

Article

Identification of the Factors That Affect the Environmental Administrative Burden for Businesses

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Abstract: Environmental regulations bring social benefits and contribute to lessening environmental damage. At the same time, due to the rapidly changing and complex environmental legislation, businesses incur costs, including administrative burdens. The article presents quantitative evidence on the factors that affect the compliance costs of environmental regulations. For this purpose, we used a binary model of logistic regression with the following predictors: enterprise characteristics, the relevance of environmental regulations for business operations, and the impact of environmental stimulus measures on compliance costs. The results of the study suggest that medium-sized enterprises are less likely to experience the environmental administrative burden than small enterprises. However, no difference has been found between large and small enterprises. Further, we show that environmental consents are an important determinant of the environmental administrative burden and that financial environmental measures can have a positive impact thereon.

Keywords: compliance costs; environmental regulations; logistic regression; red tape

1. Introduction

Environmental regulations have been changing relatively rapidly over the past two decades. In the context of environmental protection, such changes are generally necessary, and recent studies [1–3] suggest that the benefits outweigh the costs. Although these studies mainly focus on the societal benefits of environmental regulations, there is another important aspect related to the quality thereof to be taken into account, i.e., the costs of compliance with the obligations imposed thereby. The quality of regulation does not relate only to the public benefit. One also needs to consider whether there are any unnecessary costs that could be reduced if regulation could be better while the benefits thereof remained the same. In most countries, the measures taken in such regard can be classified into the following groups: use of information technology, lower number of licences and reporting, no duplication in reporting, lower frequency and simplification of reporting, grouping of regulations pertaining to the same field (codification), etc. Such simplifications are expected to reduce the compliance costs of environmental regulations by more than EUR 90 million [4,5]. As reported by the Department for Environment, Food & Rural Affairs (DEFRA) in the United Kingdom (UK) [6], by merging two major environmental systems (the Integrated Pollution Prevention and Control (IPPC) and the System of Permits in Waste Management), the UK economy and public sector are expected to save around GBP 70 million (approximately EUR 78 million) in ten years, with additional potential economic benefits without compromising environmental standards. Close attention to unnecessary costs is also paid by the European Commission [7], which adopted an action programme to reduce administrative burdens that arise from environmental regulations in cross-border business operations. Contrary to these findings, a Dutch study [8] showed that 70 percent of Dutch enterprises did not

experience any significant effects of regulatory simplification. Most of the surveys mentioned below focus on compliance costs, cost-benefit analysis, or comparison of ex ante and ex post evaluations of implemented regulations. In line therewith, our goal was to build a model with the following determinants: enterprise characteristics, relevance of environmental regulations for business operations, and positive impact of environmental stimulus measures on compliance costs.

The paper is structured as follows: after the introduction, a comprehensive review of the literature on measuring compliance costs of environmental regulations and presentation of the theoretical framework for the empirical model is provided. This is followed by the presentation of research methodology, results, and conclusions.

2. Review of the Literature on Measuring Compliance Costs

Terminology used by different researchers and institutions interchangeably used expressions like compliance costs, administrative costs, administrative burden, red tape, etc. Therefore, first we would like to determine the meaning of expression compliance costs and administrative burden in the content of our research. Tran-Nam, Evans, Walpole, and Ritchie [9] argued that any regulation, including environmental ones, implies three types of societal costs: administrative costs, compliance costs, and efficiency costs. Compliance costs are the costs incurred by regulations in addition to the actual paying of tax (i.e., the time spent to comply with the obligation, the cost of consultants, etc.). Sandford, Godwin, and Hardwick [10] distinguished between administrative costs, other state costs, and compliance costs, i.e., the costs of complying with regulatory obligations. Methodology, called Standard Cost Model (SCM), which is used in the European Union (EU), defines administrative costs as the sum of administrative burden (*‘information that is solely collected because of a legal obligation’*) and business as usual costs [11,12]. Administrative costs are defined far from the previous explanation from researchers mentioned above. The same is true for compliance costs, which in SCM are defined as costs *‘stern from the requirements of the legislation, such as costs induced by the development of new products or processes that meet new social and environmental standards’* [11,12]. The EU Action Programme is concentrated to reducing the administrative burden in a way to overcome unnecessary obligation determined by the law [11,12]. Additionally to the mentioned definitions, the Australian group for better regulation determines regulatory burdens as costs imposed by regulatory requirements, including unnecessary regulation, and divides them further into administrative compliance costs (i.e., paperwork), substantive compliance costs (costs related to expenditures such as equipment), financial costs (actual paying of obligation), indirect costs (i.e., barriers to entry through licensing) and cost of delays [13].

