In Pursuit of Eco-innovation

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Drivers and Consequences of Eco-innovation at Firm Level

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Abbreviations

CfSD	Centre for Sustainable Design
CIS	Community Innovation Survey
CMV	Common Method Variance
EIO	Eco-Innovation Observatory
EMAS	ECO - Management and Audit Scheme
EMS	Environmental Management Systems
ENGO	Environmental Non-Governmental Organization
EQS	Structural Equation Modeling Software
EU	European Union
IMPRESS	Impact of Clean Production on Employment in Europe
ISO	International Organization for Standardization
MEI	Measuring Eco-Innovation research project
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
QMS	Quality Management Systems
R&D	Research and Development
ROA	Return on assets
ROE	Return on equity
ROS	Return on sales
SEM	Structural Equation Modeling

SME	Small and Medium-sized Enterprises
SPSS	Statistical Package for the Social Sciences
TQEM	Total Quality Environmental Management
VDI	German Association of Engineers (Verein Deutscher Ingenieure)
ZEW	The Centre for European Economic Research in Mannheim (Zentrum für Europäische Wirtschaftsforschung)

Introduction

There is no business to be done on a dead planet.
David Brower, Executive Director, Sierra Club

In recent years, eco-innovations have gained importance and generated vast interest in both the academic and business worlds. Due to the salient issues, among which are primarily scarce resources and increasing population, the conservation of environmental quality has become essential (Govindan et al. 2014). Moreover, resource management, pollution control and climate change phenomena are all issues that, by their nature, reach beyond geographic borders (i.e., economic trends that occur in one country and/or internationalization of production and international trade all affect also other national economies) and thus make the challenges of sustainability a priority shared by countries and communities worldwide (Strange and Bayley 2014). The equilibrium in the environment has been distorted; therefore, the key challenge that must be undertaken is to reestablish that equilibrium.

The interest in eco-innovation in research and practice has increased, particularly because of companies' adverse impacts on the environment, which have resulted in serious global environmental problems and rising global concern for the environment on the other hand. Related to those, the data (OECD 2009) demonstrate that manufacturing companies account for a significant part of the world's consumption of resources and generation of waste and were estimated to account for nearly a third of global energy usage. Therefore, the manufacturing industries carry the potential to become a driving force for the creation of sustainable society, through the development and implementation of products, services and other integrated sustainable practices in order to improve the environmental performance (OECD 2009). On the other hand, as aforementioned, the practice of green activities and conservation of the environment has become mandatory due to the scarce resources and increasing population (Govindan et al. 2014).

The subject of our study is eco-innovation, which is a subset of all innovations in an economy (Wagner 2008). According to the Measuring eco-innovation project (MEI project),[1] eco-innovation is defined as: "production, application or exploitation of a good, service, production process, organizational structure, or management or business method that is novel to the firm or user and which results, throughout its lifecycle, in a reduction of environmental risk, pollution and the negative impacts of resources use (including energy use) compared to relevant alternatives" (Kemp and Pearson 2007, 7). Likewise, Eco-Innovation Observatory (2013) defined eco-innovation as any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole lifecycle, which reflects its environmental component. Eco-innovation therefore is identified by the feature of providing solutions that are more environmentally benign than relevant alternatives, even if the environmental component is not planned. It is increasingly apparent and widely accepted that eco-innovations are environmentally benign; additionally, some types of eco-innovations may be beneficial for the environment and the end-user (e.g., providing energy and material savings). Moreover, eco-innovations are considered a path to new business opportunities, encompassing growth and competitive advantage (Aschhoff and Sofka 2009; Laperche and Uzunidis 2012). In eco-innovation hence lies the potential to create and provide a win-win situation, pertaining to both the environment and the company (Horbach 2008).

Therefore, companies should know more about the possible benefits to be obtained from eco-innovation's implementation and should be encouraged to implement eco-innovation to a larger extent, which we believe is a critical point to gain a competitive advantage, expand on foreign markets and improve firm performance in the long run. The way to reach

1 MEI is a project for DG Research of the European Commission (Call FP6-2005-SSP-5A, Area B, 1.6, Task 1). The project has been carried out in collaboration with Eurostat, the European Environment Agency (EEA) and the Joint Research Center (JRC) of the European Commission. MEI offers a conceptual clarification of eco-innovation (developing a typology) and discusses possible indicators, leading to proposals for eco-innovation measurement (Kemp and Pearson 2007).

for sustainability is through implementation of eco-innovation, which by bringing benefits to the environment and companies presents a win-win situation. Therefore, we will strive to fill the gap by empirically testing an integrative model of eco-innovation. Finally, our aim is also to propose a definition of eco-innovation, with more focus on entrepreneurial orientation and its influence on company competitiveness.

In this study we thus aim to analyze the relationships between the drivers of eco-innovation, implementation of different types of eco-innovation (product, process and organizational eco-innovation and, lastly, eco-innovation construct) and its outcomes at firm-level, based on a sample of Slovenian companies. We have first conducted the qualitative analysis to determine whether the identified drivers are appropriate for the Slovenian environment/companies. Drivers for implementation of eco-innovation were tested in this way by employing a qualitative study in the first stage (interviews with companies' environmental managers about the drivers and outcomes of eco-innovation). While the qualitative research was followed by a quantitative study in which we empirically tested the integrative model based on Slovenian companies.

The structure of the study is presented below in Figure 1, and it is as follows: 1) Introduction, 2) Eco-innovation (definition and its main dimensions), 3) Drivers of eco-innovation, 4) Consequences of eco-innovation, 5) Research design, 6) Methodology, 7) and 8) Results, 9) Summary of findings and discussion, and 10) Conclusion.

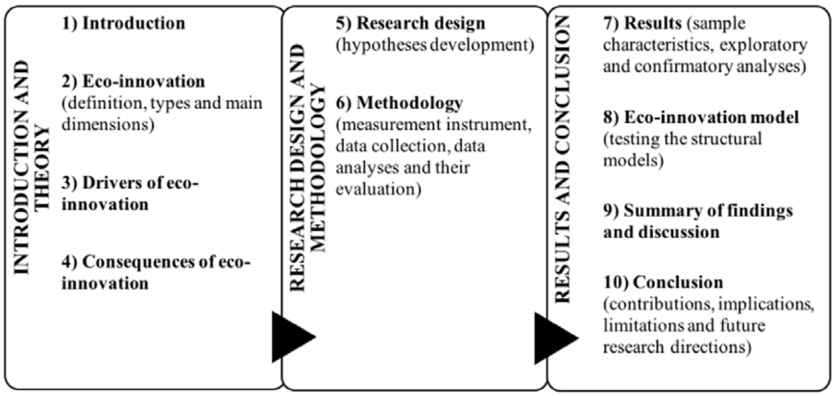

Figure 1: Structure of the study

Eco-innovation

In this section, we will focus on several issues pertaining to eco-innovation. The first subsection will focus on the main peculiarities of eco-innovation, which differentiate it from regular innovation (2.1). Next, we will define eco-innovation (2.2) and present its distinct features (2.3), main dimensions (2.4), types (2.5) and measurement (2.6). Finally, we will conclude this section with our own proposed eco-innovation definition (2.7).

Why to distinguish eco-innovation from regular innovation

Environmental innovations can be defined as a subset of all innovations in an economy (Wagner 2008). As such, they present an answer to the problems which already have or in the future will have a global dimension (Jänicke 2008). Based on global concerns and discourses regarding global warming, eco-innovations have a global market potential, while political support is required to trigger them, especially when pertaining to renewable energy technologies (Karakaya et al. 2014).

Therefore, researchers (van den Bergh et al. 2011) argue that the main difference between "regular" innovation and eco-innovation pertains to the combination of an urgent environmental problem, which requires a solution associated with external costs (these costs do not enter the private costs of the polluter). This results in the need for adoption and investments in new technologies, which create less pollution and thus are less harmful for the environment (resulting in beneficial environmental characteristics), while there are no incentives for the polluter or other companies to induce adoption and implementation of such technologies (van den Bergh et al. 2011). This would lead to reduced social costs, while the private costs would increase (van den Bergh et al. 2011). Van den Bergh et al. (2011) argue that the cost structure becomes more incentive compatible and tends to improve the likelihood of eco-innovations when external (social) costs are translated into private ones through a public policy (regulation of the environmental externality). Hence, eco-innovations are increasingly at the center of the policy action, and therefore a crucial question pertaining to eco-innovations regards whether or not they actually require a specific theory and policy (Rennings 2000; De Marchi 2012). Other important characteristics that differentiate eco-innovation from regular innovation are that eco-innovation is not an open-ended concept and that eco-innovation explicitly pinpoints reduction of environmental impacts, whether these are intentional or not (Kemp and Foxon 2007; Arundel and Kemp 2009; OECD 2009; Machiba 2010; Fawzi and Rundquist 2011; Rave et al. 2011; Fleiter et al. 2012; Horbach, Rammer and Rennings 2012; Antonioli, Mancinelli, and Mazzanti 2013; Cainelli and Mazzanti 2013).

The existing literature (especially neoclassical contributions) focuses on and emphasizes two main aspects that differentiate eco-innovations from other innovations (De Marchi 2012). These two aspects concern their externalities and drivers (see Table 1), which has already pointed out Rennings (2000), who named them the "double externality problem" and "the regulatory push/pull effect". The double externality problem is one of the most important and well-known peculiarities of environmental innovations and regards production of the common spillovers of innovations in general and at the same time creation of less environmental external costs (Rennings 2000; Ziegler and Rennings 2004; Rennings et al. 2006). This means that the whole society exploits the benefits from an environmental innovation, while a single company carries all the costs by itself (Ziegler and Rennings 2004; Beise and Rennings 2005). Moreover, even if a company successfully markets an environmental innovation, the company's appropriation of the profits for this innovation is difficult, especially if the access to the corresponding knowledge about this environmental innovation is easily accessible to possible imitators and when environmental benefits result to have a good public character (Ziegler and Rennings 2004; Beise and Rennings 2005). Researchers (Rennings 2000; Ziegler and Rennings 2004) emphasize that the double externality problem leads to an increase of the importance of regulatory framework (because both externalities result in a suboptimal investment in environmental innovations).

Table 1: Main peculiarities of environmental innovations as compared to other types of innovations (identified by neoclassical contributions in the environmental innovation economics literature)

	Environmental innovations	Other innovations
Externalities	Knowledge externalities and *environmental externalities*	Knowledge externalities
Drivers	Demand-pull, technology push and *regulatory push/pull factors*	Demand-pull and technology push factors

Source: De Marchi 2012.

We follow Rennings (2000), who argues that three peculiarities of eco-innovation actually exist, which he further identifies as follows: 1) the double externality problem, 2) the regulatory push/pull effect, and 3) the increasing importance of institutional and social innovation.

In more detail, we describe the aforementioned peculiarities of eco-innovation identified by Rennings (2000). Focusing first on institutional and social innovation, we mention an important peculiarity regarding the nature and development of eco-innovation. Eco-innovations can be developed by companies or non-profit organizations and traded or not on markets, while their nature can be technological, organizational (pertaining to management instruments at the firm level, like eco-audits), social (regarding changes of lifestyles and consumer behavior; Scherhorn et al. 1997, 16, in Rennnings 2000, 323) or institutional (e.g., Rennings 2000, 324, posits promotion of sustainable transport or improvement of material flow management in a certain region by a network of scientists, public authorities and NGOs).

The second peculiarity of eco-innovation peculiarity pointed out by Rennings (2000) regards the issue of eco-innovation placed between two different economic sub-disciplines, which are innovation economics and environmental economics. In order to provide an adequate analysis of eco-innovation, an interdisciplinary approach is required. Meanwhile, a valuable contribution derived from innovation economics pertains to identification of innovation determinants and the complexity of drivers that spur innovation, while from the side of environmental economics, the main contribution regards how to assess environmental policy instruments (Rennings 2000). Combining both approaches would lead to identification and assessment of the state regulation role to induce innovation (Rennings 2000). On the one hand, environmental economics was oriented towards environmental policy instruments (encompassing tradable permits, taxes) and regulatory framework concerning innovation methods and strategies in order to valuate and internalize the negative external costs (Rennings 2000). On the other hand, innovation economics focused on positive spillovers of basic R&D efforts in companies (Rennings 2000). Eco-innovations produce positive spillovers in the innovation and the diffusion phase (e.g. "a smaller amount of external costs compared to competing goods and services on the market"; Rennings 2000, 326). This leads to the double externality problem, which results in the reduction of incentives for companies to invest in eco-innovation (Rennings 2000). With a better coordination of environmental and innovation policy, the main aim of innovation policy would be to cut the costs of technological, institutional and social innovation (especially required would be in phases of invention (financial support for pilot projects) and market introduction (improvement of performance characteristics of eco-innovations)) (Rennings 2000). The key role of environmental policy regarding the diffusion phase would comprise internalization of external costs, which are imposed by competing, non-ecological products or services (Rennings 2000). The markets' non-punishment for products and services that harm the environment leads to the distortion of competition between environmental and non-environmental innovation (Rennings 2000). Therefore, the competition between environmental and non-environmental innovation continues to be distorted, unless markets reward environmental improvements and punish environmentally harmful impacts (Beise and Rennings 2005). In conclusion, all innovations produce common knowledge spillovers, while eco-innovations also bring positive externalities (environmental spillovers), which result in benefits to society, while the costs are borne by the enterprises that practice and introduce eco-innovations (Rennings et al. 2006). Because of those two positive externalities created by eco-innovation (usual knowledge externalities through research and innovation phases as well as environmental externalities in the adoption and diffusion phases), eco-innovations are socially desirable (Belin et al. 2009).

Moreover, the double externality problem (i.e., both externalities result in sub-optimal investment in eco-innovations) leads to the last peculiarity of eco-innovation, which pertains to the determinants of eco-innovation adoption (Rennings 2000). Innovation economics should also consider regulatory framework as an important driver of eco-innovation adoption (Rennings 2000). Although new eco-efficient technologies can be spurred under technology push factors, it is also well known that market pull factors induce environmentally friendly products or image (Rennings 2000). Hence, due to the externality problem regarding eco-innovation, the determinants of eco-innovation should also include the regulatory framework (the regulatory push/pull effect), because the regulatory framework and environmental policy both strongly affect eco-innovation (Rennings 2000). Therefore, neoclassical environmental economics considers environmental regulation to remedy a market failure through the internalization of costs that occur from the negative externalities (Testa et al. 2011). While environmental regulation corrects the negative externalities, it also burdens companies with additional costs deriving from increased expenditures in environmental protection in order to comply with regulations (Testa et al. 2011). Higher production costs lead to a lower competitiveness of companies' products on the domestic and foreign markets (Testa et al. 2011). In contrast, the second stream argued that environmental regulation could be beneficial. The Porter hypothesis suggests that environmental regulation stimulates innovation (Testa et al. 2011) by providing incentives that affect companies' production routines in a way that ensures compliance and leads to cost reductions (through decrease of resource inputs or increased efficiency) or even to new marketable products that entirely offset the costs of compliance (Testa et al. 2011). Thereby, environmental innovation represents a source of comparative advantages (Costantini and Crespi 2008). Ford et al. (2014) found some support for the original version of the Porter hypothesis, which claims that regulation spurs innovation. Additionally, Jaffe and Palmer (1997) differentiated the Porter hypothesis into "weak", "narrow" and "strong" versions, with the results of their study confirming the "weak" version. The "narrow" version claims that a certain type of regulation motivates innovation (Jaffe and Palmer 1997), the "weak" version posits that only regulation will induce certain types of innovation, and the "strong" version postulates that properly designed regulation induces innovation and more than offsets the costs of compliance (i.e., leads to compliance with regulation and increased profits) (Jaffe and Palmer 1997). Furthermore, other researchers (Mazzanti and Costantini 2010) found support for the weak and the strong Porter hypothesis on export performance, while Lanoie et al. (2011), based on seven OECD countries, found strong support for the weak version, found qualified support for the narrow version and rejected the strong version (no support found). Regarding the strong version of the Porter hypothesis, Mazzanti and Costantini (2010) found that the overall impact of environmental policies is not in conflict with export competitiveness. For the weak version of the Porter hypothesis, empirical support has been found – all (e.g., use of export flows of environmental goods, environmental policies, public R&D expenditures and all patenting activities) induce competitive advantages of green exports (Mazzanti and Costantini 2010). In addition, the overall impact of environmental policies does not negatively affect export competitiveness in the manufacturing sector, and the strong version of the Porter hypothesis is confirmed – specific innovation efforts and energy tax policies positively affect export flows dynamics (Costantini and Mazzanti 2012). Researchers also found support for the narrowly strong version, arguing that environmental policies foster green exports (Costantini and Mazzanti 2012). In contrast, Rexhäuser and Rammer (2013) have come to somewhat opposite findings, arguing that the strong version of the Porter hypothesis does not hold in general, but rather depends on the type of environmental innovation.

