firm belongs to **Accommodation and food service activities,** 0 otherwise	.043	.204	0	1
Information and communication	Takes value 1 if firm belongs to **Information and communication sector,** 0 otherwise	.034	.181	0	1
Financial and insurance activities	Takes value 1 if firm belongs to **Financial and insurance activities,** 0 otherwise	.019	.137	0	1
Real estate activities	Takes value 1 if firm belongs to **Real estate activities,** 0 otherwise	.030	.171	0	1
Professional, scientific activities	Takes value 1 if firm belongs to **Professional, scientific activities,** 0 otherwise	.088	.283	0	1

Table 2. Factor analysis

Variable	RESOURCE SAVING	MINIMISING_RECYCLING
Saving water	0. 7956	
Saving energy	7801	
Using renewable energy		
Saving materials	0.4762	
Minimising waste		0. 5471
Selling your scrap		0.5147
Recycling		0. 5812

Table 3. Econometric Results

	(1)	(2)	(3)	(4)	(5)	(6)
Green Product	0.854***	0.842***	0.849***	0.859***	0.847***	0.852***
	(13.96)	(13.81)	(13.99)	(13.12)	(12.94)	(13.24)
Present 10-50emp	2.059***	2.041***	2.048***	2.091***	2.072***	2.084***
	(31.62)	(31.74)	(31.16)	(29.66)	(29.82)	(29.24)
Present more 50emp	3.374***	3.366***	3.371***	3.427***	3.416***	3.428***
	(36.49)	(36.32)	(36.24)	(37.16)	(36.86)	(37.18)
Age	-0.00375	-0.00243	-0.00397	0.000359	0.00197	0.000193
	(-0.32)	(-0.21)	(-0.34)	(0.03)	(0.16)	(0.02)
Factor 'Saving'		-0.0198			0.0194	
		(-0.25)			(0.23)	
Factor 'Minimize waste'		0.152*			0.125	
		(1.76)			(1.33)	
EMS			0.166***			0.173***
			(2.70)			(2.67)
GrowthValueaddedEmp[22]				0.0001	0.0001	-0.0001
				(0.05)	(0.10)	(-0.02)
Size	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies[23]	Yes	Yes	Yes	Yes	Yes	Yes
Turnover	Yes	Yes	Yes	Yes	Yes	Yes
_cons	-0.385*	-0.389*	-0.430*	-0.356	-0.359	-0.398
	(-1.65)	(-1.65)	(-1.81)	(-1.42)	(-1.41)	(-1.56)
lnalpha _cons	0.817***	0.813***	0.813***	0.812***	0.808***	0.808***
	(16.16)	(16.11)	(15.82)	(14.67)	(14.51)	(14.36)
Wald chi2	7844.83	7749.84	7790.63	7137.84	7067.16	7154.13
N	9233	9233	9233	8031	8031	8031
pseudo R^2	0.134	0.135	0.135	0.136	0.137	0.137

t statistics in parentheses

* p<.10, ** p<.05, *** p<.01

[22] This variable measures the Growth of 'value added of employment' and is a proxy for real wages: the mean is 2.79 and the standard deviation is 27.94.

[23] We additionally included as control the ratio between value added and CO_2 emissions, namely emission intensity; the covariate ends up being not significant. Estimates are available on request.

Annex A

Table A1. Descriptive statistics of the variables measuring the environmental management

Variable	Obs	Mean	Std.	Min	Max
Saving water	9233	.4697281	.4991098	0	1
Saving energy	9233	.6680386	.4709427	0	1
Using renewable energy	9233	.1492473	.3563513	0	1
Saving materials	9233	.5760858	.4942038	0	1
Minimising waste	9233	.5917903	.4915289	0	1
Selling your scrap	9233	.354381	.4783512	0	1
Recycling	9233	.5769522	.4940696	0	1