Summarising the definitions used in different studies [9,10,14–18], expression compliance costs used in this paper refer to:

- the costs of acquiring the knowledge necessary to properly comply with the obligation;
- opportunity costs of the time spent by the taxpayer (enterprise) to fill in the necessary forms;
- consulting fees;
- costs of acquiring, delivering and storing data;
- other monetary expenditure (mailing, copying, transport, equipment, etc.).

Expression administrative burden used in this paper refers to unnecessary obligation determined by the law that could be easily overcome by better quality of regulation.

An important aspect in identifying the compliance cost of regulations is their impact on the overall cost burden of businesses, i.e., the impact on relative prices and efficient use of resources. According to Sandford et al. [10], compliance costs have an unequal impact on incidence. For example, the costs of tax regulations are more likely to affect small businesses, and excessive costs can be one of the reasons for tax evasion. Porter and Van der Linde [19] argued that environmental regulations require a redefinition of production processes, leading to lower production costs and competitive advantages for the enterprise. According to research by Russo and Fouts [20], environmental performance and economic performance

are positively linked. The importance of research in this area is also underlined by the Organisation for Economic Co-operation and Development (OECD) study [21]: “There is a real risk, however, particularly in a time of profound and rapid change in economic and social conditions, that regulations and formalities can impede innovation or create unnecessary barriers to trade, investment, and economic efficiency ... These effects are more costly in global markets, where business competitiveness can be affected by the efficiency of the domestic regulatory and administrative environment...”. This is in line also with the research by Freeman [22], who pointed out several determinants of administrative intensity in the organisation. Due to the regressive effect of institutional barriers on corporate costs, such barriers particularly affect small and medium-sized enterprises (SMEs), which are an important element of development of any economy, especially entrepreneurship. According to the European Commission study [23], compliance costs for small enterprises can be up to 5 to 10 times higher than for large enterprises. Despite constituting the most numerous group, small enterprises do not have the market power nor the finances to invest in the reduction of pollution. Scientific literature also fails to point out that enterprises sometimes take more stringent environmental measures than required by law. This applies to enterprises with high market power, which enables them to pass these costs on to their users/customers and deprive their competitors of a certain share of profit [24]. Nonetheless, the compliance costs of environmental regulations are usually lower than the costs of tax or employment regulations [25].

Different studies on the compliance costs of environmental regulations have led to different findings. The most comprehensive survey covering ten countries is the OECD study [21]. Costs were estimated using the values provided by the enterprises included in the survey. Compliance costs of environmental regulations were expected to account for, on average, 19% of all compliance costs related to tax, environmental and employment regulations in all ten countries. With the exception of Sweden and Finland (30% and 35% of the total compliance costs, respectively), the share of compliance costs of environmental regulations in all other countries was estimated as the lowest. On average, the compliance costs of environmental regulations in the observed ten countries reached USD 6325 (approximately EUR 5600) per enterprise, the highest being estimated in Portugal (approximately EUR 8000) and the lowest in New Zealand (approximately EUR 1700). On average, these costs accounted for 0.9% of the turnover of the observed enterprises and 0.6% of GDP of the observed countries. On average, the total amount of compliance costs of environmental regulations was estimated at USD 1.4 million (approximately EUR 1 million) [21].

There are also other studies evaluating compliance costs of environmental regulations as well. In Germany, compliance costs related to environmental regulations were estimated at EUR 1.98 billion or 0.09% of GDP for year 2003. The compliance costs of environmental regulations were estimated at EUR 82 per year on average, based on the costs reported by the enterprises. The estimated value of compliance costs per enterprise was relatively low, owing to the fact that enterprises probably considered part of the costs related to environmental regulations to fall under taxes, since the survey classified environmental taxes under tax regulations, which in fact account for the highest compliance costs (over 40% of total costs) [26]. The 2012 survey on compliance costs of environmental regulations conducted in Belgium used the same method of cost estimation, i.e., estimates provided by the enterprises covered by the survey [27]. In 2000–2012, the compliance costs of environmental regulations ranged between EUR 1.18 billion or 0.45% of GDP (in 2002) and EUR 0.35 billion or 0.1% of GDP (in 2008), on average amounting to EUR 0.56 billion or 0.2% of GDP. In the US, an estimate of compliance costs of environmental regulations was made in 2008 [28]. According to data obtained from this study, the total cost of environmental regulations was the second most expensive category (just after the cost of economic regulations) of the total costs and was estimated at USD 281 billion (over EUR 222 billion), of which USD 183 billion (approximately EUR 145 billion) were costs relating to enterprises, namely USD 30,329 (over EUR 24,000) per enterprise. Chittenden, Kauser and Poutziouris [29] summarised the estimates of the compliance costs of various US regulations, which, however, were estimated differently than in most other surveys, i.e., based on business-to-business