Defining eco-innovation

Eco-innovation is a type of innovation that steers companies towards reduction of environmental impact, whether this effect is intentional or not (Machiba 2010; Fawzi and Rundquist 2011). Fleiter et al. (2012) discussed the fact that the introduction of eco-innovation is not necessarily dependent on environmental harm reduction. Therefore, if technology is less environmentally harmful than its conventional alternative, it can be defined as eco-innovation (Kemp and Foxon 2007). Laperche and Picard (2013) suggest that firms, through eco-innovation, try to transform constraints into opportunities, which can results in cost reduction, enjoyment of better reputation and gain of new markets.

Eco-innovation observatory (2010 in EIO 2013a) proposed a definition of eco-innovation as: "introduction of any new or significantly improved product (good or service), process, organizational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the lifecycle". Given this broad definition, we can recognize that the emphasis is put on different types of eco-innovation, such as product, process, marketing and organizational innovation, which induce a reduction of the use of natural resources and the release of harmful substances, highlighting the entire lifecycle of it. Hence, the environmental benefits should pertain to the production of goods or services within companies as well as the after-sale use of the end-user (Arundel and Kemp 2009; Doran and Ryan 2012; Horbach et al. 2012). More information about eco-innovation definitions will follow in section 2.2.1.

With regard to eco-innovation activities, the survey of Eurobarometer (2011) has shown that approximately three out of 10 companies in the EU (29%) had introduced a new or significantly improved eco-innovation production process or method in the past two years, whereas 24% had introduced a new or significantly improved eco-innovative product or service on the market. On the other hand, summarizing the Eco-Innovation scoreboard, Slovenia advanced from the 10th place to the 7th between 2011 and 2012 and has remained among the best-performing new member states, even though that some indicators have regressed (EIO 2011a; EIO 2013b). However, in 2010 was noted an increase in the R&D in all sectors compared to the previous year, and also number of policy measures have supported public spending on R&D and intended to reinforce the knowledge triangle: research, education and innovation. (EIO 2011a). While, the situation regarding eco-innovation in Slovenia has changed over the years. Compared to 2011 and 2012, Slovenia has decreased in the ranking, it ranked only 15th in 2013.

Review of current eco-innovation definitions

Today, most people have a general knowledge or opinion about the meaning of the words "eco", "green", and "environmental". Nonetheless, the definition of eco-innovation in research is still evolving. For instance, Rennings (2000, 322) summarizes that eco-innovations can be developed by firms or non-profit organizations, they can be traded on markets or not, their nature can be technological, organizational, social or institutional, while the Eco-innovation Observatory (hereinafter EIO) defined eco-innovation as "introduction of any new or significantly improved product (good or service), process, organizational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the lifecycle" (EIO 2010 in EIO 2013a, 2). Within the literature, all definitions definitely acknowledge that eco-innovation contributes to the environmental benefit or at least decreases the environmental burden. The definitions proposed by various organizations and researchers will be presented in more detail further ahead (see Table 2).

When reviewing eco-innovation in the literature, we can also notice the use of different terms when referring to eco-innovation. Some confusion still exists regarding eco-innovation's definition as well as the terms used for eco-innovation activities. In the review of the existing literature, we find three synonyms implying the same meaning or addressing the same type of innovation: "eco"/"ecological", "green" and "environmental" innovation. Through our study, we will use interchangeably all three expressions, and we will also clarify the difference between eco/green/environmental and sustainable innovation. The use of these synonyms (eco, green and environmental innovation) depends largely on how each individual researcher addresses the same type of innovation. Here we briefly present the research of Angelo et al. (2012), who have done a literature review focusing on eco, green and environmental innovation and on the frequency of used terms. Reviewing scientific articles published up to the year 2012 using the terms "environmental innovation", "green innovation" and "eco-innovation" revealed that the term "environmental innovation" is used in 65% of the analyzed articles, followed by the term "eco-innovation" (22%) and finally "green innovation" (13%). Likewise, Schiederig et al. (2012) have also noted confusion about different notions and terminology in describing innovations that have a reduced negative impact on the environment. Thus, the terms green, eco/ecological and environmental innovation are used as synonyms, and they suggest that we should be aware of the broader concept of sustainable innovation, which also includes a social dimension (Schiederig et al. 2012). Further ahead, we explain the main difference between eco-innovation and sustainable innovation. We cite a few brief but meaningful definitions and conclude with a summary of the difference between eco-innovation and sustainable innovation. James (1997 in Charter and Clark 2007, 9) has defined eco-innovation as the "process of developing new products, processes or services which provide customer and business value but significantly decrease environmental impact". Moreover, eco-innovation can be considered as "any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy" (Competitiveness and Innovation Framework (2007 to 2013) in Charter and Clark 2007, 9). The main differences between eco-innovation and sustainable innovation therefore lie in the different dimensions they encompass. Eco-innovation addresses economic and environmental dimensions, while sustainable innovation includes these as well as two broader dimensions: social and ethical (Charter and Clark 2007). Table 2 illustrates all the selected definitions of eco-innovation encompassed in our literature review.

Table 2: Selected definitions of eco-innovation

Author	Definition of eco-innovation
Fussler and James (1996 in Carillo-Hermosilla et al. 2010, 1074)	Eco-innovation is the process of developing new products, processes or services, which provide customer and business value but significantly decrease environmental impact.
James (1997)	Eco-innovations are new products and processes that provide customer and business value but significantly decrease environmental impact.
Rennings (2000, 322)	Eco-innovations include all measures of relevant actors (firms, politicians, unions, associations, churches, private households), which develop new ideas, behavior, products and processes, apply or introduce them and which contribute to a reduction of environmental burdens or to ecologically specified sustainability targets.
Rennings et al. (2004, 8)	Environmental innovations consist of new or modified processes, techniques, practices, systems and products to avoid or reduce environmental harms. Environmental innovations may be developed with or without the explicit aim of reducing environmental harm. They may be motivated by the usual business goals such as reducing costs or enhancing product quality. Many environmental innovations combine an environmental benefit with a benefit for the company or user.
Chen et al. (2006, 332)	Green innovation is a hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in energy-saving, pollution prevention, waste recycling, green product designs, or corporate environmental management.
Ottman et al. (2006, 24)	Although no consumer product has a zero impact on the environment, in business, the terms 'green products' or 'environmental product' are used commonly to describe those that strive to protect or enhance the natural environment by conserving energy and/or resources and reducing or eliminating the use of toxic agents, pollution, and waste.
Competitiveness and Innovation Framework 2007 to 2013 (in Charter and Clark 2007, 9)	Eco-innovation is any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy.
MEI – Measuring Eco-Innovation – research project (Kemp and Foxon 2007, 4; Kemp and Pearson 2007, 7)	Eco-innovation is the production, application or exploitation of a good, service, production process, organizational structure, or management or business method that is novel to the firm or user and that results, throughout its lifecycle, in a reduction of environmental risk, pollution and the negative impacts of resources use (including energy use) compared to relevant alternatives.
Reid and Miedzinski (2008, 2) – The EUROPE INNOVA panel	Eco-innovation is "the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for everyone with a lifecycle minimal use of natural resources (materials including energy and surface area) per unit output, and a minimal release of toxic substances".
Community Innovation Surveys (CIS) in Belin et al. (2009)	A new or significantly improved product (good or service), process, organizational method or marketing method that creates environmental benefits compared to alternatives. The environmental benefits can be the primary objective of the innovation or the result of other innovation objectives. The environmental benefits of an innovation can occur during the production of a good or service or during the after-sale use of a good or service by the end user.

Author	Definition of eco-innovation
Huppes and Ishikawa (2009, 1698)	Eco-innovation is a change in economic activities that improves both the economic performance and the environmental performance of society.
Kammerer (2009, 2286)	Environmental innovations are all innovations that have a beneficial effect on the natural environment regardless of whether this was the main objective of the innovation.
Oltra and Saint Jean (2009, 567)	Environmental innovations can be defined as innovations that consist of new or modified processes, practices, systems and products, which benefit the environment and so contribute to environmental sustainability.
Ahmed and Kamruzzaman (2010, 10)	Eco-innovations are innovations that consist of new or modified products, processes, techniques, practices, organizations, markets and systems to avoid or reduce environmental harms.
Carrillo-Hermosilla et al. (2010, 1075)	Eco-innovation is defined as an innovation that improves environmental performance (Carrillo-Hermosilla et al., 2009), in line with the idea that the reduction in environmental impacts (whether intentional or not) is the main distinguishing feature of eco-innovation. From the social point of view, it does not matter very much if the initial motivation for the uptake of eco-innovation is purely an environmental one.
Eco-innovation Scoreboard (2011b, VII)	Eco-innovation is innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole lifecycle. The understanding of eco-innovation has broadened from a traditional understanding of innovating to reduce environmental impacts towards innovating to minimize the use of natural resources in the design, production, use, re-use and recycling of products and materials.
Rave, Goetzke and Larch (2011, 12)	Environmental innovation is defined as a sub-group of general innovations that contribute to an improvement of environmental quality or the use of fewer natural resources. This includes the advancement of existing or the development and market introduction of new environmentally friendly products or environmental improvements through the modification or replacement of existing processes (add-on or integrated technologies). Environmental improvements may not be directly intended (i.e., they may only be a side effect of the innovation).
Angelo et al. (2012, 117)	Environmental innovations are organizational implementations and changes focusing on the environment, with implications for companies' products, manufacturing processes and marketing, with different degrees of novelty. They can be merely incremental improvements that intensify the performance of something that already exists, or radical ones that promote something completely unprecedented, where the main objective is to reduce the company's environmental impacts. In addition, environmental innovation has a bilateral relationship with the level of pro-active environmental management adopted by companies.
Eco-innovation Scoreboard (2012b, 8)	Eco-innovation is the introduction of any new or significantly improved product (good or service), process, organizational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the lifecycle.

Author	Definition of eco-innovation
European Commission (2012, 29)	Eco-innovation can be found in all forms of new, or significantly improved, products, goods, services, processes, marketing methods, organizational structures, institutional arrangements and lifestyle and social behaviors, which lead to environmental improvements compared to relevant alternatives.
Horbach, Rammer and Rennings (2012, 119)	Eco-innovation is defined as product, process, marketing, and organizational innovations, leading to a noticeable reduction in environmental burdens. Positive environmental effects can be explicit goals or side effects of innovations. They can occur within the respective companies or through customer use of products or services.
Pereira and Vence (2012, 91)	The singularity of eco-innovation with regard to conventional innovation resides in its favorable effect on the environment, which improves social wellbeing. The concept tries to highlight the compatibility between the two traditionally opposed goals of improving business competitiveness and the environmental care.
Dong et al. (2013, 2)	From a theoretical perspective, eco-innovation has become an interdisciplinary concept; as a research field, it is established on the principles of innovation theories and environmental science. Eco-innovation is studied as an aspect of innovation and thus is compared to the general innovation measures, even though it specifically aims to improve firms' long-term ecological performance, rather than to promote business operational efficiencies and/or profitability per se. Eco-innovation focuses on reducing the negative effects of excessive natural resource exploitation, environmental pollutant emissions, and ecological risks that emerge along the lifecycle of specific products and/or services.
Wilts et al. (2013, 824)	Eco-innovation can be a new good or service, process, organizational change, or marketing method in a company, but also a wider change with systemic implications for economy and society (e.g., new production–consumption models based on services).

Source: Fussler and James (1996 in Carillo-Hermosilla et al. 2010); James (1997); Rennings (2000); Rennings et al. (2004); Chen et al. (2006); Ottman et al. (2006); Competitiveness and Innovation Framework 2007 to 2013 (in Charter and Clark 2007); Kemp and Foxon (2007); Kemp and Pearson (2007); Reid and Miedzinski (2008); Belin et al. (2009); Huppes and Ishikawa (2009); Kammerer (2009); Oltra and Saint Jean (2009); Ahmed and Kamruzzaman (2010); Carrillo-Hermosilla et al. (2010); Eco-innovation scoreboard (2011b); Rave, Goetzke and Larch (2011); Angelo et al. (2012); Eco-innovation scoreboard (2012b); European Commission (2012); Horbach, Rammer and Rennings (2012); Pereira and Vence (2012); Dong et al. (2013); Wilts et al. (2013).

Features of eco-innovation

In the following pages, we extract and delineate the main characteristics of eco-innovation, beginning with the lifecycle perspective (Kemp and Pearson 2007; Speirs, Pearson and Foxon 2008; EIO 2010 in EIO 2013a; EIO 2011b; EIO and CfSD 2013). The definition proposed by EIO emphasizes the full lifecycle perspective and not just environmental aspects of individual lifecycle stages (EIO and CfSD 2013). Inventing new products and delivering new services is not the only issue of eco-innovation, which also includes reduction of environmental impacts in the way products are designed, produced, used, reused and recycled (EIO and CfSD 2013).

The lifecycle perspective of eco-innovation includes the following stages (EIO and CfSD 2013):

- resource extraction (reduction of environmental pressure and impacts by limiting extraction of virgin resources and also limiting "unused" extraction),
- manufacture (with regard to using fewer resources – including energy),
- use or substitution of materials with less environmental impacts, less pollution and waste production,
- distribution (reduction of impacts through better packing design, reuse and recycling, reduction of fuel and energy in transportation and storage),
- use (use of less resources (e.g., materials, energy, land and water), less pollution and waste),
- "end-of-life" (reduction of impacts of waste disposal by improving the quality of waste or decreasing the volume of waste).

Reid and Miedzinski (2008, 4) summarize as follows: "All types of innovations leading to a lower resource and energy intensity at the stages of material extraction, manufacturing (both in relation to the components and final product), distribution, use, reuse and recycling as well as disposal are considered eco-innovations if they lead to a decreased resource-intensity from the perspective of the whole lifecycle of the product or a service. Indeed, the concept of cradle-to-cradle takes the minimization of waste to a logical extreme". Furthermore, Figure 2 summarizes product lifecycle stages, which have been presented by Maxwell and van der Vorst (2003, 885). They have presented concept SPSD (sustainable product and/or service development) defined as "the process of making products and/or services in a more sustainable way throughout their entire lifecycle, from conception to end of life" (Maxwell and van der Vorst 2003, 884). These products and/or services are developed in order to balance economic, environmental and social aspects – they imply development towards sustainability regarding the Triple Bottom Line (Maxwell and van der Vorst 2003, 884). As we can see from Figure 2, the product and/or service lifecycle starts at conception (the stage of concept and design of a potential product, service or product service systems), followed by remaining stages encompassing raw materials and all till the end of life of product/service/system as well as potential "recovery" and "reuse" options after the end of life (Maxwell and van der Vorst 2003). Therefore, the focus of eco-innovation should be oriented towards eco-innovation's lifecycle, which implies that we should consider the use of resources from the beginning (the conception phase of product) till the end of the production process as well as when the product 'expires', referring to the end life of the product (i.e., waste), to prevent release of harmful substances into the environment.

