

INNOVATION FOR ENVIRONMENTALLY SUSTAINABLE BUSINESS

INOVACIJE U FUNKCIJI ODRŽIVOG POSLOVANJA

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Abstract: *During the last decades there has been a growing awareness of widespread environmental degradation facing present and future generations. Companies are increasingly recognizing the importance of the innovation and introduction of ISO 14001 standards in order to achieve the goal of environmentally sustainable business. Technology and innovation will have to play an important role in the process of changing current industrial society. This study investigates the relationship between “going green” and innovation in more details while involving the paradigm of corporate social responsibility and environmental management. The study relies on the data from the World Economic Forum Surveys for Competitive Index development and ISO 14001 certifications across Europe from the European Environment Agency (EEA). Using panel data regression models the results indicate there is a strong influence of innovation on “going green” and the vice versa. The effect of other determinants including foreign competition, corporate ethics, strength of corporate boards, are also of interest.*

Key words: *Innovation, sustainable business, going green, environmental management, corporate boards*

Sadržaj: *Tokom poslednjih decenija došlo je do porasta svesti o sve većoj degradaciji životne sredine i ugrožavanju potreba budućih generacija. Kompanije prepoznaju značaj inovacija i uvođenje ISO 14001 standarda kao način postizanja ekološki održivog poslovanja. Tehnologija i inovacije će morati da igraju važnu ulogu u procesu menjanja trenutnog industrijskog društva. U radu ispituje se odnos između “ozelenjavanja biznisa” i inovacija, uključujući korporativnu društvenu odgovornost i zaštitu životne sredine. Studija se oslanja na podatke iz istraživanja Svetskog ekonomskog foruma za konkurentske indekse razvoja i ISO 14001 sertifikacije u Evropi, od Evropske agencije za životnu sredinu (EEA). Koristeći regresioni model panel podataka dobili smo rezultate koji ukazuju na postojanje jakog uticaja inovacija na “ozelenjavanje” i obrnuto. Signifikantni faktori su još i strana konkurencija, korporativna etika, snaga korporativnih odbora i drugi.*

Ključne reči: *inovacije, održivo poslovanje, ozelenjavanje biznisa, zaštita životne sredine, korporativni odbori*

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1. INTRODUCTION

An increase in the corporate environmental responsibility from firms has seen a surge of popularity over the last 30 years. The general concept of a firm is to serve the needs of the stakeholders such as owners, suppliers, customers, retailers, government, etc. Organizations have worked in the interest of their shareholders, which generally revolve around higher profits. However, as organizations and business have evolved they have realized that working with other stakeholders is as important as satisfying the needs of their shareholders. Walley and Taylor described “Going Green” or “Greening” as “moving towards environmental or ecological sustainability” [1]. Going Green refers to the organizations using new processes or technology in an attempt to conserve the environment. It is expected that spending on green projects within the U.S will increase to \$44 billion by 2017. [2]

Corporate Social Responsibility is also gaining importance since more investment, production, and operational processes are resulting in negative effects on the social, economic and natural environment. This concept has been promoted through literature, evidenced through empirical evidence and promoted through political and economic debates. It has been redesigned to the extent of the investment decision making and shifted in some of the corporation’s strategic growth towards going eco-friendly.

The data from International Standards Organization reveals that over the last couple of years, more organizations from the EU are registering their systems as being eco-friendly. The EU regulations are further strengthening the efforts of the organizations through national legislations to promote eco-friendly environment within the business organizations and to promote environment friendly business processes with decreased emissions and consumption as the outcome. This further has affected the business decision making to shift towards technological development with the sole objective of “greening” process of the business organizations.

Going green decision making is currently a thematic business approach within the EU states and the business organizations operating within these states. The decision making towards going green in the EU states



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and the companies in these states are not dictated by the company's origin of State, which is usually a key determinant of the extent of decision making in business world since and is affected by the country of origin and the leadership styles. The common approaches towards leadership style that dictates the decision making framework are well known as American or Japanese style. The companies which have origin or headquarters in these and other countries are definitely behaving differently towards promoting eco-friendly systems within the business organizations through developing processes that results least emission of the greenhouse gases on global level.