surveys with due consideration of public expenditure on environmental programmes. According to this estimate, regulatory costs averaged USD 17,467 (over EUR 13,000) per enterprise in 1995. In other research by Pope and Owen [30], the compliance costs of environmental regulations for the average major polluter with a single emission site was estimated at 4% of the enterprise's total tax burden, while in the case of larger pollutants with 10 emission sites, the costs were estimated at 40% [30]. In a survey conducted among taxpayers in Slovenia in 2006, compliance costs were estimated at an average of EUR 1378 per enterprise. The weighted average compliance costs of the small, medium and large enterprises in the sample amounted to EUR 1031, or EUR 2.97 million in total, thus accounting for 0.1% of GDP [31].

The interesting point was also elaborated by Joshi, Krishnan and Lave [32], who used structured interviews to estimate compliance costs. Results showed that a USD 1 (about EUR 0.89) increase in the visible compliance costs of environmental regulations was associated with an increase in the total cost (at the margin) of USD 10 to 11 (EUR 8.90 to 9.79), most of which were hidden in other accounts. The compliance costs of environmental regulations for private enterprises were estimated at USD 70,000 (just above EUR 62,000) per site (source) of emissions.

Inside the EU, several estimations of environmental regulation were done using the already mentioned SCM. The measurements were part of The European Commission's Action Plan of reducing administrative burdens. The Commission identifies 13 priority areas that, according to preliminary research, cause the highest administrative burdens. These include, of course, environmental regulations. According to data obtained from various EU Member States, the administrative burden (part of compliance costs that are an unnecessary burden) of environmental regulations is estimated at EUR 1.2 billion [7]. The new Industrial Emissions Directive, which in 2010 replaced the hitherto seven directives, in fact reduces administrative burden by around EUR 30 million per year by issuing multiple consents and EUR 2 million per year by rationalising reporting [33]. As much as 30% of administrative burden is generated by additional requirements introduced by the Member States (gold plating) and not as EU regulation. Estimations of compliance costs were done also in several Member States separately, using SCM as well. If we summarise the findings, the compliance costs reached up to 0.3% of GDP only for the environmental regulations and are rising over time. According to the results, the proportion of administrative burden (unnecessary obligations) is high [6,11,34]. The first measurement results published on the SCM Network allow an approximate comparison of the scopes and approaches of various Member States. The most comprehensive survey and compliance cost assessment was carried out in the UK. Compliance costs were estimated in 2005 at GBP 122.1 million (approximately EUR 141 million) for 82 legal acts [6]. The highest costs were associated with the keeping of records (39%), followed by applications for subsidies (23%), registration (9%), and reporting (7%). In 2008, Belgium estimated environmental and energy compliance costs at EUR 412,000. Denmark started the second round of measurements in 2004, with the compliance costs of environmental regulations estimated at around EUR 150 million (up by 0.1% compared to 2001). The Netherlands estimated the level of administrative burden in 2002. The administrative burden as part of compliance costs of environmental regulations was estimated at EUR 1 billion or 0.2% of GDP. Slovenia measured compliance costs in 2009, using SCM for 15 environmental regulations. Costs were estimated at EUR 95.8 million (or 0.3% of GDP), with an administrative burden of 82.2% on average [34]. Some latest research on regulatory burdens showed still high costs of regulation. Crews [35] presented an evaluation of the costs of environmental regulations to an average of 394 billion USD for year 2020. In its report, the High Level Group on Administrative Burdens (HLG) appointed by the European Commission showed that administrative burden for environmental regulation was estimated at 1.2 billion EUR and, after adopted simplifications, reduced by 25.6% till year 2014 [12]. The further work is presented by The Regulatory Fitness and Performance Programme, which till 2017 adopted additional 11 initiatives for better regulation [36]. The Government of Canada uses a count system of the requirements in federal regulations that impose an administrative burden on business. According to the report in 2018, Environment and Climate Change Canada impose the total 2018 count of 11,390. The latest research

by Evans et al. [37] on compliance burden for VAT (Value added tax) used methodology, which used ranking on different statements by experts. Statements are connected to paperwork, procedures, tax administration support, etc.