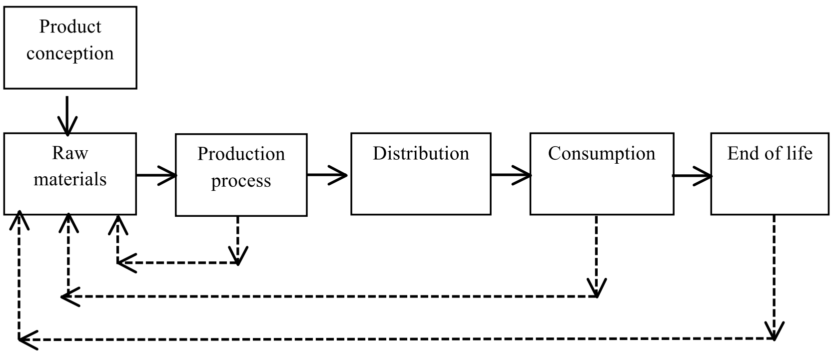

Figure 2: Product lifecycle stages
Source: Maxwell and van der Vorst 2003, 885.

The second characteristic of eco-innovation is that of being more resource efficient (Competitiveness and Innovation Framework (2007 to 2013) in Charter and Clark 2007; Kemp and Foxon 2007; EIO 2010 in EIO 2013a). Kemp and Foxon (2007) argue that eco-innovation is not limited to new or better environmental technologies but includes every environmentally improved product or service and organizational change for the environment; that is, all new processes that are more resource efficient are eco-innovations (Kemp and Foxon 2007).

As a third eco-innovation characteristic, we emphasize the environmental impact (James 1997 in Charter and Clark 2007; Competitiveness and Innovation Framework 2007 to 2013 in Charter and Clark 2007; Rennings 2000; Rennings et al. 2004; Kemp and Foxon 2007; Speirs, Pearson and Foxon 2008; Kammerer 2009; Ahmed and Kamruzzaman 2010; EIO 2011b; Angelo et al. 2012; Horbach, Rammer and Rennings 2012). The literature acknowledges eco-innovations to be environmentally benign and/or to benefit the environment, either intentionally or unintentionally, by introducing new or significantly improved products, processes, organizational changes or marketing methods (Kammerer 2009: Machiba 2010; EIO 2010 in EIO 2013a; Belin et al. 2011; Fawzi and Rundquist 2011; Horbach, Rammer and Rennings 2012). In addition, we have to highlight that an innovation's effects determine whether an innovation is environmental; therefore, the determinant is not an innovation's intention (Fawzi and Rundquist 2011). In accordance to the previous, Belin et al. (2011) have emphasized that the environmental objective is generally not the direct and only intention of eco-innovation. They argue that the environmental objective comes in addition to other objectives (i.e., companies follow their main purposes such as competitiveness and productivity, while also seeking to stay in compliance with environmental regulatory requirements). Machiba (2010) summarizes that eco-innovation is innovation with an explicit emphasis on reducing environmental impact, whether this effect is intended or not. Therefore, eco-innovation is not limited to environmentally motivated innovations but also includes "unintended reduction of environmental impact" (Kemp and Foxon 2007; Arundel and Kemp 2009; Machiba 2010; Fawzi and Rundquist 2011; Rave et al. 2011; Fleiter et al. 2012; Horbach, Rammer and Rennings 2012; Antonioli, Mancinelli, and Mazzanti 2013; Cainelli and Mazzanti 2013). Therefore, environmental improvements can happen by chance; they are not required to be the primary goal of a new eco-product or eco-process (Horbach et al. 2012).

Fourth, eco-innovations can be introduced in various industries or sectors of the economy, such as in manufacturing, services, organizations, management styles, urban and rural planning and design, agriculture, and many other sectors (European Commission 2012). An important characteristic of eco-innovation, thus, is that eco-innovation can take place in any economic activity and is neither technology- nor sector-specific (Antonioli, Mancinelli, and Mazzanti 2013; Cainelli and Mazzanti 2013).

Summarizing, we can see that eco-innovation in not just innovation or introduction of novelties regarding "eco/environmental area" but also involves improvement of already existing products, processes, services, technologies, organizations, marketing, and so on, with the aim of using more efficient and less harmful natural resources and materials, leading to less adverse effects on the environment and consequently bringing benefits to the environment or at least reducing the negative impacts released in the environment. Schiederig et al. (2012), in their review of different terminology encompassing green, eco, environmental and sustainable innovation, have identified six important aspects that create a linkage between them: 1) innovation object (product, process, service and method);

2) market orientation, where the goal is to satisfy needs and be competitive on the market; 3) the environmental aspect, all four innovation notions aim to reduce negative impact (optimum or zero impact); 4) phase in the lifecycle; 5) impulse, where the intention for reduction is ecological or economical; and 6) level – setting up a new innovation or green standard for the firm (Schiederig et al. 2012). Finally, we should differentiate sustainable innovation from eco/green/environmental innovation, because sustainable innovation implies a broader concept and adds to the aforementioned dimensions a social dimension (Schiederig et al. 2012).

In order to provide an instrument to identify and analyze the different characteristics and features of green products and practices, Dangelico and Pontrandolfo (2010) have developed The Green Option Matrix (GOM), which integrates different dimensions of green products. The three-dimensional GOM encompasses the following dimensions (see Table 3):

- *Phase of the product lifecycle*: with regard to this dimension, the authors have considered three main phases: before usage (included materials extraction, production processes and transportation processes), usage and after usage (end-of-life);
- *The main environmental focus of the product*: this dimension distinguishes the focus of green products on materials, energy and pollution;
- *The type of impact on the environment*: this can be less negative (when green products have a lower environmental impact then conventional ones), null or positive (positive contribution to the environment).

Table 3: Example of GOM (The Green Option Matrix)

Focus / Environmental impact	Green product with focus on materials	Green product with focus on energy	Green product with focus on pollution
Less negative	During production, uses less materials than conventional products.	The green product is more energy efficient than a conventional one or part of the used energy derives from renewable energy sources.	Pollute less than conventional products.
Null	During production, uses only recycled materials or natural/ biodegradable materials at a sustainable rate.	Energy use only from renewable sources.	Green products that do not pollute.
Positive	Is designed in such a manner as to be reused, disassembled and manufactured or is made of such materials that can be recycled, leading to reduction of the environmental impact of other products that will not require the virgin materials consumption. Those products, by allowing a new life for materials, recall the concept of "cradle to cradle".	Energy production from renewable sources, leading to reduction of environmental impact caused by other products.	Reduction of pollution caused by other products.

Source: adapted from Dangelico and Pontrandolfo 2010.

Main dimensions of eco-innovation

Prior research works, the objective of which was to delineate the main dimensions of eco-innovation and develop a psychometrically reliable and valid scale, have in common the same conclusion. Eco-innovation's nature is a multi-aspect concept, which comprises production of an eco-product, carrying out an eco-process and at last managing an eco-organization (Arundel and Kemp 2009; Cheng and Shiu 2012; Tseng et al. 2013); therefore, we have to deal with it from a multidimensional perspective (Cheng and Shiu 2012). Arundel and Kemp (2009) noted that past research works and measurement activities focused merely on pollution control and abatement activities or on the environmental goods and services sector. Moreover, they have argued (Arundel and Kemp 2009) that research and data collection encompassing eco-innovation should not be oriented to only environmentally motivated innovation; rather, researchers should overcome this limitation in the sense of comprising products, processes and/or organizational innovations with environmental benefits. In addition, Arundel and Kemp (2009) pointed out the fact that the attention should be broadened in order to include innovation oriented towards the following characteristics: resource use, energy efficiency, greenhouse gas reduction, waste minimization, reuse and recycling, new materials (e.g., nanotechnology) and eco-design.

In the following pages, we first describe the concept of eco-innovation provided by OECD (2007 in OECD 2009). This concept comprises three dimensions, which are *targets, mechanisms* and *impacts* (see Figure 3). Moreover, we briefly summarize the dimensions as they did in OECD (2009, referring to the Oslo manual, OECD 2007), followed by dimensions of eco-innovation features proposed by Dong et al. (2013) and by a description of the main types of eco-innovation in more detail.

Target

Target refers to the basic focus of eco-innovation. Following the Oslo manual in OECD (2009), the target of eco-innovation can be: *products* (goods and services), *processes* (production method or procedure), *marketing methods* (promotion and pricing of products and other market-oriented strategies), *organizations* (in the sense of structure of management and responsibility distribution) and finally *institutions* (including broader societal area beyond a single organization's control – such as institutional arrangements, social norms and cultural values). The target's nature can be technological or non-technological. As we can also see from the scheme below (see Figure 3), eco-innovation products and processes tend to rely mainly on technological development, while eco-innovations in marketing, organizations and institutions rely more on non-technological changes (OECD 2007 in OECD 2009). In addition, researchers (Rennings 2000; Reid and Miedzinski 2008) suggest that eco-innovation includes innovation in social and institutional structures and therefore should not be limited to innovation in products, processes, marketing methods and organizational methods.

Mechanisms

The second dimension of eco-innovation is that of *mechanisms*. Adapted by Stevels (1997; Charter and Clark 2007), four main levels of eco-innovation can be defined in the context of environmental improvement. The first level (i.e., modification) is incremental and regards small or progressive improvements to existing products. The second level (i.e., re-design) is the complete re-design of existing product concepts or "green limits", where there is a major re-design of existing products (while the level of improvement that is technically feasible is limited). The third level (i.e., alternatives) regards functional or "product alternatives"; this refers to new product or service concepts that satisfy the same functional need (e.g., teleconferencing instead of travelling). Finally, the last level (i.e., creation) is that of systems as designs suitable for sustainable society (e.g., design and introduction of entirely new products, processes, procedures, organizations and institutions). Thus, mechanisms are related to where eco-innovation target takes place or is introduced (OECD 2009).

Eco-innovation's impact on the environment

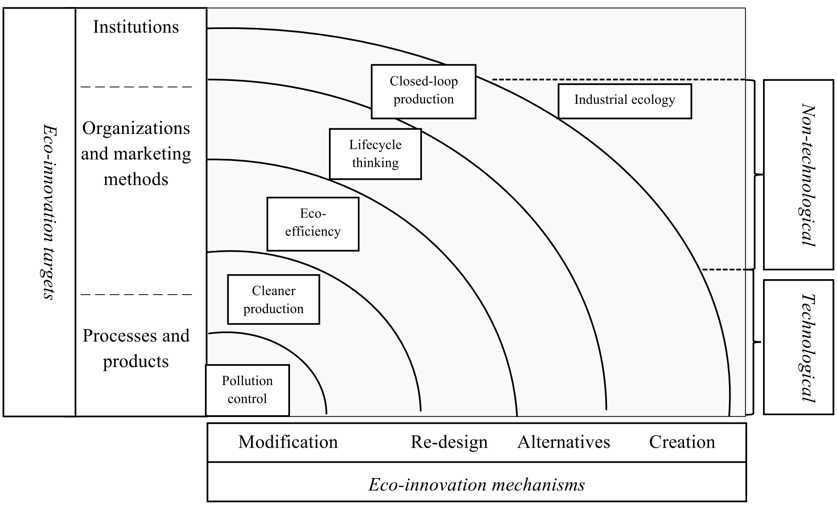

Figure 3: Conceptual relationships between sustainable manufacturing and eco-innovation
Source: OECD 2009, 15, Figure 5.

The last dimension is eco-innovation's *impact*. The impact that eco-innovation brings across its lifecycle or some other focus area refers to its effect on the environment (OECD 2009). Eco-innovation's target and mechanism interplay with socio-technical surroundings and bring potential environmental impacts (OECD 2009). Certain mechanisms (e.g., alternatives and creation) generally bring higher potential environmental benefits, but they are more difficult to co-ordinate, while mechanisms such as modification and re-design bring lower potential environmental benefits (OECD 2009). The environmental benefits do not have to be necessarily the primary objective of the innovation; they can be the result of other innovation objectives and can occur during the production of a good or service, or during the after sales use of a good or service by the end user (Arundel and Kemp 2009). In more detail, environmental impact concerns reduction of material and energy use; reduction of air, water, soil and noise emissions/pollution; replacement of hazardous substances and improved recycling of water, waste or materials during the production and after use of products (Horbach et al. 2012).

Moreover, Dong et al. (2013) argue that the typology of eco-innovation dimensions is based on the categorization dimensions of general innovation. Dong et al. (2013) have summarized the eco-innovation features derived from the current literature and presented the dimensions of eco-innovation. The three dimensions identified by Dong et al. (2013) are innovation content, ecological/environmental target and innovation intensity. We scrutinize briefly the literature from which these dimensions are drawn. Rennings (2000) categorized eco-innovations into four types (focusing on their subjects): technology, society, organization and institution. Oltra and Saint (2009) distinguished the following eco-innovation types: product innovation, process innovation and organizational innovation. Examples of other categories include: disruptive innovation, sustainable innovation and system innovation proposed by MEI (Kemp and Foxon 2007). Further, Reid and Miedzinski (2008) developed an eco-innovation classification system in which they take into account environmental performance and therefore differentiate four types of eco-innovation: lifecycle innovation, product and process innovation, organizational innovation and marketing innovation. By eco-innovation's technical characteristics and environmental impact, OECD (2009) has divided eco-innovation in the following categories: pollution management, clean technologies and products, natural resource management and eco-friendly products.

Types of eco-innovation

This chapter presents eco-innovation types. Types of eco-innovation are not congruent among research works; therefore, in this section, we present in more detail the classification of eco-innovation provided by EIO (2013). According to EIO (2013) types of eco-innovation are as follows:

product, process, organizational, marketing, social and system eco-innovation.

Product eco-innovation

EIO (2013a) argue that product innovation encompass both goods (those that tend to minimize the overall impact on the environment though their production, while also emphasizing eco-design) and services. Eco-design as a part of product innovation regards resource constraints in the sense of designing a product in such a manner as to provide a reduction of environmental impact and less use of resources during operation and recovery options, which comprise repairing, remanufacturing or recycling (EIO 2013a). Product innovation, according to OECD (2005), is defined as the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and material, incorporated software, user friendliness or other functional characteristics (OECD 2005). Meanwhile, Dong et al. (2013) describe product eco-innovation as innovation that responds to the environmental needs of the market and the government and thereby aims to achieve long-term environmental performance by improving the resource effectiveness and optimization of environmental benefits in a product's lifecycle. Implemented eco-product innovation brings environmental improvements to existing eco-products or the development of new eco-products (Cheng and Shiu 2012). In the previous description, we can see that Cheng and Shiu (2012) identify eco-innovation as the improvement of something "old" or already existing and eco-innovation as a total novelty. Product eco-innovations include novelties and existing products or services that are significantly improved in a way that minimizes their overall impact on environment (Reid and Miedzinski 2008). Furthermore, eco-product implementation focuses mainly on a product's lifecycle in order to reduce environmental impact, because the principal environmental impact of many products stems from their use (e.g., fuel consumption and CO_2 emissions of cars) and disposal (e.g., heavy metals in batteries) (Cheng and Shiu 2012). According to Kemp and Foxon, product or service eco-innovation refers to a new or improved product/good/service that offers environmental benefits and is less pollution- and resource-intensive, including eco-houses, eco-buildings and eco-services such as car sharing. According to Reid and Miedzinski (2008), products can include various goods with different numbers of components (e.g., just a household appliance or an entire house) and various types of services (e.g., new public mobility schemes, car sharing and environmental services, waste management, environmental consulting). In summary, product eco-innovation tends to use less or non-polluting/toxic materials (using environmentally friendly material); improving and designing environmentally friendly packaging (e.g., less paper and plastic material used) for existing and new products; recovery of a company's end-of-life products and recycling; and using eco-labeling (Chiou et al. 2011; Ar 2012). Product eco-innovation also consists of development of new eco-products through new technologies to simplify their packaging, construction and components, with the goal of easily recycling their components and easily decomposing their materials, followed by development of new eco-products through new technologies to avoid the use of processed materials and instead use natural materials and reduce of waste and damage by waste as much as possible with as litte use of energy as possible (Cheng and Shiu 2012). Chassagnon and Haned (2014, p: 3) argue that product eco-innovation requires the development of new eco-friendly goods or services, such as products free of harmful chemicals (e.g., phosphates or solvents).