The world economies are not enforced to promote firms that have started transformation of the general business towards the green processes. On the other hand, consumers are increasingly choosing the products of the companies recognized for their social responsibility through the environmental friendly processes in production and service outcomes. Several factors have been identified as to why organizations take up environmental friendly initiatives:

- Reduction in costs and an increase in efficiency which can be summarized as eco-efficiency and eco-effectiveness resulting in the efficient usage of resources and a reduction in waste generation [3], [4]
- Avoiding regulatory action [5]
- Use it as a competitive advantage [6]
- To enhance the image of the organization as a socially responsible firm in the market. [5]
- To comply with pressures which are imposed by stakeholders who do not want any type of environmental liabilities. [5]
- Due to pressure from community groups, other organizations in the industry, and environmental organizations. [7]
- To motivate employees into performing better due to the improved culture and pride which they might feel due to working within a socially responsible organization. [3]



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- Tax incentives given by the federal government in the United States. Along with the federal tax incentives, states have also decided to give tax incentives on their terms in order to promote environment sustainability. [8]

Corporate social responsibility and decisions to invest in green process are little studied in the literature where the country of origin has been different from the operational. This does not imply that the countries are not promoting it in the same way, but the extent of adoption is variable across the world economies and even within the EU states.

This reveals that the studies should now consider the variations in adoption of green technologies in a comparative type of studies where the corporations are selected from various countries and within these countries, from within cities/regions so the framework can be assessed to have a reasonable and significant revelations through country level of data. The current study will evaluate how the country level data can help produce even a significant research debate because of the origin of corporations had a variable extent of decision making system. These decisions make further affects on the extent of going green within a single country and that the regional variation within the country selected might produce variable outcome in the green technology adoption. Thus, the evidence from country level data induces that firm's specific parameters nested within countries will shed more insights on the going green decisions of the firms and it will further help to realize the fluctuation across countries.

The going green or developing the business model to rely more on environment friendly business process is highly correlated with the variation in legal systems within countries. This implies that if data is collected on the regional level data nested within countries, level statistics will produce more robust outcomes for the comparative frameworks on the EU levels. This study will explore the key issues in more details and will provide insights on how eco-friendly firms are growing with variable rate across the EU member states in the last three to four years. The study will further pose important questions to highlight how panel data will be of importance to answer such questions and lead to the conclusion if mixed and multilevel data is used so even more significant outcome can be generated.

2. HYPOTHESES AND METHODS

To test whether there is any effect on the going green by the companies with the origin of the companies itself, and if the location of headquarters has an effect on such decisions, the study will mainly evaluate if the location of headquarters away from home has any



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effect on the decision to invest in green projects, eco-friendly projects or indirectly we can evaluate if there is any country-level effect of companies on going green each year. This can be simply implied from the regression analysis of using panel data that is collected from Eurostat, OECD and Business Surveys of the EU States. [9], [10], [11]

The study will further evaluate the effect of increasing tendency towards going green on the innovativeness index of the countries as reported in the data, from where the data has been collected, as in the various databases selected.

2.1. POOLED REGRESSION MODEL

To estimate the regression model between going green and its determinants, we use the following model as a pooled regression. Pooled regression is only a rough idea development between the dependent and independent variables and in cases where data is of panel type, this kind of regression model seldom turns out to be usable for predictive analytics.

$$y_i = \alpha + \beta X_i + \gamma Z_{it} + \varepsilon_i \quad (1)$$

Where the Y is the dependent variable, X is the determinant and Z is the control variable. We will run the model twice, once for the estimation of effect of innovation and strength of corporate boards while controlling for foreign competition and corporate ethics. The second model will have innovation as dependent variable while using corporate strength and going green as independent variables and controlling for the foreign competition and corporate ethics.