The compliance costs of environmental regulations can also be estimated in a different manner. Le Roux et al. [38] assumed that the estimates of the costs of environmental regulations for the private sector are positively correlated to the actual costs of private-sector administration in relation to environmental regulatory obligations. They introduced a three-step methodology for estimating the compliance costs of environmental regulations. The first step is to compare environmental protection expenditure in the industry sector among the EU countries. In the second step, the environmental regulatory regime index developed by Esty and Porter [39] is used for comparison among selected countries. The third step compares the environmental quality of each country with the other countries on the basis of three criteria: SO₂, PM₁₀ and energy efficiency.

Other recent research focuses more on estimation of compliance costs connected to selected industry on farming [40,41], on transportation [42], to methodology used issues [43–46] or to single issues connected to environmental regulation (selected law in Prause and Olaniyi [18]; influence of environmental regulation in Taheri and Stevenson [47] and Lade and Rudik [48]; effect of company characteristics on the effectiveness of environmental regulation in Wang, Yin and Chen [49]; critical factors for environmental regulation change management in Ribeiro and Kruglianskas [50]; and how to secure high levels of business compliance with environmental laws in Kellett [51]).

For easier review, Table 1 provides a summary of the main methods for measuring environmental compliance costs.

Table 1. Overview of the methods for measuring environmental compliance costs.

Method	Description
Standard Cost Model (SCM) [6,7,11,33,34]	Most commonly used in the EU. A method for determining the compliance costs for businesses imposed by regulation. It allows an approximate comparison of the scopes of compliance costs.
Individual reports and evaluations for the European Commission [12]	Individual reports and evaluations of experts' groups appointed by the European Commission.
European Commission's Tax Survey [23] and subsequent research using the same methodology (e.g., in Slovenia [31])	Survey providing information on a large number of tax-compliance-related issues.
OECD methodology [21]	Businesses' views on administrative and regulatory burdens on small and medium-sized enterprises. Systematic comparison across 11 OECD countries.
Individual country questionnaires [26,27]	Individual country questionnaires that are being (jointly) developed and tested across several countries (e.g., in Germany and Belgium).
Business-to-business surveys (performed in the US, UK, Australia and New Zealand [29])	Business-to-business surveys with due consideration of public expenditure on environmental programmes.
Plant-level data from steel mills and structured interviews (in the US [32])	Use of plant-level data from 55 steel mills to estimate hidden costs, and followed up with structured interviews of corporate-level managers and plant-level accountants.
Reports of regulatory costs in the form of accounting statements (in the US [28,35])	Survey of the size, scope and cost of federal regulations in the US.
Report on compliance costs of an emissions trading scheme (in Australia [30])	Cost estimate by number of emission sites and the size of pollutants.
A count system of the requirements in federal regulation (in Australia [37])	Cost estimate on the basis of the count of federal regulations that have requirements that impose administrative burden on business.
Costs of compliance with environmental regulations borne by industry (in Scotland and the International Community [38])	A three-step methodology for estimating the costs of environmental regulations based on the level of environmental expenditures in industry, and the quality of the regulatory regime.

The presented overview of selected research shows different methodologies used to estimate environmental compliance costs. Except in some cases, such as the SCM model, for the OECD methodology or methods, jointly developed and used by several countries, a direct comparison is not possible and is hence only indicative. Especially, results based on surveys can raise some questions about possible overestimation of the compliance costs. Overestimation is argued in different research in connection with the methodology used, since surveys can induce the overestimation, for example, due to negative attitudes towards regulation or administrative work. The other point stressed in such research was that the benefits of a better environment are not included in total cost of regulation [17,43,47,52–57]. Despite different approaches and methodologies used, recommendations for regulation simplification are similar. Most comments and suggestions for simplification related to the number and size of forms and the introduction of e-commerce. In fact, entering waste collectors in the register is time-consuming, while the supporting documents and attachments that serve as the basis for issuing environmental consents are rather expensive. According to the respondents, the procedure for obtaining an environmental consent is also very demanding. The same applies to reporting. Likewise, most respondents believe that it would be reasonable to combine the forms and harmonise the activities and reporting of the enterprises that need to obtain environmental consents or pay environmental taxes.

Our study examines the relationships between the presence of (unnecessary) environmental administrative burden and five predictors seen as important in past research: economic sector, size of enterprise, financial and nonfinancial measures and environmental consents. Further, we present the theoretical model and hypotheses to be tested in empirical analysis below.