Process eco-innovation

The main characteristics that define process innovations are reduction of material use, lower risk and cost savings as a result (EIO 2013a). Furthermore, OECD (2005) defined process innovation in general as implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software (OECD 2005). Rennings et al. (2006) argue that environmental process innovations comprise or are commonly subdivided into end-of-pipe technologies and cleaner production technologies (i.e., innovation in integrated technologies). In more detail, end-of-pipe technologies reduce the impact of pollution at the end of the production process without modifying it, while cleaner technologies imply a change in the production process, such as the use of an alternative process that is less harmful to the environment than the conventional one or a reduction of input (Chassagnon and Haned 2014). Process eco-innovation, according to Dong et al. (2013), is not limited to explicit environmental performance (reduction of clean production cost and decrease of the pollutant emission in order to achieve compliance with environmental regulations) but also encompasses the tacit environmental performance (i.e., increase of resource utilization and pollution protection). According to Cheng and Shiu (2012) eco-process innovations refer to the introduction or manufacturing of processes that lead to a reduction of environmental impact, such as closed loops for solvents, material recycling or filters. Furthermore, process eco-innovation also involves the improvement of existing production processes or the implementation of new processes to reduce environmental impact (Cheng and Shiu 2012). Process eco-innovation reflects support for novel technological and non-technological solutions, which result in the reduction of material and energy costs of companies (European Commission 2012). In summary, process eco-innovation includes low consumption of energy sources such as water, electricity, gas and petrol during production/use/disposal; recycle, reuse and remanufacture of material; and use of cleaner technology to produce savings and prevent pollution (such as energy, water and waste) (Chen et al. 2006; Chen 2008; Chiou et al. 2011; Wong 2012; Tseng et al. 2013).

Technological eco-innovation

Process innovations can be grouped in two broader categories: end-of-pipe technologies and clean technologies (del Río 2005; Triguero et al. 2013). End-of-pipe technologies are defined as "devices or plants added at the end of the production process with the aim to transform primary emissions into substances easier to handle. They do not involve changes in the production processes"; on the other hand, clean technologies are "changes in production processes that reduce the quantity of wastes and pollutants generated in the production process or during the whole life-cycle of the product (clean products)" (del Río 2005, 22). According to the VDI (2001 in Rennings et al. 2006, 47-48) typical examples of end-of-pipe technologies are: incineration plants (waste disposal), wastewater treatment plants (water protection), sound absorbers (noise abatement) and exhaust-gas cleaning equipment (air quality control). Examples ofcleaner production technologies are (according to the VDI 2001 in Rennings et. al 2006, 48): the recirculation of materials, the use of environmentally friendly materials (replacement of organic solvents by water) and the modification of the combustion chamber design (process integrated systems). In summary, end-of-pipe technologies (incremental innovations) require an increase in capital and also costs derived from maintenance but do not lead to an increase in production, while clean technologies (radical innovations), through a reduction of materials and energy consumption, lead to improved efficiency of the production process and furthermore have the potential to increase firm productivity and competitiveness (del Río 2005). Cleaner production technologies follow a preventive approach to environmental problems by reducing emissions at the source (i.e., they do not need to be dealt with afterwards), while end-of-pipe technologies follow a reactive approach, treating emissions and discharges after they have been generated (del Río 2009). Cleaner technologies seem to be economically superior and may lead to economic benefits for adopting companies acquired through reduced energy costs, material cost savings and/or greater revenues (del Río 2009). The economical superiority of cleaner technologies can be recognized even though that they require significant up-front investments (e.g., total reconfiguration of the company's production process or other major changes such as hiring specialized staff or retraining the workforce) (del Río 2009). On the other hand, end-of-pipe technologies do not lead to efficiency in the production process; they involve only sunk costs (del Río 2009). According to Tseng et al. (2012), technological eco-innovations are the key player in giving information to comprehensive material-saving plans and management of documentation and information. With regard to Tseng et al. (2012) investment in green equipment and installation of advanced green production technology plays a strategic role as a motive/stimulus and as a support for innovation effort. By reducing the consumption of energy and other resources and consequently contributing to the decrease of waste and emissions, environmental technologies lead to cost reduction and improved competitiveness (Klassen and Whybark 1999 in Murovec et al. 2012). Therefore, environmental technologies can be divided into two groups: those that aim to reduce the negative effects of pollution and/or improve the production process (such as cleaner technologies and end-of-pipe technologies) and those that are a part of the manufacture of environmentally-friendlier products (UN-DESA 1999 in Murovec et al. 2012).

Organizational eco-innovation

Organizational innovation implies implementation of a new organizational method in the firm's business practices, workplace organization or external relations (OECD 2005). Therefore, organizational eco-innovation aims to enhance the total environmental performance on the basis of firm's environmental vision – that is, to improve and sustain the ecological benefits and resource efficiency and expand the firm's social responsibility as well (Dong et al. 2013). Rennings et al. (2006) explain that environmental organizational innovations aim to reduce environmental impacts and encompass reorganization of processes and responsibilities within the company (e.g., EMS). Their contribution can also lead to technological opportunities for the company, and they may act as supporting factors for technical environmental innovations (Rennings et al. 2006). Several researchers (Kemp and Foxon 2007; Kemp and Pearson 2007) have written that organizational eco-innovation refers to the introduction of new organizational methods and management systems for coping with environmental issues in production and products. Furthermore, they have classified organizational eco-innovation as: *pollution prevention schemes* (prevention of pollution through input substitution, a more efficient operation of processes and small changes to production plants); *environmental management and auditing systems* (formal system that involves measurement, reporting and responsibilities for dealing with issues of material use, energy, water and waste; e.g., EMAS and ISO 14001); and *chain management* (cooperation between companies to close material loops and to avoid environmental damage across the value chain – "from cradle to grave"). Among the management instruments on a firm level are eco-audits (Rennings 2000). "The Eco-audit should provide a list of recommended actions, in terms of increasing cost-effectiveness in addressing the critical environmental issues. This list should include interim and long-term targets and a timetable for achieving them, together with an indication of the investments and other resources (human, information, and so on) that would be required. The following points relate to the procedures for the execution of an Eco-Audit" (World Bank, 1995 in Sarkar 2013, 214). Cheng and Shiu (2012) distinguish the following types of organizational eco-innovation: use of novel systems to manage eco-innovation, use of eco-innovation as one of a unit's management policies, collection of information on eco-innovation trends, active engagement in eco-innovation activities, communication of eco-innovation information to employees, applying the concept of eco-innovation to unit management, investment of a high ratio of R&D in eco-innovation and communication of experiences among various departments involved in eco-innovation. Organizational eco-innovations include any reorganization in the company intended to reduce the negative impact on the environment, such as environmental management systems (Chassagnon and Haned 2014, 3). Organizational eco-innovations, therefore, comprise: environmental management systems (e.g., ISO 14000 family standards or the voluntary EU instrument on the Eco-Management and Audit Scheme (EMAS)) or other specific environmental management tools such as process control tools, environmental audits or "chain" management (Reid and Miedzinski 2008). In addition, ISO 14001 is more a response to external pressure (customer requirements, public image, stakeholders' and regulatory pressure), while EMAS tends to be motivated internally by corporate culture and influential individuals (Neugebauer 2012). Regarding environmental management systems (focusing on

ISO 14001 and EMAS), Frondel et al. (2008) find that the EMS adoption strongly correlates with an expected enhancement of corporate image, while it is negatively linked to the expected cost savings (EMS adoption can be assumed to be costly). Moreover, neither the occurrence of environmental incidents nor environmental regulatory compliance seem to be effective drivers for spurring EMS adoption, although those two drivers effectively induce eco-innovation and abatement activities (Frondel et al. 2008).

Marketing eco-innovation

Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing (OECD 2005; EIO 2013a). Eco-innovation in marketing comprises new ways of integrating environmental aspects in communication and sales strategies (OECD 2009). For example, a company improves a general product, then further develops it and/or sells eco-efficient products through better market research, contacting its consumers directly and using marketing practices that appeal environmentally aware consumers (OECD 2009). Therefore, marketing eco-innovation tends to discover which marketing techniques can be used to stimulate people to buy, use or implement eco-innovations; thus, it involves changes or development in product design or packaging, product placement, product promotion, pricing and also eco-labeling (EIO 2013a). In addition to the previous types of marketing eco-innovation, Kinoti (2011) suggest the following marketing green innovations: green products strategies, green consumption and green probe strategies (marketing information system). Herbig et al. (1993 in Kinoti 2011) has stressed that green marketing refers to products and packages that have one or more of the following characteristics: they are less toxic, are more durable, contain reusable materials and/or are made of recyclable materials. For companies and in marketing terms, brand is key to understanding the process of commercialization of products or services (EIO 2013a). A brand represents a collection of symbols, experiences and associations, which are linked with a product or service by potential customers (EIO 2013a). Moreover, green branding is important, but it is not the only or the best way to sell eco-innovations. Another important aspect of eco-innovation's marketing, as aforementioned, is eco-labeling (EIO 2013a).

Social eco-innovation

One of the aspects of social eco-innovation is that any discussion of resource consumption considers the human element to be integral. Social eco-innovation includes market-based dimensions of behavioral and lifestyle change and consequently focuses on ensuring the demand for green goods and services. Some companies try to follow and practice the so-called user-led innovation, through which the functionality of new goods is developed with stakeholders and the risk of superfluous product features is minimized. Another important aspect that leads to an absolute decrease of material use without decreasing the provided quality of services to the user is product sharing (EIO 2013a).

System eco-innovation

System eco-innovation refers to a series of connected innovations that bring improvement or create entirely new systems delivering specific functions with a reduced overall environmental impact (EIO 2013a). Its key feature is a collection of changes implemented by design. This means that, for example, a system eco-innovation related to a house is not just about window isolation or just use of a better heating system; it is about innovating the entire design to improve its functionality (EIO 2013a). EIO (2013a, 3) proposes another example of system innovations called "Green cities": "when innovation and planning efforts lead to a combination of changes to make the functioning of the city and city life more 'green'. This includes, for instance, new mobility concepts that tackle not only traditional public transportation services (e.g. buses) but also shared-bike systems (and related infrastructure like bike stations) as well as planning to reduce the need for travel (requiring that supermarkets, day care facilities, etc. are incorporated in new housing developments)". Kemp and Foxon (2007) have defined green system innovations as alternative systems of production and consumption, which are more benign than already existing systems (e.g., biological agriculture, renewable-based energy systems). The European Commission (2012) includes in systemic eco-innovations comprehensive solutions based on innovative business models (e.g., smart cities), sustainable mobility and industrial ecology.

Measuring eco-innovation

Researchers (Speirs, Pearson, and Foxon 2008) argue that the lack of relevant data and indicators hinders policies and measures related to the promotion of eco-innovation. Therefore, Arundel and Kemp (2009) summarized the following measures of eco-innovation:

- *Input measures:* research and development (R&D) expenditures, innovation expenditures (inclusion of investment in intangibles, such as design expenditure, software and marketing costs) and R&D personnel (Acs and Audretsch 1993, 10 in Arundel and Kemp 2009, 15);
- *Intermediate output measures*: the number of patents (regarding eco-innovation – patents covering eco-inventions), number and types of scientific publications, etc. (Acs and Audretsch 1993, 10 in Arundel and Kemp 2009, 15);
- *Direct output measures*: number of innovations, individual description of innovation, data on sales of new products etc. (Acs and Audretsch 1993, 10 in Arundel and Kemp 2009, 15);
- *Indirect impact measures derived from aggregate data*: changes in resource efficiency and productivity using decomposition analysis (Arundel and Kemp 2009, 15).

In the following pages, we depict types of eco-innovation and measures used in prior research (Table 4). We focused only on research works that have explored in their research at least two types of eco-innovation.

Table 4: Types of eco-innovation used in previous studies examining more than one eco--innovation type

Author, year and publication name	Eco-innovation main dimensions		
	Eco-product innovation	***Eco-process innovation***	***Eco-organizational innovation***
Cheng and Shiu (2012); Technovation	Our unit often emphasizes developing new eco-products through new technologies to: 1. Simplify their packaging 2. Simplify their construction 3. Easily recycle their components 4. Easily decompose their materials 5. Use natural materials 6. Reduce damage by waste as much as possible 7. Use as little energy as possible	Our unit often updates manufacturing processes to: 1. Protect against contamination 2. Meet standards of environmental law 3. Our unit often introduces new technologies into manufacturing processes to save energy 4. Our unit often updates equipment in manufacturing processes to save energy	Our unit management often: 1. Uses novel systems to manage eco-innovation 2. Collects information on eco-innovation trends 3. Actively engages in eco-innovation activities 4. Communicates eco-innovation information with employees 5. Invests a high ratio of R&D in eco-innovation 6. Communicates experiences among various departments involved in eco-innovation

Author, year and publication name	Eco-innovation main dimensions			
	Eco-product innovation	***Eco-process innovation***	***Management innovation***	***Technological innovation***
Tseng et al. (2013), Journal of Cleaner Production	1. Degree of new green product competitiveness to understand customer needs 2. Evaluation of technical, economic and commercial feasibility of green products 3. Recovery of company's end-of-life products and recycling 4. Using eco-labeling, environment management system and ISO 140001 5. Innovation of green products and design measures 6. Investment in green equipment and technology	1. Low energy consumption such as water, electricity, gas and petrol during production/use/disposal 2. Recycle, reuse and remanufacture of material 3. Use of cleaner technology to generate savings and prevent pollution (such as energy, water and waste) 4. Sending in-house auditor to appraise environmental performance of supplier 5. Process design and innovation and enhancement of R&D functions 6. Low cost green provider: unit cost versus competitors' unit cost	1. Redefine operation and production processes to ensure internal efficiency that can help to implement green supply chain management 2. Re-design and improvement of product or service to obtain new environmental criteria or directives 3. Reduction of hazardous waste, emission, etc. 4. Less consumption of resources, e.g., water, electricity, gas and petrol 5. Install environmental management system and ISO 14000 series 6. Providing environmental awareness seminars and training for stakeholders	1. Implementation of comprehensive material saving plan 2. Supervision system and technology transfer 3. Advanced green production technology 4. Management of documentation and information

Author, year and publication name	Eco-innovation main dimensions	
Cheng et al. (2013), Journal of Cleaner Production	***Eco-product innovation*** Our firm often places emphasis on developing new eco-products through new technologies to: 1. Simplify their packaging 2. Simplify their construction 3. Easily recycle their components 4. Easily decompose their materials 5. Use natural materials 6. Reduce damage from waste as much as possible 7. Use as little energy as possible	***Eco-process innovation*** Our firm often innovatively updates manufacturing processes to: 1. Protect against contamination 2. Meet standards of environmental law 3. Our firm often uses innovative technologies in manufacturing processes to save energy 4. Our firm often innovatively updates manufacturing equipment in manufacturing processes to save energy