2.2 PANEL DATA MODELS

Wooldridge provides a simple and elaborative introduction to the fixed effects and random effects regression using panel data and an extensive overview of using fixed versus random effects model. [12]

Let us estimate a regression model of the following type using the panel data,

$$y_{it} = \alpha + x_{it}\beta + v_i + \varepsilon_i \quad (2)$$

It is to note here that $v_i + \varepsilon_i$ is the residual of the model (2). v_i is the unit-specific (individual specific residual and it varies across units and a single unit it remain invariant over the time. On the other hand ε_i is the usual regression error term which is assumed to have mean 0 and follows the assumptions of standard regression theory, i.e. it is uncorrelated to itself, homoscedastic and uncorrelated with v_i and not correlated to the list of x .

Before going to describe the fixed effect regression results in the given results, we need to describe a little algebra to understanding the working of the type of regression. Note that if (2) is a true case then the following is also true.

$$\bar{y}_i = \alpha + \bar{x}_i\beta + v_i + \bar{\varepsilon}_i \quad (3)$$

Note that $\bar{y}_{it} = \sum y_{it} / T_i$, $\bar{x}_{it} = \sum x_{it} / T_i$ and $\bar{\varepsilon}_{it} = \sum \varepsilon_{it} / T_i$

Now subtract (3) from (2) and we obtain:

$$[(y_{it} - y)_i] = (x_{it} - \bar{x}_i) \cdot \beta + (\varepsilon_{it} - \bar{\varepsilon}_i) \quad (4)$$

Equation (2), (3) and (4) provides the basic frameworks for the estimation of the β . Fixed effect regression provides the basis for within estimation using the equation (4). Few assumptions are required to estimate the fixed effect regression with justifications that ε_{it} are not assumed to have a distribution but treated as fixed and estimable pointing to the difficulty of out of sample prediction. Despite all its limitations, fixed effects estimator has much to be recommended for estimating panel data models. An alternative to this fixed effect is the between estimation that is conducted using the equation 2 though OLS. Estimates of the BE models are not important to discuss here; rather we only describe the random effect so we know the basic differences in FE and RE models.

Random effect regression models are estimated using the panel data using the matrix of weighted average of estimates produced by the FE and BE. It is equivalent to

$$(y_{it} - \theta \bar{y}_i) = (1 - \theta) \cdot \alpha + [(x_{it} - \theta \bar{x}_i)] \cdot \beta + [(1 - \theta) \nu_i] + (\varepsilon_{it} - \theta \bar{\varepsilon}_i) \quad (5)$$

Here θ is a function σ_v^2 and σ_ε^2 . If $\sigma_v^2 = 0$ meaning that ν_i is always 0, $\theta = 0$ and (2) can directly be estimated using the OLS. Alternatively $\sigma_\varepsilon^2 = 0$ meaning that ε_{it} is 0, $\theta = 1$ and the within estimator returns all the information available and in fact be a regression with R^2 of 1. It is to be note in short that the between estimator has no significant role but to help in estimating the RE as the RE needs the matrix of the weights which is available through the BE.

Now we can determine the goodness of fit of the estimate regressions. R^2 is one of the traditional method to assess the goodness of fit of regression models. In case of our fixed and random effect estimations, we can determine the value of R^2 using the following algebraic notation (6), (7) and (8) which is available from the estimated equation in (1), (2) and (3).

$$\hat{y}_{it} = \hat{\alpha} + x_{it} \hat{\beta} \quad (6)$$

$$\tilde{\tilde{y}}_{it} = \hat{\alpha} + \bar{x}_{it} \hat{\beta} \quad (7)$$

$$\tilde{\tilde{y}}_{it} = (\hat{y}_{it} - \tilde{\tilde{y}}_{it}) = (x_{it} - \bar{x}_i) \hat{\beta} \quad (8)$$

The models will be evaluated for the assumptions which affect the estimates. These include Hausman test to verify if the random effect or fixed effect model is reliable and consistent, estimating the models for presence or absence of heteroscedasticity and autocorrelation, where the latter is improbable due to the small time periods selected for the data and due to non-availability of the data for more years. Once the models are verified, the Feasible Generalized Models for Panel Data will be estimated. The paper presents only important results while full Stata code and output can be requested from the authors.