2.1. Economic Sector

As mentioned in the introduction, recent research also focuses on assessing the benefits and not just the costs of environmental regulations. The quality of regulations can be an important factor for the (un)necessary high financial burden for both the public and private sectors [38]. Compliance costs cannot be the only criterion when assessing the compliance costs of environmental regulations. The quality of the regulatory framework should also be taken into account. Thus, the UK measures benefits in addition to cost, whereas Norway, Germany, the Netherlands, Sweden and Denmark measure only costs. Porter and Van der Linde [19] suggested that an important issue in measuring net compliance costs of environmental regulations are also the benefits from the innovation induced by it [58], which, however, varies across sectors. Competitive enterprises can address environmental problems in an innovative way, which can stimulate sustainable development [59] and simultaneously reflect in lower compliance costs of environmental regulations. The formula for success must include innovative solutions that promote both environmental and industrial competitiveness in different economic sectors. According to the Office of Management and Budget [1], the benefits exceeded the costs in the case of 39 major regulations introduced by the Environmental Protection Agency between 2006 and 2016. The estimated annual compliance costs in 2015 (between USD 54 billion and 64 billion) were more than three times lower than the estimated benefits. Similar results were obtained by the Smart Prosperity Institute [2]. It compared costs and benefits of five different environmental regulations in the US and Canada and found that the benefits were much higher than the costs. At the same time, Morgenstern [3] compared ex ante and ex post evaluations of the costs and benefits of selected environmental regulations and found that, in most cases, both were overestimated.

In this paper, we predict environmental administrative burden for businesses by including, among other, three different industrial sectors (manufacturing, commercial services or public services) in the model. We have chosen to study economic sectors for several reasons. According to some studies [38,60–62], industrial sectors are subject to different (environmental) compliance costs (e.g., depending on the specific activity, for which environmental consents an enterprise applies for, etc.). Bozeman [60] demonstrated that private-sector managers show greater adherence and commitment to rules than their public-sector counterparts, indicating higher compliance costs of the first group. On the contrary, several authors

(e.g., [61,62]) found evidence of higher levels of formalisation and perceived compliance costs in the public sector compared to the private sector, though the findings were mostly connected to external constraints. Based on rather controversial findings of previous studies, we articulated the following baseline hypothesis to be verified, namely:

Hypothesis 1 (H1). *There are no differences in environmental administrative burden between economic sectors.*

2.2. Size of Enterprise

One measure of the environmental regulation compliance costs is the size of the enterprise. This is known as economies of scale by looking at businesses of different sizes [23,28]. Many authors (e.g., [9,10,21,23,63,64]) showed evidence of a clear inverse relationship between business compliance costs and business size, where results demonstrate that relative compliance costs are much larger for small businesses. For example, the OECD survey results [21] suggest a clear negative relationship between business size and relative compliance costs, whereby Ariff [63] found only a smaller difference in the relative compliance costs between small and large enterprises in selected Asian economies. Based on the findings of previous research, the following hypothesis is postulated:

Hypothesis 2 (H2). *Larger enterprises are less likely to have a burden than smaller ones.*

2.3. Financial and Nonfinancial Measures

Environmental compliance costs also depend on financial and nonfinancial measures [9,10,13–18]. Financial measures include (i) reimbursement of paid environmental tax, (ii) exemption from environmental tax for energy efficiency, (iii) exemption from excise duty for biofuels and (iv) grants for implementation of environmental legislation, while nonfinancial measures comprise (i) energy and environmental labelling of technologies, products, (ii) the energy performance certificate for buildings, (iii) fostering voluntary agreements and certification systems (EMAS, ISO 14001), (iv) information and awareness-raising programmes, (v) promotion actions, training and demonstration projects, and (vi) assistance to managers in the implementation of environmental standards and legislation. Both measures present compliance costs for businesses. Ittner and Larcker [65] recognized that businesses need to focus on both financial and nonfinancial measures in enhancing their survival prospects and competitive advantages, where nonfinancial measures must supplement financial measures [66]. Using both measures helps businesses achieve strategic goals and improve their performance, thereby incurring compliance costs. These arguments would suggest the following hypothesis:

Hypothesis 3 (H3). *Financial and nonfinancial measures contribute to higher probability of environmental administrative burden occurrence.*

2.4. Environmental Consents

Reducing administrative burden for businesses means rationalising reporting and issuing multiple environmental consents. As has already been pointed out, the new Industrial Emissions Directive [38] contributed to this reduction, but primarily due to additional country requirements, obtaining environmental consents, required to carry out business's activities, is still costly and demanding, which is reflected in additional compliance costs. For this reason, we expect a higher number of environmental consents to result in higher compliance costs. Based on this, we test the following hypothesis, namely:

Hypothesis 4 (H4). *Number of environmental consents per year increases the likelihood of environmental administrative burden occurrence.*

Hypotheses were tested using a binary outcome logistic regression model. The developed model considers compliance costs from a different perspective and can serve as a basis for improvement of environmental regulations. In addition to developing the model, we compared compliance cost estimates obtained through different methods of estimation, which indicates that the question of measuring compliance costs is rather vague.