Author, year and publication name	Eco-innovation main dimensions	
Chen et al. (2006), Journal of Business Ethics; Chen (2008), Journal of Business Ethics	*Eco-product innovation* The company chooses the materials of the product that: 1. Produces the least amount of pollution for conducting the product development or design 2. Consumes the least amount of energy and resources for conducting the product development or design 3. The company uses the smallest amount of materials to comprise the product for conducting the product development or design 4. The company circumspectly deliberates whether the product is easy to recycle, reuse, and decompose for conducting the product development or design	*Eco-process innovation* The manufacturing process of the company: 1. Effectively reduces the emission of hazardous substances or waste 2. Recycles waste and emissions that allow them to be treated and re-used 3. Reduces the consumption of water, electricity, coal or oil 4. Reduces the use of raw materials

Author, year and publication name	Eco-innovation main dimensions	
Wong (2012), European Journal of Innovation Management	*Eco-product innovation* 1. Our new products use less or non-polluting/ toxic materials 2. Our new products use environmentally friendly packing 3. When designing new product, we take recycling and disposal at end-of-life into account 4. Our new products use recycled materials 5. Our new products use recyclable materials	*Eco-process innovation* 1. Our production processes consume less resource (e.g. water, electricity, etc.) than those of our competitors 2. Our production processes recycle, reuse and remanufacture materials or parts 3. Our production processes use cleaner or renewable technology to generate savings (such as energy, water and waste) 4. We redesign our production and operation processes to improve environmental efficiency 5. We redesign and improve our products or services to meet new environmental criteria or directives

Author, year and publication name	Eco-innovation main dimensions		
Cheng et al. (2013), Journal of Cleaner Production	*Eco-product innovation* Our firm often places emphasis on developing new eco-products through new technologies to: 1. Simplify their packaging 2. Simplify their construction 3. Easily recycle their components 4. Easily decompose their materials 5. Use natural materials 6. Reduce damage from waste as much as possible 7. Use as little energy as possible	*Eco-process innovation* Our firm often innovatively updates manufacturing processes to: 1. Protect against contamination 2. Meet standards of environmental law 3. Our firm often uses innovative technologies in manufacturing processes to save energy 4. Our firm often innovatively updates manufacturing equipment in manufacturing processes to save energy	*Eco-organizational innovation* Our firm's management often: 1. Uses novel management systems to manage eco-innovation 2. Collects information on eco-innovation trends 3. Actively engages in eco-innovation activities 4. Communicates eco-innovation information with employees 5. Invests a high ratio of R&D in eco-innovation 6. Communicates experience among various departments involved in eco-innovation

Author, year and publication name	Eco-innovation main dimensions	
Chen et al. (2006), Journal of Business Ethics; Chen (2008), Journal of Business Ethics	*Eco-product innovation* The company chooses the materials of the product that: 1. Produces the least amount of pollution for conducting the product development or design 2. Consumes the least amount of energy and resources for conducting the product development or design 3. The company uses the smallest amount of materials to comprise the product for conducting the product development or design 4. The company circumspectly deliberates whether the product is easy to recycle, reuse, and decompose for conducting the product development or design	*Eco-process innovation* The manufacturing process of the company: 1. Effectively reduces the emission of hazardous substances or waste 2. Recycles waste and emissions that allow them to be treated and re-used 3. Reduces the consumption of water, electricity, coal or oil 4. Reduces the use of raw materials

Author, year and publication name	Eco-innovation main dimensions	
Wong (2012), European Journal of Innovation Management	*Eco-product innovation* 1. Our new products use less or non-polluting/ toxic materials 2. Our new products use environmentally friendly packing 3. When designing new product, we take recycling and disposal at end-of-life into account 4. Our new products use recycled materials 5. Our new products use recyclable materials	*Eco-process innovation* 1. Our production processes consume less resource (e.g. water, electricity, etc.) than those of our competitors 2. Our production processes recycle, reuse and remanufacture materials or parts 3. Our production processes use cleaner or renewable technology to generate savings (such as energy, water and waste) 4. We redesign our production and operation processes to improve environmental efficiency 5. We redesign and improve our products or services to meet new environmental criteria or directives

Author, year and publication name	Eco-innovation main dimensions		
Chiou et al. (2011) Transportation Research Part E-Logistics and Transportation Review (based on the items proposed by Chen et al. (2006) and Chen (2008))	*Green product innovation* 1. Using less or non-polluting/toxic materials (using environmentally friendly materials) 2. Improving and designing environmentally friendly packaging (e.g., less paper and plastic material used) for existing and new products 3. Recovery of company's end-of-life products and recycling 4. Using eco-labeling	*Green process innovation* 1. Lower consumption of resources, e.g., water, electricity, gas and petrol during production/use/disposal 2. Recycle, reuse and remanufacture of materials or parts 3. Use of cleaner or renewable technology to generate savings (such as energy, water, waste) 4. Redesign of production and operation processes to improve environmental efficiency 5. Redesigning and improving products or services to meet new environmental criteria or directives	*Green managerial innovation* 1. Redefine operation and production processes to ensure internal efficiency that can help to implement GSCM (Green Supply Chain Management) 2. Re-designing and improving product or service to obtain new environmental criteria or directives

Author, year and publication name	Eco-innovation main dimensions		
Montabon et al. (2007) Journal of Operations Management; Hofer et al. (2012) Journal of Operations Management	*Operational practices* 1. Recycling 2. Waste reduction (proactive) 3. Waste reduction (reactive) 4. Remanufacturing 5. Substitution 6. Consume internally 7. Packaging 8. Spreading risk 9. Market for waste 10. Energy: energy conservation, efficiency, recovery, fuel recovery 11. Money spent on environmental initiatives 12. Environmental information 13. Rewards as incentive for environmental project	*Tactical* 1. Supply chain management 2. Early supplier involvement 3. Environmental standard for suppliers 4. Environmental audits suppliers 5. Environmental awards 6. Environmental participation 7. Lifecycle analysis 8. Product development and innovation 9. Design (eco-design) 10. Design targets/goals 11. Environmental risk analysis 12. Environmental management systems 13. Communication with stakeholders	*Strategic* 1. Integration with long-term business strategy 2. Corporate policies and procedures 3. Environmental mission statement 4. Employee programs 5. Environmental departments/teams 6. Surveillance of the market for environmental issues 7. Strategic alliance

Author, year and publication name	Eco-innovation main dimensions		
Kemp and Foxon (2007) Project Paper Measuring Eco-innovation; Kemp and Pearson (2007) Final Report MEI Project About Measuring Eco-innovation	*Environmental technologies:* 1. Pollution control technologies including waste water treatment technologies 2. Cleaning technologies that treat pollution released into the environment 3. Cleaner process technologies: new manufacturing processes that are less polluting and/or more resource efficient 4. Waste management equipment 5. Environmental monitoring and instrumentation 6. Green energy technologies 7. Water supply 8. Noise and vibration control	*Organizational innovation:* 1. Pollution prevention schemes: aimed at prevention of pollution through input substitution, a more efficient operation of processes and small changes to production plants (avoiding or stopping leakages and the like) 2. Environmental management and auditing systems: formal systems of environmental management involving measurement, reporting and responsibilities for dealing with issues of material use, energy, water and waste (EMAS and ISO 14001 are examples) 3. Chain management: cooperation between companies to close material loops and to avoid environmental damage across the value chain (from cradle to grave)	*Product and service innovation:* 1. New or environmentally improved products (goods) including eco-houses and buildings 2. Environmental services: solid and hazardous waste management, water and waste water management, environmental consulting, testing and engineering, testing and analytical services 3. Services that are less pollution and resource intensive, such as is car sharing

Author, year and publication name	Eco-innovation main dimensions		
Lewis and Cassells (2010) International Journal of Business Studies	*Operational practices* 1. Reduce fuel costs 2. Optimize distribution network 3. Reduce polluting emissions to air and water 4. Set measurable targets for reducing energy usage 5. Treat or capture polluting emissions 6. Demonstrate a preference for green products in purchasing 7. Set measurable targets for reducing water usage 8. Select cleaner methods of transportation	*Waste management practices* 1. Dispose of hazardous waste appropriately 2. Have a recycling program 3. Use re-useable packaging 4. Minimize product packaging 5. Set measurable targets for waste reduction 6. Take back packaging 7. Take back end-of-life products	*Design for environmental practices* 1. Use non-hazardous materials 2. Design products to be easy to repair and/or last longer 3. Design products to be easy to disassemble and/or recycle 4. Replace virgin materials with recycled materials

Author, year and publication name	Eco-innovation main dimensions		
Dong et al. (2013) Journal of Engineering and Technology Management	*Pollutants/wastes (end-treatment)* 1. Water treatment works or facilities are available, such as biological treatment, and physical and chemical treatment equipment 2. Air pollution control projects or facilities are available, such as precipitators, desulfurization, denitrification or incinerators equipment 3. Solid waste or hazardous waste treatment projects or facilities are available, such as incinerator, landfill 4. Degraded, damaged or destroyed ecosystems in plants were recovered 5. Detection instruments were applied to environmental monitoring in plants	*Manufacturing technique (cleaner production)* 1. Cleaner production was assessed 2. Main equipment was technically modernized with capacity expansion 3. Process routes were improved or replaced 4. Raw materials were replaced 5. Energy system was improved or replaced, such as oil replaced by gas 6. Toxic raw materials were replaced or abandoned 7. Main waste was recycled in plants 8. Main waste was recycled through other company	*Products or services* 1. Environmental performance of products was evaluated 2. Products were marketed as environmental or green 3. Products were authenticated to be environmental, energy-saving or water-saving 4. Specific labels, such as energy efficiency grade, recyclable, energy- saving, were attached on the products 5. Specific environmental performance was addressed in the R&D of novel products 6. Specific environmental performance was indicated in the product packaging

Author, year and publication name	Eco-innovation main dimensions			
Rao and Holt (2005) International Journal of Operations & Production Management	1. Environment-friendly raw materials 2. Choice of suppliers by environmental criteria 3. Taking environmental criteria into consideration 4. Optimization of processes to reduce solid wastes 5. Optimization of processes to reduce air emissions 6. Use of cleaner technology processes to make savings (energy, water, wastes)	7. Use of waste of other companies 8. Recycling of materials internal to the company 9. Change to more environmental-friendly transportation 10. Providing consumers with information on environmentally friendly products and/or production methods 11. Substitution of environmentally questionable materials 12. Urging/pressuring supplier(s) to take environmental actions	13. Design considerations 14. Optimization of processes to reduce water use 15. Optimization of processes to reduce noise 16. Helping suppliers to establish their own EMS 17. Eco-labeling	18. Environmental improvement of packaging 19. Taking back packaging 20. Use of alternative sources of energy 21. Recovery of the company's end-of-life products

Toward a new definition of eco-innovation

Eco-innovation covers a variety of innovations, including products, processes, and organizational methods. They can be new (i.e., development of a new product, process or organizational method) or modified (in terms of significant improvements of an already existing product, process or organizational method). They can be either implemented or developed by the company (further divided into novelty in the company, novelty on the market where the company operates (domestic or global), or worldwide novelty (e.g. patented invention)). Eco-innovations can further stem from different reasons; the major driving force is competitive pressure, followed by market demand. Other effective drivers of eco-innovation in companies are managerial environmental concern and environmental policy instruments (the command-and-control instrument and the economic incentive instrument). Its outcome usually results in a decrease of the environmental burden (less adverse effects on the environment), as well as economic and competitive benefits to the company that adopts or develops them. In some cases, when significant improvements or developments occur, eco-innovations also benefit the company (higher company profitability, mostly stemming from cost savings). In sum, eco-innovations deliver several benefits to the company, including economic and competitive benefits and a higher degree of internationalization (i.e., entering more foreign countries, higher share of sales abroad and use of more operation types).

Based on the results of the conducted study, we define eco-innovations as follows. Eco-innovations encompass environmental and economic dimensions and include a variety of new or significantly improved products, processes, organizational methods and systems that are more environmentally friendly than the existing ones. They stem mainly from competitive pressure and customer demand. The most important outcome of eco-innovations (which can be intentional or a side effect) pertains to decreased adverse effects to the environment. From the environmental point of view, eco-innovations decrease the company's environmental burden, while from the economic point of view, being eco pays off, as they result in a gain of competitive and economic benefits, as well as a higher degree of internationalization.

Table 5: Main characteristics of eco-innovation

Eco-innovation – main characteristics	Eco-innovation – the strongest drivers	Eco-innovation – outcomes
Encompass environmental and economic dimensions	Competitive pressure	Decreased adverse effects to the environment (can be intentional or a side effect)
Include a variety of new or significantly improved products, processes, organizational methods and systems that are more environmentally friendly than the existing ones	Customer demand	Gain of competitive benefits
Decrease the company's environmental burden		Gain of economic benefits
Economically pays off		Higher degree of internationalization

Source: own elaboration based on survey results

Drivers of Eco-innovation

Motives for companies' adoption of eco-innovation may be legal, moral, financial, public relations image or human resources-related (Johnson 2009). Eco-innovations as such have its own peculiarities, which demand different treatment as regular innovations when exporing their drivers. Eco-innovation is distinct from general innovations mainly because of the production of two positive externalities, which require regulatory push/pull factors as a driver (De Marchi, 2012; Horbach, 2008; Rennings, 2000). Van den Bergh (2013) pointed out that eco-innovations cover a broader set of drivers than regular innovations. The reason for this lies in their inspiration; eco-innovations are driven not only by market opportunities but also by health, environmental and ethical concerns (van den Bergh 2013).

In the following pages, we provide a more detailed description related to the findings of past research on drivers of eco-innovation. First, we describe drivers of eco-innovation pertaining to the environmental policy instruments, followed by demand side, competition, society, expected benefits, sources of information, organizational capabilities and managerial environmental concern.

Environmental policy instruments

"Public environmental policy affects the way organizations think and act, and therefore, their adaptation to the challenges relating to protection of the natural environment" (Camisón 2010, 346). The driving forces from the government consist of governmental incentives, regulations and assistance (Zeng et al. 2011). In our study, we use the term environmental policy instruments, as have several researchers (Horbach et al. 2012; Murovec et al. 2012), and in testing hypotheses we further break them down into two individual components: the command-and-control instrument and the economic incentive instrument (as practiced by Li 2014). In this section, we describe in more detail the effect of environmental policy measures on eco-innovation's adoption.

The traditional view divides policy instruments for inhibiting environmental degradation into two general categories: "command-and-control" standards and market-based approaches (Popp et al. 2009 in Ford et al. 2014). Likewise, Li (2014) distinguishes the command-and-control instrument and the economic incentive instrument. Testa et al. (2014) summarize del Brío et al. (2003), who base their classification of policy instruments on how compulsory they are, resulting in the following three categories: direct regulation (command-and-control), marked-based instruments (economic instruments) and soft instruments. First, "polluter pays principle" (i.e., direct regulation) or command-and-control regulations include standards such as mandatory limitations and prohibitions (Camisón 2010). By direct regulations, which impose setting specific standards and limits on performance and/or requirements about the adoption of technologies and processes and later check their compliance with regulations through controls and inspections, companies are forced to adapt to new environmental changes (Camisón 2010). Second, we distinguish market-based or, more broadly, economic instruments. Zylicz (2010 in Testa et al. 2014) summarizes a number of potential advantages of market-based instruments over direct regulation: they provide a continuous incentive to reduce pollution (e.g., "pigouvian" taxes), are less costly to implement and can be applied through easily calculable parameters (e.g., energy or carbon taxes). Third, soft instruments comprise voluntary industry agreements, green procurement practices and environmental certification schemes (standards for EMS such as the worldwide ISO 14001 and the European EMAS) and can be extended to include incentives for other eco-innovations: products, processes and systems in organizations (Rennings et al. 2006; Camisón 2010). Regarding soft instruments, companies set their own objective and targets for environmental improvement and commit themselves publicly to pursuing these objectives and achieving these goals (Testa et al. 2014). Chappin et al. (2009) summarize that there are different mechanisms (e.g., coercion, consent and incentives) behind these instruments, which induce or inhibit certain behaviors. The underlying mechanisms are coercion for command-and-control regulation, consent for interactive regulation (voluntary agreements and covenants) and, lastly, incentives for positive and negative economic instruments (such as subsidies and taxes) (Chappin et al. 2009).