2.3. DATA COLLECTION

To investigate the relationship between going green, innovation and performance and check the variation of these relationships across countries, the required data was collected from various sources including firm level surveys across EU member states conducted by the World Economic Forum following the thematic research on Global Competitiveness Index. This data contains key variables as innovation, foreign competition, strength of corporate boards and corporate ethics. To include the tendency of firms towards going green, we collected annual number of firms registering for ISO 14001 Environmental Management Framework which is one the highest considered theme of standards. This number provides a key insight on the tendency towards going green and comparable across country over the selected years. The key point of using this number of registered firms with ISO certification is hence one of the better alternative indicators for measuring going green to use in this research. The details of the variables used in this research are outlined. We will use the renames for the survey questions as outlined in the following paper.

The empirical analysis of any study requires selection of a suitable datasets to explore the key relationships between the identified variables and the connections and associations between the variables. The current study will employ a cross country data to explore how the changing number of corporations as registered with ISO 14000-14001 which registered the standardized procedures as outlined within the business models of the companies. Using an example dataset from EU states, it is identified that tendency for registration for environmental standards is increasing and hence that becomes a key insight for use in this study. The data has been collected for the 28 member states of EU which include Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom.

Name of Variable used	Variable Definition***
Firms ethics	Ethical behavior of firms, 1-7 (best)
Corporate boards	Efficacy of corporate boards, 1-7 (best)
Invest or protection	Strength of investor protection, 0–10 (best)*
Corporate ethics	1. Corporate ethics
Foreign competition	2. Foreign competition
Innovation	Innovation and sophistication factors
Going green	No of registered firms with ISO 14001

Table 1: Definition of Key variables

*** From World Economic Forum, Global Competitiveness Index

<http://www.weforum.org/reports/global-competitiveness-report-2014-2015>

4. RESULTS AND DISCUSSION

In this study we have attested the relationship between “going green”, measured through the number of registration for Environmental Management with ISO Quality Framework 14001 each year by firms, and innovation as an index calculated by the World Economic Forum through the Global Competitiveness Index. Datasets are available from the websites of the providers. The panel data regression was employed to estimate the relationship between going green and innovation while controlling for the corporate ethics, strength of the corporate boards, foreign competition and investor protection indices. The results indicate that there is strong relationship between going green and innovation which is important because

innovation leads to more environment friendly business processes and hence businesses should employ specific strategies to innovative development to add towards their social responsibility.

Furthermore, it is observed that corporate ethics has been found to significantly influence the innovation and the decision to go green. It has strong implications for the cross country comparison because where the ethical corporate behaviour are found stronger, the tendency towards environmental management and registration for environmental management standards are on the rise. It further motivates the significance of this study that corporate governance paradigm can play a vital role in dictating the business strategy for growth of the businesses in future which are based on the evidence that ethical practices leads to sound social responsible behaviour by the business organizations.

Moreover, the investment protection is found to have a weak relationship with going green policy of the firms. This is due to mainly because businesses realize that the returns from environment friendly ventures could be not that much produce returns on investment as an indicator for the performance. On the other hand the effect of investment protection is not significant an indicator of the innovation.

Finally, the effect of strength of the corporate boards affect going green and innovation and this implies interesting policy and strategic value for the business models. Wherever, the organizations are led by the strong board, the decisions to switch to environment friendly business frameworks are very likely. These further highlights the key role of corporate structure and membership of the board of governors with ethical standards leads to more “greener” investment frameworks, more innovations and hence more safer future.

The current study utilizes a classical panel data model to estimate the relationship between going green and innovation and other important determinants of the two factors. The future research may benefit from a more robust approach through cross country framework like this and include firm level data nested into the analysis through multilevel and mixed approaches to produce in-depth insights and clear path for regulatory framework. The emphasis on this specific methodological approach will allow cross country comparison and across regional observation within a country , for more effective policy frameworks and hence better resources allocations for the business development and growth in the future.

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