3. Materials and Methods

3.1. Survey, Sample and Data Collection

The paper employed an explanatory and exploratory online survey questionnaire research design, based on literature review and study of several sources on the subject matter under discussion. The online survey questionnaire method was applied to assess the costs of compliance of the Slovenian private sector with environmental regulations. The survey methodology was based on the European Tax Survey [23]. A part of the research method was adapted to the specifics of the research problem and the implications thereof [67]. The study on environmental compliance costs was conducted between September 2017 and March 2018. A research framework based on literature review was established during the formative research phase. The online survey was used as the main data collection technique to investigate the research question raised in the introduction.

A random sampling approach was used to ensure a representative sample of enterprises having an equal chance of getting selected. The sample's representativeness of the total population was tested mainly in terms of the characteristics relevant for the assessment of compliance costs. The survey was sent to 720 private enterprises from various areas that reflected the actual ratio regarding sector and size. This represents 21.2% of the population (out of 3390 businesses) registered for different obligations connected to environmental regulation. The number of potential enterprises included in the sample was specified in advance and obtained from the records of the Financial Administration of the Republic of Slovenia.

The pilot survey questionnaire was tested by field experts from academia and business representatives prior to the actual start of the sampling process. The final set of questions was revised and improved according to their recommendations and comments, which helped resolve conceptual uncertainties and weaknesses. The required sample size was determined based on the opinion of academia and field experts and the actual population size. Data were collected through 1KA (one click survey), an open source application for online surveys. A personal address was included in the invitation to ensure greater responsiveness. The questionnaire included close-ended questions with numerical estimates and open-ended questions. The data collected allowed to carry out a quantitative analysis.

The questionnaire was sent to accountants in enterprises (or to the owners in the case of micro companies). The purpose and objectives of the research were clarified to all participants at the beginning of the questionnaire or during a particular question in order to explain potential uncertainties. Two reminders were sent to the selected participating enterprises. Eventually, 289 valid observations were obtained. The number of observations for which the analysis was conducted was reduced to 241, because 16.6% of the sample had to be excluded due to incomplete information regarding the enterprise's behaviour associated with environmental regulations and the benefits of environmental stimulus measures. Observations with missing values were listwise deleted after checking that the deleted observations did not differ significantly from those in the analysed sample. The final analysed sample of 241 units represents 7.1% of the population. Although at first glance a small sample seemed too small for the reader to be representative, other studies [64,68] confirmed that small-scale research on compliance costs can be practically as reliable as large-scale research. In our sample, small enterprises (with less than 50 employees) represent 78% of all enterprises, medium-sized enterprises (with 50 to 249 employees) 17%, and large enterprises (with over 250 employees) 5%. Enterprises in the

commercial services sector are in the majority (65%), followed by enterprises in manufacturing (21%) and enterprises in public services (14%).

3.2. Method

To conduct the statistical analysis, namely logistic regression, the Stata/MP 15.1 software package was used. Generally, logistic regression is well suited for predicting the relationships between a categorical dependent variable and one or more categorical or continuous predictor variables [69]. Therefore, in order to identify the factors that affect the presence of environmental administrative burden for enterprises, the binary outcome logistic regression model was used in which the dependent variable represents the share of environmental regulation compliance costs in total enterprise revenue. The binary variable equals 1 if such share is at least 0.03%, and 0 otherwise. To define the threshold at 0.03%, we considered the average share of compliance costs related to environmental regulations in total enterprise revenue. As was pointed out in the introduction, administrative burden used here refers to unnecessary obligation determined by the law that could be easily overcome by better quality of regulation.

In our analysis, y is the observed variable, i.e., environmental administrative burden, which equals 1 or 0 depending on whether or not the latent variable y^* crosses the threshold 0:

$$y = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{if } y^* \leq 0 \end{cases}$$

with

$$y^* = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_5 x_5,$$

where x_1, \dots, x_5 are predictor variables: industrial sector, size of enterprise, number of environmental consents per year, environmental stimulus financial measures and environmental stimulus nonfinancial measures, respectively.