Camisón (2010, 347-348) distinguishes between five models of policy, which aim to encourage environmental adaptation within organizations.

Table 6: Five models of policy to encourage environmental adaptation within organizations

Type of policy	Description
Command-and-control regulation	Public administration develops coercive policies, followed by checks for compliance and imposed sanctions when the law is violated. This kind of regulation imposes ways in which companies have to adapt to new environmental challenges, and no flexibility in their application is tolerated. Moreover, command-and-control regulation is seen as the most appropriate approach in order to achieve objectives related to emissions in polluting industries, to establish norms related to products and processes, to establish direct regulation of the interaction between business-oriented activity and the natural environment and to restrict activity in some areas.
Market-based environmental approaches	These are coercive in nature as well, while they stimulate a more flexible adaptation in organizations. Flexible regulation gives the company the possibility to choose and apply the technology that fits better with their operations and strategy. There are also mechanisms that stimulate pollution control through total cost minimization. Thus, this approach is based on economic instruments and also establishes limits regarding pollution levels and applies controls and penalties. This kind of policy comprises marketable emission permits (related to quantity and used mainly in order to obtain cost savings) and emission charges (establishment of price or charge by emission and used in order to improve environmental quality through profit re-allocation).
Mandatory information-based environmental approaches	These also impose mandatory obligations on companies, but the requirements are related to information. Therefore, companies have to communicate transparently regarding their environmental adaptation to their stakeholders by providing environmental reports of their environmental impact or environmental external audits. Some countries (e.g., Canada, the United Kingdom and the United States) apply the following approach and publish list of organizations that do not comply with regulations or have poor environmental performance (for possible polluters, inspections and penalties are applied and public information is issued about annual polluting emissions).

Type of policy	Description
Voluntary, individual environmental policies	The essence of this approach is that organizations, by voluntary and individual agreement, apply proactive environmental policies, without any coercive public pressure. In this case, public administration plays a key role in providing positive incentives (tax and financial advantages and public contracts, which favor environmental adaptation). Green economic incentives also encompass insurers, which can reduce premiums in order to reward companies for their extraordinary environmental efforts.
Voluntary, cooperative environmental policies	This approach is used when organizations with voluntary, cooperative environmental approaches act through a network (green clubs or associations, interorganizational networks, strategic alliances) in order to promote agreements of cooperation. Norms and standards are established within these networks to produce benefits by supporting changes in the behavior of associated companies, and the benefits of belonging to this network can be exploited only if adhering to these norms. Therefore, companies included in this network have to demonstrate continuous fulfillment of auto-regulation if they wish to remain members. In addition, effective mechanisms of control and sanctions are also present here to detect and differentiate opportunistic behaviors of companies that join this network in order to exploit the benefits from its reputation.

Source: Camisón (2010)

Cleff and Rennings (1999) stressed that market-based instruments (e.g., taxes and tradable permits) are the environmental policy instruments with the highest dynamic efficiency (innovation efficiency), as they give permanent incentives for further cost-efficient emissions reductions. Meanwhile, regulatory regimes driven by technical standards (command-and-control system or voluntary agreements in which standards are negotiated between government and industry) are not cost-efficient, and the incentives for progress in emission reduction disappears after the standards are met (Cleff and Rennings 1999). The researchers (Cleff and Rennings 1999; Rennings et al. 2006) stressed that the basic lesson from environmental economics was the assumption of the superiority of market-based instruments (such as taxes and tradable permits) over regulations in relation to spurring innovation. These instruments have been identified as the environmental policy instruments expressing the highest innovation efficiency (having an advantage in giving continuous incentives for further, cost-efficient reductions of environmental impacts) among environmental economists (Rennings et al. 2006). In addition, Oltra and Saint Jean (2009) argue that market-based instruments and standards cannot be complete substitutes and thus are not sufficient in order to spur innovation – other policy instruments are needed as well. Here we add the research of Chappin et al. (2009), who distinguished between command-and-control regulation (top-down regulation), interactive regulation (covenants and voluntary agreements) and positive and negative economic instruments (subsidies and taxes). The results of the study focused on paper and board factories revealed that governmental environmental policies are perceived to be relevant but constitute just one of the factors that influence adoption of environmental innovation (Chappin et al. 2009). Therefore, positive economic instruments turned out to be important (but not the most important) factors in almost all adoption processes, while the role of command-and-control regulation is limited. Finally, the role of interactive regulation appears to be important for several factories in the latest period of adoption (Chappin et al. 2009). The results indicate that, for adoption of cogeneration of heat and power, the most important reason was a combination of high-energy prices and cost reduction or threat of additional regulation (Chappin et al. 2009). Camisón (2010) stressed that those companies that use voluntary approaches (cooperative and individual auto-regulation) have more advanced environmental adaptation, have higher environmental performance and, therefore, exhibit major adoption of preventive and proactive environmental practices. Companies that practice auto-regulation consequently deploy and implement preventive environmental productive tools, proactive environmental management systems, environmental reporting and measuring methods (Camisón 2010). On the other side, companies that are restricted to the command-and-control regulations and market-based approach are more likely to deploy end-of-pipe measures, while cleaner production and good green productive techniques are less likely to occur or occur to a lesser extent (Camisón 2010). Moreover, an information-based environmental approach seem to drive companies towards implementation of management practices (allowing them better communication and reporting towards stakeholders in companies) and prevention of negative environmental impacts (e.g., waste and emissions minimization plans, emergency plans, eco-efficiency indicator systems and environmental reports) (Camisón 2010, 359). Camisón (2010, 359) concludes that the diffusion of environmental good practices motivated by managerial voluntary initiatives, and especially cooperative auto-regulation, is better than promotion through legal impositions.

Among various interpretations of public policy, Nemet (2009) decomposed public policy into technology-push policy and demand-pull policy. The main difference between these two is the way in which the government encourages innovation. The demand-pull policy pertains to government actions, which affect the size of the market for a new technology (government implements measures that increase the private payoff to successful innovation), while the technology-push policy affects the supply of new knowledge directly (government implements measures that reduce the private cost of producing innovation) (Nemet 2009, 702). Based on his case study focused on inventions related to wind power, the results revealed that inventions were not responding positively to the strong demand-pull policies (Nemet 2009).

In addition, public procurement can play a significant role in inducing environmental innovation with the creation of niche markets for environmental technologies and by gathering feedback between experimental users and the emerging technology producers. A major potential source of innovation is demand, which has yet to be recognized in government policy as a key driver of innovation (Edler and Georghiou 2007). However, public demand oriented towards innovative products and solutions has the potential to improve delivery of public policy and services (Edler and Georghiou 2007). Hence, public procurement as a demand-oriented measure has the potential to shape market demand conditions and provide the diffusion of environmental innovation (Edler and Georghiou 2007; Oltra and Saint Jean 2009). Georghiou et al. (2013) conclude that, while public procurement is increasingly seen as an important potential instrument of innovation policy, the evidence of public procurement effectiveness is largely anecdotal. The whole set of instruments discussed in this paragraph defines an environmental policy mix with the purpose of promoting more sustainable systems of production and consumption (Oltra and Saint Jean 2009). Researchers (Oltra and Saint Jean 2009) emphasize the key role of properly designed regulation, which can strengthen technology-push and market-pull effects as well but cannot be considered a simple and systematic response to regulatory pressure (many other factors may affect the technological response of companies). Related to the double externality problem of environmental innovation, various innovation policy instruments (e.g., R&D subsidies, information diffusion, public procurement and cooperative research programs) can be used to correct these market failures deriving from the positive externalities of environmental innovations and thus provide favorable conditions for knowledge creation and innovation (Oltra and Saint Jean 2009).

Research works that focus on the effectiveness of policy measures on eco-innovation show different results. For instance, Murovec et al. (2012) have found a similar impact on environmental investments through group of measures that consist of financial incentives, tax measures, regulation and other non-market instruments. Similarly, Mickwitz et al. (2008), who explored effects of regulations, taxes and economic incentives on environmental innovations, rejected the popular claims pertaining to the ineffectiveness of regulations on eco-innovations. Their results indicate that, in some cases, regulations can result in the emergence or diffusion of new and more environmentally sound technologies, while the economic instruments were acknowledged as the most efficient policy instruments for triggering innovations (Mickwitz et al. 2008). Whether economic instruments will become efficient means to support the diffusion/emergence of environmental friendlier technologies largely depends on the political feasibility of setting economic instruments at sufficiently high levels (Mickwitz et al. 2008). Therefore, we should not generalize the role of policy instruments for innovation and diffusion without considering the specific characteristics of the situation (regulations can hinder innovations in some cases, and taxpayers' money can be wasted on inefficient R&D subsidies, but this conclusion is dangerous to generalize because is not self-evident in all cases) (Mickwitz et al. 2008).

Regulation

Due to the double externality problem (Rennings 2000), eco-innovations clearly differ from other innovations, and regulation becomes a key prerequisite for them (Walz and Köhler 2014). Heyes and Kapur (2011, 337) argue that "environmental regulation aims to correct static market failures due to externalities but also to provide incentives for innovation and adoption of better abatement technologies".

Therefore, regional, national and cross-national regulations exert effects on the extent of environmental products and a company's sustainable new product development (Gmelin and Seurin 2014). Past empirical works have revealed that regulatory design (considering its stringency, flexibility and limiting uncertainty) is a key factor affecting companies' innovative response (Oltra and Saint Jean 2009). Stringency relates to the absolute reduction of environmental impacts as well as to the fact that compliance using existing technology is either costly or not possible; thus, stringent regulations should provide a spur for environmental innovation (Oltra and Saint Jean 2009). Stringent regulation is a key factor that paves the way for technological environmental innovations, while command-and-control regulations impose cumbersome application procedures (also prescribing the best available technology, which must be implemented) (Huber 2008). Usually performance standards are preferred and completed by the push and/or pull financial instruments – green taxes, emissions trading and subsidies (Huber 2008). Thus, environmental standards increasingly force developing countries to comply with global rules in order to enter global markets (Radonjič and Tominc 2006).

Moreover, regulatory pressures derived from current and anticipated regulations play an important role in spurring voluntary environmental innovation (Khanna et al. 2009). Therefore, expected future regulations play an important role in encouraging eco-innovation's adoption. Expected future regulations have been found to be highly important for the adoption of environmental product innovations (Horbach et al. 2012). Future regulations (such as anticipation of stringent environmental regulations for reducing currently unregulated pollutants), especially those targeted at toxic releases, can affect the adoption of pollution prevention strategies and induce technological innovation by firms, which aim to reduce pollution at the source (Porter and van der Linde 1995b; Khanna et al. 2009). Rehfeld et al. (2007) found a positive relationship between environmental policy and environmental product innovations; therefore, 68.9% of all companies that have realized an environmental product innovation consider compliance with existing and future legal requirements to be an important innovation goal.

Hence, regulation has been recognized as an important instrument with which companies are pushed towards improved environmental performance (Madsen and Ulhøi 2001). Moreover, regulations are significantly more important for eco-innovation than for any other kind of innovation (Horbach et al. 2012). Compliance with legal demands is the most basic environmental requirement for all business, while SMEs are even more affected by environmental regulations than larger business because of the lack of necessary resources (Lee 2009). The study undertaken by Dangelico and Pujari (2010), which focused on case studies comprising Italy and Canada, found that compliance with regulations is one of the motivations for companies to go green (i.e., develop green products). The authors (Dangelico and Pujari 2010) also expose the frequency of declarations and regulations, such as the restriction on chlorofluorocarbon (recommended by the Montreal Protocol, 1987); the restriction on CO_2 (recommended by the Kyoto Protocol, 1997); and the European Community directives on the restriction of the use of certain hazardous substances (RoHS) and on waste electronics and electrical equipment (WEEE), effective since 2006. Thereby, the following four agreements are related to remediation of universally recognized environmental problems: Agenda 21[8] (covers economic and social development that is consistent with future generations' needs); the Montreal protocol (which covers ozone depletion substances); the Kyoto protocol (covers global warming gas emissions); and the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal (Müller and Sturm 2001). Furthermore, the executives from the conducted interviews add that regulations are not just compelling companies to introduce green practices and thus presenting constraints to them but also act as a "caution for avoiding risks of activity breakdown, money losses or damage to the company image" (Dangelico and Pujari 2010, 474). Related to the findings of Popp et al. (2011), results indicate that regulations play a role in both development and diffusion of environmental technologies (pertaining to the alternative bleaching technologies in the pulp industry).

Environmental regulation may force companies to realize economically benign environmental innovation, because companies are generally not able to recognize cost-saving potentials such as energy or material savings (Porter and van der Linde 1995b; Horbach 2008; Belin et al. 2011). With regard to the sustainable energy sector, environmental regulation is positively correlated with it and may affect international competitiveness in the export of energy technologies, while Costantini and Crespi (2010) suggest that environmental policies should be supported by technology policies. Studies of environmental innovation over the last 15 years have found that regulation is the most important stimulus for environmental innovation (Blum-Kusterer and Hussain 2001; Randjelovic et al. 2003; Green 2005 in Triebswetter and Wackerbauer 2008; Belin et al. 2009; Qi et al. 2010; Weng and Lin 2011; Chassagnon and Haned 2014). Prioritizing the existing regulations and complying with them has affected the most eco-product and eco-organizational innovations (Horbach 2008; Triguero et al. 2013). Meanwhile, environmental regulations are identified as the most important driver of eco-innovation, as they can change the level and nature of competition between firms (Porter and van der Linde 1995a; Kammerer 2009; Doran and Ryan 2012). When companies deal with more strict environmental regulations, they implement significantly more environmental product innovations, while there is weakly significant positive effect of stringent regulations on the novelty of environmental product innovations (Kammerer 2009). In other words, this means that more stringent regulations lead to environmental product innovations and their broad application, but they are not necessarily novel to the market (Kammerer 2009). In conclusion, environmental regulations intended to stimulate adoption actually lead to implementation of eco-innovation (Porter and van der Linde 1995b; Beise and

Rennings 2005; Lai and Wong 2012) and can also enhance competitiveness (Porter and van der Linde 1995b) and may create lead markets (new markets, export opportunities for the pioneering country), but the regulations have to comply with international regulations, global demand or regulatory trends (Beise and Rennings 2005). Thereby, Porter and van der Linde (1995b) add that greater innovation and innovation offsets can be achieved by imposing stringent regulation. Therefore, incremental innovation and without innovation (i.e., end-of-pipe or secondary treatment solutions) are spurred by lax regulation, while more stringent regulations induce more fundamental solutions, such as reconfiguration of products and processes (Porter and van der Linde 1995b). More stringent environmental regulation provides a positive impulse for increasing investments in advanced technological equipment and innovative products (Testa et al. 2011). The findings of Yang et al. (2012b) give support to the Porter hypothesis, which suggests that more stringent environmental regulations may enhance industrial competitiveness rather than lower it. Furthermore, if governmental regulations and institutional arrangements are correctly designed, they consequently positively affect eco-innovations (Porter and van der Linde 1995a; Beise and Rennings 2005; Testa et al. 2011; Murovec et al. 2012). Therefore, Jaffe and Palmer (1997) have distinguished and further divided the Porter hypothesis into two components: the weak version, which posits that environmental regulation spurs innovation, and the strong version, which states that innovation increases profits and competitiveness of the regulated firm more than it offsets the induced cost. Böhringer et al. (2012) examined the weak and the strong version of the Porter hypothesis and found support for the strong version, suggesting that improved environmental and economic performance can be accomplished through well-designed environmental regulations that spur environmental investment (induce innovation).