4. Results

The estimation results for the environmental administrative burden model, together with marginal effects, are presented in Table 2. Pseudo R^2 of 0.257 indicates a good model, as, according to McFadden [70], the values ranging from 0.2 to 0.4 represent an excellent fit. The p -value of the χ^2 statistics (84.84) is less than the generally used criterion of 0.05, so we are able to reject the null hypothesis indicating that the coefficients are not simultaneously equal to zero.

Based on the sample and with respect to enterprise characteristics, we cannot claim that the economic sector to which the enterprise belongs is a statistically significant factor of environmental administrative burden. However, we can conclude that small, medium-sized and large enterprises are subject to environmental administrative burden differently. Medium-sized enterprises are statistically significantly less likely to experience the environmental administrative burden than small enterprises (−1.1434). The marginal effect is −0.2779, which means that, for medium-sized enterprises, the probability of experiencing environmental administrative burden decreases by 27.79 percentage points.

As regards the importance of environmental regulations, the probability of experiencing environmental administrative burden increases with the number of obtained environmental consents of an enterprise. Namely, the regression coefficient is 1.367, which means that the higher the number of obtained environmental consents, the higher the probability that the enterprise will experience environmental administrative burden. The value of the relevant marginal effect is 0.3241, which means that, for each obtained environmental consent at the average value of all other variables, the probability of experiencing environmental administrative burden increases on average by 32.41 percentage points. Moreover, our results show some differences between enterprises that benefited from financial environmental measures and those that benefited from nonfinancial ones. While the

effect of nonfinancial environmental measures on environmental administrative burden is not present, those enterprises which benefited from financial environmental measures are statistically significantly more likely to experience environmental administrative burden. The regression coefficient is 0.7378, while the marginal effect is 0.1637, which means that when the enterprise benefits from financial environmental measures, the probability of administrative burden increases by 16.37 percentage points. This is in line with the regulatory burden of obtaining financial benefits, which require reporting and constant providing of documentation to appropriate institutions, while nonfinancial benefits are gained usually in one process with control over a determined period of time (i.e., obtaining a certificate).

Table 2. Estimation results for the environmental administrative burden model, coefficients and marginal effects: Binary logistic regression.

<i>Dependent Variable</i>	<i>Burden</i>			
<i>Explanatory variable</i>	b_i	dF/dx	Z	$p(z)$
<i>Constant</i>	−1.0809			
<i>Industrial sector</i>				
Sector: commercial services	−0.2918	−0.0684	−0.68	0.494
Sector: public services	0.0531	0.1187	0.09	0.926
<i>Size of enterprise</i>				
medium-sized	−1.1434	−0.2779	−2.45	0.014 **
large	0.2907	0.0622	0.36	0.718
<i>Environmental consents</i>	1.3677	0.324	6.96	0.000 ***
<i>Financial measures</i>				
implemented	0.7378	0.1637	1.73	0.084 *
<i>Nonfinancial measures</i>				
implemented	−0.1452	−0.0346	−0.38	0.704
				0.494
N	241			
logL	−122.88			
Pseudo R2	0.257			
LR $\chi^2(7)$	84.84	$p(\chi^2)$	0.000	

Note: Significance levels: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.001$.

5. Discussion with Conclusions

In this article, we built a model of environmental administrative burden and identified its determinants. The scientific contribution and the novelty of our research is in the use of a different method of analysis, which, as far as we know, has not been used in connection with the study of administrative burden. For this purpose, the data were also processed in a different way. In the proposed method, we took into account that part of the administrative burden is also useful, as we did not take into account the total administrative burden, but we determined the threshold.

As suggested by literature, the size of the enterprise contributes to different probability of experiencing administrative burden. Medium-sized enterprises are less likely to experience the environmental administrative burden than small enterprises. It highlights the well-known economies of scale of environmental tax compliance activities [9,10,63,64]. This is in line with several studies showing the regressive burden of regulation (i.e., European Commission [23], Tran-Nam et al. [9]. Contrary to these [34,63] and similar to the OECD study for some countries [21], we still did not confirm a statistically significant difference between large and small enterprises. The number of environmental consents per year is another important factor of environmental compliance costs. Enterprises that obtain more environmental consents are more likely to experience environmental administrative burden. This effect would not be necessarily so strong if the state harmonised and simplified the procedures for obtaining and reporting on environmental consents for related work activities. Measures to promote environmental protection have different effects on the presence of