Properly formed regulations can serve at least six purposes (Porter and van der Linde 1995b, 99-100):

- Regulation can signal companies about their resource inefficiencies and potential technological improvements;
- Regulation focused on information gathering can lead companies to major benefits by raising corporate awareness;
- Regulation encourages investments to address the environment by reducing the uncertainty that these investments will be valuable;
- Regulation, through its creation of pressure, spurs innovation and progress (pressure for innovation can come from strong

competitors, demanding customers or rising prices of raw materials; while also properly crafted regulation can provide such pressure);
- Regulation "levels the transitional playing field", by ensuring that, during the transition period to innovation-based solutions, one company cannot opportunistically gain a position as well as avoid the environmental investments;
- Regulation is "needed in the case of incomplete offsets", meaning that innovation cannot always offset the cost of compliance in total; thus, in such cases, regulation is necessary in order to improve environmental quality.

On the one hand, Holtbrügge and Dögl (2012) pointed out that companies cannot be trusted to self-regulate with regard to environmental responsibility and that, therefore, external pressures (policy regulations, strict regulations and other political incentives) appear to be the most effective method to encourage companies to implement environmental practices that are not only good for firm performance but also best for the environment. In addition, when and if companies violate the law or fail to achieve the standard of prescribed government regulation, the government will force companies to follow the regulations through penalties or even by stopping their business (Zeng et al. 2011). On the other hand, environmental regulations can also reduce product costs by showing how to eliminate costly materials used in processes, reduce unnecessary packaging, simplify designs or use valuable materials that are more easily recyclable and recovered (Porter and van der Linde 1995b). Regulations play an important role in implementation of typical end-of-pipe technologies, such as other air emissions (SO_2 or NOx) as well as dangerous substances and noise reduction technologies, water and soil protection (Horbach et al. 2012). Moreover, regulations have the top priority and ensure that green manufacturing practices are mandatory, while certifications and internal and external audits are used for cultivating them (Govindan et al. 2014). Some environmental technology fields are more market oriented; for instance, end-of-pipe technologies in particular are more regulation driven (Horbach et al. 2012). Meanwhile, for the adoption of eco-innovations with regard to reduction of CO_2 and energy consumption, the results show that the most effective driving force is a combination of regulations and taxes with subsidies (Veugelers 2012). Proper regulations can also influence environmental technologies; leading to the conclusion that these regulations should be flexible and oriented towards specific targets to promote innovations based on the product lifecycle and not just induce innovations in order to achieve the specific recycling targets (Yabar et al. 2013).

Leitner et al. (2010) pointed out the complexity of the relationship between regulation and innovation and suggested a focus on "smart" regulation, which has a positive effect on the environment as well as innovation, leading industries toward the common goal of sustainability. "Smart" regulation is seen as more effective and efficient than regulation by itself in order to achieve environmental goals and represent environmental issues to firms as a business challenge and opportunity (Leitner et al. 2010).

Lastly, some research works lead also to the opposite findings from those mentioned above. Frondel et al. (2008) found that policy stringency demonstrates a positive effect on environmental innovation and abatement activities, while it is not associated with EMS adoption. Moreover, they found that no single policy instrument has demonstrated a tendency to push companies towards EMS adoption (Frondel et al. 2008). Likewise, Eiadat et al. (2008) found a negative and statistically significant effect of environmental regulation on the adoption of environmental strategy.

Taxation (taxes and tax incentives) and subsidies

Brouillat and Oltra (2012) in their simulation model found that tax subsidies and stringent norms seem to be the only instruments with the potential to bring radical innovations and significant changes in product designs. Furthermore, tax subsidies impact only recyclability, while the whole set of product characteristics is affected by stringent norms (Brouillat and Oltra 2012). Based on French service firms, Desmarchelier et al. (2013) found that service firms are sensitive to environmental policies, while the eco-tax policy seems to be more effective than the consumer information policy. Tax measures have a positive and significant effect on environmental investments (Murovec et al. 2012). In addition, taxation has also been shown to be a driver of eco-innovation (Horbach et al. 2012). Subsidies especially trigger environmental innovations, mostly because of negative external effects of environmental problems (Horbach 2008). This means that public funding of private R&D activities is used as an innovation policy instrument by governments and can directly reduce the companies' R&D costs (Aschhoff and Sofka 2009). Companies can apply to the call for public support and after the government selects specific R&D projects by choosing those, which could not been carried out without their support and present a high social return (hence not all companies benefit from R&D subsidies; Aschhoff and Sofka 2009). Based on a Slovenian sample, a positive and significant impact of financial incentives on investments in environmental technologies was found (Murovec et al. 2012). In the research of Horbach et al. (2012), subsidies turned out to be very important for energy and emission reduction products and in particular for CO_2 emissions, which is a relatively young innovation area and largely depends on basic research activities financed by public funds (or, e.g., by feed-in tariffs). Yalabik and Fairchild (2011) pointed out the effectiveness of subsidies especially regarding "dirty" industries (which, with received subsidies, free up the firm's resources and invest in environmental innovation). As they provide financial support for companies, public subsidies can be classified as a direct instrument, mainly focused on the development of new technologies (Aschhoff and Sofka 2009). In contrast to the aforementioned findings, the results of Demirel and Kesidou (2011) indicate that environmental taxes do not have any significant impact on eco-innovations in the UK (focusing on end-of-pipeline pollution control technologies, integrated cleaner production technologies and environmental R&D).

In conclusion, some researchers (Zeng et al. 2011; Weng and Lin 2011) among the environmental policy instruments also counted in government assistance for eco-innovation adoption. Zeng et al. (2011) have defined government assistance as assistance such as technologies, information about environmental protection, project finance and other support with regard to corporate environmental/green products and technologies. Weng and Lin (2011) found that governmental support and regulatory pressure affect green innovation adoption, and, furthermore, government as a regulator should provide sufficient financial, technical and educational resources for the SMEs to adopt green innovations.

Demand side

Companies are challenged to satisfy consumers' "green" demands by providing proper design, production, sales and recycling of products (Sarkar 2013). Environmentalism as a consumer attitude is increasing in importance worldwide, meaning that consumers are willing to choose environmental friendly products and prepared to pay higher prices for them (Chen 2013). Consumers are gaining environmental awareness regarding the environmental impacts of their purchasing choices, and they consequently put more pressure on companies to reduce these impacts (Kemp and Foxon 2007). Therefore, researchers (Doran and Ryan 2012) argue that consumer perception is also a strong driver of eco-innovation. Empirical evidence claims that the pressure to eco-innovate is the strongest when operating in product markets, which are close to final customers (Zeng et al. 2011; Doran and Ryan 2012). Market demand is critical in today's business environment, because consumers require products to be produced in an environmentally friendly way (Chiou et al. 2011). Other researchers (Popp, Hafner, and Johnstone 2011) emphasize the consumer demand and expose the fact that most of the early demand regarding the reduction of chlorine during the production process derived from consumers. Companies that believe that customers expect environmentally friendly products also show a greater likelihood to eco-innovate (Doran and Ryan 2012). Customers' demands and preferences have the potential to affect the direction and rate of eco-innovation (Horbach 2008).

Thus, Van Hemel and Cramer (2002), in their research on eco-design, found that customer demands are the most influential driver of eco-design innovations. Customer benefit plays a key role in environmental product innovation (Kammerer 2009), and market demand is positively correlated to both green product innovation performance and firm performance (Lin et al. 2013a). Green products will generate consumer demand and spur firms to implement green innovations, because of the public benefits and the consumer private environmental benefits (such as energy savings) (Kammerer 2009). Consumer benefits, besides cost and energy savings, can also pertain to more efficient appliances; improved product quality and durability; better repair, upgrade and disposal possibilities; and reduced health impacts (Kammerer 2009). Moreover, customer pressure has a significant influence/impact on green innovation adoption in SMEs (Weng and Lin 2011) and is also positively related to the implementation of green logistics management by Chinese manufacturing exporters (Lai and Wong 2012). In addition, a study encompassing Vietnamese hotels has shown that customer demand has a certain effect on the likelihood of adoption of environmentally friendly practices (Le et al. 2006). However, ISO 14001 accreditation is also often market driven in the sense that companies adopt it because customers require/demand it or competitors have it (King et al. 2005 in Heras-Saizarbitoria et al. 2011; Potoski and Prakash 2005 in Heras-Saizarbitoria et al. 2011; Prajogo et al. 2012).

Empirical evidence identifies customer requirements as an important source of eco-innovations, especially of products with improved environmental performance and process innovations that increase material efficiency and reduce energy consumption, waste and use of dangerous substances (Horbach et al. 2012). Kammerer (2009), in his research on

German appliance manufactures, found that customer benefit plays a key role in environmental product innovations; thus, customer benefit not only fosters the implementation of environmental product innovations but also spreads its application and increases their level of novelty. German firms are orientated more towards eco-product innovations; therefore, market orientation plays a significant and important role with regard to eco-innovation adoption (Belin et al. 2011). In addition, environmental product innovation is significantly driven by the strategic market firms' behavior (Rennings 2000).

Brécard et al. (2009) stressed that the willingness to pay more for a green product that for a "brown" product reflects a higher marginal utility when buying the former (in addition to revealing the consumer's environmental preferences). According to Manget, Roche and Münnich (2009 in Doran and Ryan 2012), customers from the following countries are willing to pay from five to ten percent more for green goods: Canada, France, Germany, Italy, Japan, Spain, the United Kingdom and the United States. Guagnano (2001 in Doran and Ryan 2012) found that 86% of customers reported a willingness to pay more for household products if they are less harmful to the environment. Also, Kaenzig et al. (2013), in their survey encompassing 4968 experimental choices made by 414 retail consumers, found that German electricity customers expressed an implicit willingness to pay a premium of about 16% for electricity from renewable sources (to upgrade from the current default electricity mix in Germany to a more environmentally friendly default electricity mix). In contrast, Rehfeld et al. (2007) has shown that the higher prices of environmental product innovations seem to be one of the major reasons for the low performance of environmental products or commercial exploitation.

Research conducted in Sweden by Jansson et al. (2010) found that once consumers adopt the use of eco-innovation, they demonstrate more willingness to purchase it again, and eco-innovation becomes an important and integrated part of their lives. The researchers found a strong positive influence of personal norms on willingness for the behaviors and a negative influence of habit strength, which is particularly the major barrier in strong car habits, where consumers do not express willingness for alternative fuel vehicle adoption nor willingness to reduce the negative impact of car use (Jansson et al. 2010). Even though, in the sector of cars and fuels, car habits have turned out to be important, while customer's values, beliefs and norms are no less essential. Furthermore, researchers (Jansson et al. 2010; Jansson et al. 2011) suggested the use of attitudinal factors (values, beliefs and norms) and habits to be more effective when using a market segmentation approach instead of just applying socio-demographic variables. Moreover, Belin et al. (2009) in their research on samples from France and Germany found that eco-innovation seems to be less correlated to demand pull effects than innovation in general (an explanation could be that eco-innovations are more oriented towards process and organizational innovations). Kesidou and Demirel (2012) found that consumer demand for environmentally friendly products and processes encourages a firm's decision to invest in eco-innovation (they apply a minimum level of eco-innovation activities to respond to the market pressure, but they do not necessarily invest large amounts of resources into eco-innovation). Firms initiate the implementation of eco-innovations in order to satisfy the minimum of customer and social requirements, while customer requirements do not affect the level of investment in eco-innovation, because increased investments in eco-innovations are driven by other factors: stricter regulations, cost savings and the firm's organizational capabilities (Kesidou and Demirel 2012). In contrast, some researchers (Horbach 2008; Lee 2009) argue that customer demand represents one of the essential drivers of eco-innovations, because demand factors – especially calls for corporate responsibility and consumer demand for environmentally friendly products and processes – affect the firm's decision to invest in eco-innovation (Kesidou and Demirel 2012). Customer pressure deriving from environmentally conscious core customers influences deployment of green practices in manufacturing and ranked as third in importance as a driver (Govindan et al. 2014). Dealing with environmentally conscious customers, who are also companies' core customers, forces companies to implement green practices to avoid losing them (Govindan et al. 2014). Popp et al.'s (2011) study on the pulp sector demonstrated that the pressure imposed by consumers outperformed the effect of regulations (innovations occurred before regulations were in place); consumer demand for chlorine-free paper induced environmental technologies. To conclude, voluntary agreement and consumer perception variables together push firms to engage in at least a minimum level of eco-innovation in response to industry and social pressures and expectations (Doran and Ryan 2012).

Competition

Competitiveness has been identified as one of the major motivations for environmental responsiveness. Bansal and Roth (2000, 724) defined driver "competitiveness" as "the potential for ecological responsiveness to improve long-term profitability". In a highly competitive market, implementation of green product innovation is required in order to achieve green competitive advantage through differentiation of a firm product (Lin et al. 2013a). Leonidou et al. (2013a) found that when competitive intensity is low, environmental marketing strategy positively affects competitive advantage, while this association gets stronger under high competitive intensity conditions. Furthermore, ecological responses that improved competitiveness encompass energy and waste management, source reductions, resulting in a higher output for the same inputs (process intensification), eco-labeling, green marketing and the development of eco-products (Bansal and Roth 2000). Firms motivated by competitiveness expect that their ecological responsiveness will lead to sustained advantage and improved long-term profitability (Bansal and Roth 2000). Competitive advantage as an antecedent of eco-innovations has a positive impact on environmental marketing strategy and a greater effect on external environmental orientation (focused on the firm's relationships with external stakeholders) and environmental corporate strategy in the industry of moderate environmental impact sectors (Banerjee et al. 2003), while it had an even greater effect on internal environmental orientation (focused on the development of corporate value and vision statements, typically from top management) in the industry of high environmental impact sectors (Banerjee et al. 2003). Therefore, the development of green products can represent a tool for achieving competitive advantage (Dangelico and Pontrandolfo 2010). Regarding the market concentration, Inoue et al. (2013) found that companies with fewer than five competitors do not have to fight short-term competition and, therefore, can afford to devote their resources to environmental R&D activities in a long-term perspective. The results indicate that if a company operated in an oligopolistic market, the environmental R&D expenditures as a percentage of total R&D expenditures may be higher (Inoue et al. 2013). Moreover, Yalabik and Fairchild (2011) examined the combination of consumer, regulatory and competitive pressure effects on the firm's investment in environmental innovation, and they found that competition can be considered an effective driver of environmental innovation, when dealing with environmentally sensitive customers. When dealing with such customers, regulatory pressure also turns out to be an effective driver of environmental innovation; hence, the findings show that competition over environmentally sensitive customers has the potential to improve the effectiveness of environmental pressures (Yalabik and Fairchild 2011). Meanwhile, the empirical results of Li (2014) demonstrate a positive and significant impact of competitive pressure on environmental innovation practices, indicating the importance of strategy by providing green products through environmental innovation in order to establish a green image, increase market share and achieve sustainable development in an increasingly intense competitive environment.

Society

Among the variety of factors that influence companies' decision to invest in or implement eco-innovations and "become eco-friendly" is pressure from society, which can be composed of many elements: community requirements, environmental associations and media exposure (Zeng et al. 2011).