administrative burden. We found out that financial measures for environmental protection increase the chance of environmental administrative burden, while the impact of nonfinancial environmental measures was not detected. This is surprising, as we would expect a significant impact of nonfinancial measures on compliance costs as well. Still, it is necessary to point out that financial measures usually determine more reporting and control than nonfinancial measures, which means more paperwork. This may to some extent explain the statistical significance of the former and the insignificance of the latter. Nevertheless, there is a place for simplification in procedures of reporting for both types of measures (i.e., less frequent reporting, less documentation needed, connection with reporting for other purposes). In this regard, in order to minimise compliance costs as much as possible, especially for small enterprises, we suggest that decision-makers devise targeted policies that can help reduce unnecessary costs. Hence, it follows that hypotheses 1 and 4, testing the following determinants of enterprises, economic sector (H1), and number of environmental consents per year (H4), raised in the introduction, can be fully confirmed. The hypothesis about the size of the enterprise (H2) can be partly confirmed, as no statistically significant impact was found for large enterprises. The same applies to hypothesis 3, testing financial and nonfinancial measures (H3), as the effect of nonfinancial measures on environmental administrative burden was not detected.

In order to reduce the compliance costs of environmental regulations for enterprises and administrative work of public authorities, we recommend a simplification of the procedures for acquiring environmental consents. This can be achieved either by combining various procedures to obtain environmental consents, or by simplifying the process of obtaining such and the reporting in general. While reporting is supported by information technology and represents a simplification compared to previous years, registration and acquisition of environmental consents are still major problems. In its complexity, the legislation concerns the widest range of taxpayers and poses the biggest challenge to micro and small enterprises with a small number of employees, as well as to self-employed taxpayers. Environmental regulations in fact require the same procedures and the same documentation for all. There is no need to explain that the burden of the self-employed is relatively many times higher than that of an enterprise with widespread activity. Particularly problematic are the requirements for obtaining certain environmental consents that require analyses to be done by specialist or licenced laboratories, the costs of which exceed the total of several taxpayers' monthly incomes. Despite some proposals presented over the past years, not much has changed in this area. Codification and introduction of new environmental legislation have not even been considered, and it is still not possible to combine the acquisition of certain related environmental consents (e.g., processing, transport and storage of the same waste) if all such activities are carried out by the same company. As regards environmental taxes, simplification would be possible by reducing the frequency of preparing tax returns and paying of taxes when the amount is below a certain value. In the current system, there are still environmental taxes for which a tax return needs to be submitted on a monthly basis, whether or not the obligation has occurred. At least in these cases, simplification would mean that reporting is only necessary when an obligation actually occurs. Namely, the frequency of reporting for other taxes covers a longer period of time, which means that quarterly reporting, semi-annual and even annual reporting is needed. Moreover, the enterprises often have to wait a long time to be entered in the register of waste collectors at the ministry, or when obtaining formal responses upon request. In Slovenia, there is thus room for enforcement of environmental legislation, which would bring lower costs on both sides, without reducing the public benefit. It is therefore important to improve environmental legislation and strengthen the quality and the reaction time of the competent public organisations. In order for the companies to reduce environmental compliance costs and thus total costs, it is advisable to carry out their tax-compliance-related tasks by themselves in order to avoid additional external costs.

When analysing compliance costs, it should be noted that some enterprises exploit the state system to make profit or obtain benefits. Baumol [71] defines them as unproductive enterprises, whereby the allocation of resources to unproductive use varies across societies and can take many forms. Unproductive entrepreneurship is aimed at obtaining transfers, typically via rent-seeking, violence,

taking advantage of official permits or licences that are then promoted against competition or when enterprise influences policy in a certain area and then profits from this regulatory arrangement [72]. In the field of environmental permits, unproductive enterprises can be a problem, which, due to sufficient turnover or capital and pressure on the authorities, managed to obtain certain permits and thus competitive advantages in performing certain transactions. Although the phenomenon of unproductive entrepreneurship abroad is common [73–75], a small market such as Slovenia does not allow one to make a living from it alone. However, this can be even more problematic in practice. Due to time-consuming and expensive procedures for obtaining environmental permits, certain operations can only be carried out by larger enterprises. Obtaining environmental permits can thus be an investment or an obstacle to obtaining a deal.

Our findings may help achieve higher efficiency and more equitable outcomes. Yet, the research may have some methodological deficiencies, such as: (i) the respondents may deliberately give excessive estimates of the time and money spent on a particular procedure; (ii) the respondents' assessments may be underestimated if they are unfamiliar with the procedures and content; (iii) business respondents are generally inclined to criticise and complain, particularly when business performance is poor; and (iv) biases may occur since companies may perform administrative procedures for their own reasons, not for the purpose of complying with regulations.

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