According to Qi et al. (2010), the positive or negative public opinion on a firm's environmental performance strongly affects the way firms do business, because of their close association with business strategies in any industry. Public pressure (pressure from the public and media) seems to be an essential driver of eco-innovations (Horbach 2008; Lee 2009) and may stimulate companies to become more eco-friendly (Bansal and Roth 2000). In recent years, developing countries such as China experienced increased growth of environmental non-government organizations (ENGOs), which are gradually becoming active players in the development of environmental policies (Yang 2005 in Qi et al. 2010). NGOs, along with local governments, have played a key role in the promotion of low carbon techniques (Shi and Lai 2013). NGOs have changed the means of communication with enterprises; they do not attack firms for unawareness of environmental issues but rather offer them consultation services on how to become green (Yarahmadi and Higgins 2011). In addition, civil society actors such as NGOs, scientific organizations and the media, refuse to interact only with government and thus more often establish a direct relationship with the business community where both confrontation and cooperation are present (Jänicke 2008). NGOs and local communities play an active role in the relationship with the business community related to the environmental proactive companies; this relationship can result in providing access to knowledge networks, political dialogs and potential sales (Yang et al. 2012a). Hence, NGOs and communities become actors and not just the foundation for developing innovations (Yang et al. 2012a).

In conclusion, project stakeholders, including the community, ENGOs (environmental non-governmental organizations) and employees, generate effective pressure on the firm and demand better environmental performance (Qi et al. 2010). Therefore, firms are forced to implement green practices in response to both government regulations and project stakeholders (Qi et al. 2010). In contrast to the previous studies, Blum-Kusterer and Hussain (2001) found that in the pharmaceutical industry, the pressures of NGOs were relatively insignificant; they presume that this insignificant effect is due to respect to biodiversity appropriation and exploitation, as well as the ethics of drug sales in the developing world.

Expected benefits from eco-innovation

Companies also start to deploy eco-innovation in order to pursue benefits derived from its implementation, including cost savings (Horbach 2008; Belin et al. 2011; Demirel and Kesidou 2011; Horbach et al. 2012; Klewitz et al. 2012; Triguero et al. 2013; Chassagnon and Haned 2014) and improvement of firm reputation (Agan et al. 2013; Chen 2013; Sarkar 2013). Shrivastava (1995) summarized a few other benefits deriving from successful eco-innovation implementation: improved relationships with local communities, access to new green markets and gain of competitive advantage. Moreover, Sarkar (2013) distinguished direct benefits (cost savings, greater resource productivity, better logistics and sales from commercialization) and indirect benefits (better image, better relations with customers, suppliers and authorities, health and safety benefits, greater worker satisfaction and enhanced innovation capability).

"Companies make their offerings competitive through price/quality or prestige/image strategies from their competitors but eco-friendliness and social responsibility can make companies more profitable on a sustainable basis" (Sarkar 2013, 185). Corporate image as an expected soft benefit was found to be the strongest driver of environmental activities (Agan et al. 2013), while Sarkar (2013) notes that improved company image is an indirect benefit of innovation. It is well known that firm reputation is fragile and takes time to build; therefore, it is easier to destroy a good reputation than to create a solid one. Companies are integrating corporate social responsibility and environmental awareness in their business strategies with the goal of gaining reputational advantages (Hillestad et al. 2010). A reputation that marks a company as environmentally aware, is difficult or even impossible for competitors to imitate and, therefore, is valuable in its contribution to competitive advantage (Hillestad et al. 2010). Improved overall image or prestige of companies, followed by increased customer loyalty or support sales efforts, consequently can derive from companies' efforts to reduce pollution and other environmental impacts (Ambec and Lanoie 2008). A firm's reputation is enhanced by adoption of environmental innovation strategy (Eiadat et al. 2008). However, adoption of environmental values in companies' culture, with the goal to develop and gain a good reputation in the marketplace, is not enough; environmental commitment must be translated into specific strategies that enable customers, community and other relevant stakeholders to identify and value it (Fraj-Andrés et al. 2009).

Firms aim to maintain a certain image, which is consistent with the current external regulatory pressures (Holtbrügge and Dögl 2012). They focus on maintaining this image and avoiding a severe backflash from their stakeholders for not complying with existing regulations and therefore, putting firm reputation in jeopardy (Holtbrügge and Dögl 2012). Also, industry norms and monitoring systems ensure that non-complying behavior is punished, primarily through loss of reputation and social pressures, which eventually have an impact on commercial activity (Pacheco et al. 2010). Furthermore, according to Shrivastava (1995) environmental technologies help companies to establish a social presence on markets where they operate, gain social legitimacy and maintain good public relations and corporate image. Improved firm reputation through the implementation of sustainable practices is an important driver for corporate businesses (Pellegrini-Masini and Leishman 2011; Klewitz et al. 2012); in particular, green product development seems to be driven by improvement of reputation and corporate image (Dangelico and Pujari 2010). Based on a sample of Italian companies, image improvement was found in 80% of companies to be the strongest stimulus for the introduction of environmental management systems (ISO 14001) (Salomone 2008). Moreover, as key factors in customers' purchasing decisions are brand recognition and acceptance, having a "green brand" will become increasingly important for companies (Kemp and Foxon 2007). Therefore, voluntary agreements have the largest impact on eco-innovation implementation in firms; furthermore, firms are willing to pay to brand themselves as eco-friendly (Doran and Ryan 2012). Hence, Sarkar (2013) points out that the "going green" movement continues to build momentum, and thus firms are realizing that not becoming eco-friendly can put their business in risk (by not "going green," firms risk being branded as socially irresponsible, being a target of criticism, being vulnerable also by risking their brands). As many new firms are starting operations with green brands, older ones want to re-brand their products in order to be more eco-friendly (Sarkar 2013). Firm reputation seems to be stronger driver of green practices in developed countries than in developing ones (Govindan et al. 2014). Several researchers have identified corporate image and reputation as one of the strongest drivers of environmental activities (Eiadat et al. 2008; Hillestad et al. 2010; Pellegrini-Masini and Leishman 2011; Holtbrügge and Dögl 2012; Klewitz et al. 2012; Agan et al. 2013).

Among the other expected benefits that can be seized from eco-innovation are cost savings, which play an important role in inciting eco-innovation implementation and motivating the reduction of energy and material use (Horbach et al. 2012). However, cost-saving potentials (e.g., energy or material savings) of environmental innovation are often not recognized by firms (Porter and van der Linde 1995b; Horbach 2008; Belin et al. 2011). Cost savings constitute one of the main reasons for investments in eco-innovations, while lack of knowledge about the potential of technologies for material and energy savings and the lack of immediate results act as barriers to the implementation of eco-innovations (Pereira and Vence 2012).

Better environmental performance and environmental innovations can lead to several reductions of costs in the following areas: cost of material, energy and services; cost of capital; cost of labor; risk management and relations with external stakeholders (Ambec and Lanoie 2008). Meanwhile, Horbach (2008) argues that cost savings represent a significant determinant for environmental innovations compared to other innovations; moreover, the chemical industry, which is an environmentally intensive industry, realizes more innovations with environmental effects than other sectors. Cost savings (especially material and energy savings) strongly trigger eco-innovations in Germany and in France (Belin et al. 2011), where they play a very important role as a trigger of eco-innovation implementation (Horbach 2008; Horbach et al. 2012). SMEs can benefit from cost savings (increased energy efficiency) when dealing with sustainability-related issues (Klewitz et al. 2012). In addition, environmental management practices that are associated with cost savings are as follows: recycling (through more efficient use of materials, they reduce the cost structure), proactive waste reduction and remanufacture (both of which focus on lowering cost structure) (Montabon et al. 2007). Shrivastava (1995) suggested that companies can make large financial gains by waste reduction, energy saving, material reuse and addressing lifecycle costs. Similarly, the findings of Govindan et al. (2014) emphasized the importance of cost savings, especially because companies have acknowledged that recycling leads to lower costs (instead of purchasing original material, they reuse it and consequently lower the costs).

Additionally, cost savings are most closely associated with the most advanced eco-innovations, because they derive from elimination or reuse of waste, and they appear to be significant in driving investment in environmental R&D, while less advanced eco-innovations have a lower potential for creating such savings for companies (Kesidou and Demirel 2011). The findings of Triguero et al. (2013) demonstrate the significance of cost savings only for eco-process innovations (Triguero et al. 2013). Therefore, environmental technologies offer the opportunity to decrease operating costs by exploiting ecological efficiencies (Shrivastava 1995).

Sources of information

For successful implementation, eco-innovations also require sources of knowledge and information. Prior research works (Bansal and Roth 2000; Yarahmadi and Higgins 2012) argue that, to acquire competency (access to resources such as funds, knowledge and skills) and to obtain legitimacy and compliance with environmental laws and regulations, firms cooperate with the following institutions: governmental agencies, NGOs, suppliers, customers and industry associations. They also argue that cooperation with competitors and knowledge leaders is spurred only by competency-oriented motivation (Yarahmadi and Higgins 2012).

As aforementioned, eco-innovations require more external sources of knowledge and information than innovations in general do (Belin et al. 2011). According to Belin et al. (2011), external information and knowledge are considered an important source for eco-innovation-related activities, while internal sources such as R&D are less important. It has been found (Belin et al. 2011) that, to French eco-innovators universities, consultants and conferences are very important as information sources, while to German eco-innovators state-dependent research institutes represent an important source. Belin et al. (2011) found a similar picture between the two countries (France and Germany) for external sources, while the results are more distinct with regard to internal sources of information. In France, eco-innovation activities depend more on external sources of information, although internal sources also remain very important, while Germany relies on and uses more external information (public sources) and fewer internal sources of information (Belin et al. 2011). The results of De Marchi's (2012) survey, which focused on technological environmental innovation of Spanish manufacturing firms, indicate the importance of firms' cooperation with external partners when dealing with environmental innovation, while the most important external partners seem to be suppliers and scientific agents (including universities, consultants and research centers). Environmentally innovative firms cooperated with external partners on innovation to a greater extent than other innovative firms and engaged resources on a continuous basis for internal R&D activities and cooperation with external partners (De Marchi 2012; De Marchi and Grandinetti 2013). Regarding development of environmental innovations, companies demonstrate a higher recourse to external knowledge, including use of external sources of information such as R&D from external firms and cooperation (De Marchi and Grandinetti 2013).

Robin and Schubert (2013) evaluated the relationship between innovation activities in general and cooperation with public research institutions in France and Germany. The findings show that cooperation with public research increases product innovation, while there is no impact on process innovation (Robin and Schubert 2013). In summary, eco-innovations demonstrate a greater tendency towards knowledge and information intensity than do innovations in general, and R&D is not the most important source of information. Hence, several researchers (Belin et al. 2011; De Marchi 2012; Pereira and Vence 2012; Yarahmadi and Higgins 2012; De Marchi and Grandinetti 2013) have argued that, regarding environmental innovation, companies enter into cooperation with external partners (external sources of information) to a greater extent than in the case of regular or other innovation.

Organizational capabilities

Several researchers have identified organizational capabilities as driving forces of product and process eco-innovation (Demirel and Kesidou 2011; Kesidou and Demirel 2012; Cuerva et al. 2013). Some call these environmental organizational measures (Ziegler and Rennings 2004; Rennings et al. 2006; Wagner 2008). Cai and Zhou (2014, 2) noted that implementation of EMS serves to help companies "to build organizational capabilities and practices such as resource reduction, recycling, pollution prevention, and green product design, which are intended to promote mainly process innovations toward improved environmental quality in combination with decreased costs. They may also facilitate product and service innovation in the field of eco-efficiency".

However, researchers used certified environmental management systems – usually ISO 14001 and EMAS (Ziegler and Rennings 2004; Rehfeld et al. 2007) to examine the effect of environmental management systems on the adoption of environmental innovation. In some cases, the effect of EMS on environmental innovation was rather negligible

(Ziegler and Rennings 2004). Wagner (2008) pointed out that, when by following the neo-institutional organizational theory of DiMaggio and Powell (1983 in Wagner 2008, 394), which stresses that "certification is a symbolic gesture with little influence on environmental innovations but rather motivated out of institutional isomorphism and mimicry behavior," it is not appropriate to include standards as a drivers of eco-innovation. Therefore, single measures such as product design with lifecycle analysis and take back systems for products have turned out to be important drivers of environmental product and process innovations (Ziegler and Rennings 2004). Ziegler and Rennings (2004) argue that certified environmental management systems seem to be statistically less reliable (while the ISO 14001 standard has shown a significantly weak positive impact, the EMAS standard has shown no significant impact on environmental innovations at all). Meanwhile, the findings of the study undertaken by Cuerva et al. (2013) revealed a strong impact of organizational capabilities on green innovation. The results indicate that implemented Quality Management Systems (QMS) seem to be the strongest driver of environmental innovation strategy (pertaining to the ISO 9000 family of standards) (Cuerva et al. 2013). In conclusion, a positive impact of environmental management systems (EMS) on environmental innovation has been found by several researchers (Rehfeld et al. 2007; Wagner 2008; Kammerer 2009; Demirel and Kesidou 2011; Weng and Lin 2011; Kesidou and Demirel 2012).

Managerial environmental concern

To the entrepreneur is entrusted an important task, which also involves adoption of eco-innovations and concern about the environment, employees, final consumers and society. Banerjee et al. (2003) argued that top management plays a key role in influencing corporate environmentalism directly and helps to modify the influence of other stakeholders. Moreover, Martinsons et al. (1996 in Ndubisi and Nair 2009) suggested that the so-called entrepreneurial spirit is more important in making green business than regulations. Environmentally concerned and trained human resources (or managers or employees) increase environmental process innovations (Triguero et al. 2013). Ndubisi and Nair (2009) argue that green entrepreneurial orientation is vital for the development of green value added. Somewhat similar findings are derived from a case study conducted by Hillestad et al. (2010), who argue that a founder or a leader of a company plays the role of "cultural architect" and thus positively affects assessment of the company's image by external constituents, pertaining to the company's innovations and its awareness of environmental issues. The company's image can be shaped in two ways: first, a company's leader or founder has a role of coordination and motivation of employees' attitudes and behaviors related to environmental issues; second, a green innovator enforces a positive external company reputation (Hillestad et al. 2010). In addition, Lewis and Cassells (2010) argue that the personal commitment of the firm's owner or manager can be an advantage for SMEs in terms of the improvement of environmental responsibility. In Lewis and Cassells' (2010) study, personal commitment was ranked the third most relevant factor (in 45.3%) in driving firms towards implementation of environmental innovations; thus, more emphasis should be given to it in future research works.

Mzoughi (2011) explored the role of social and moral concerns and emphasized the extent to which we try to show others our environmental commitment (social concerns) and how guilty we feel about our choices (moral concerns). Moral concerns relate to so-called intrinsic motivations (individuals' ethics, such as personal satisfaction), where rewards are not expected and motivation stems from the individual (Mzoughi 2011). Meanwhile social concerns shape the individual's behavior in relation to its reference group (which can result in social recognition or monetary rewards if adopting a given behavior or threats of punishment for non-compliance with the prescribed behavior). Findings emphasize the significant effect of moral and social concerns on adoption of ecologically friendly practices and should be considered in research works as well (Mzoughi 2011).

Regarding this point, we "borrow" the broader concept of sustainable entrepreneurship in order to demonstrate the importance of the entrepreneur's role. Sustainable entrepreneurs "…balance economic health, social equity and environmental resilience though their entrepreneurial behavior" (Kuckertz and Wagner 2010, 525). Furthermore, sustainability orientation has been found to have an influence on entrepreneurial intention, although business experience destroys the positive relationship between them (Kuckertz and Wagner 2010). Bansal and Roth (2000) assume that managers respond only to the salient issues; moreover, they chose to operate within cohesive fields and hire managers who exhibit ecological concern.

On the other hand, managers possess pre-existing values and capabilities that can affect eco-innovation and encourage environmental actions in the company where they work (Ramus and Steger 2000). They encourage and support employees' involvement in environmental innovation and are open to new environmental innovation ideas by providing resources and other support for environmental projects to be realized (Ramus 2002). Personal values of managers shape their environmental attitudes and, through managers' environmental attitudes, exert influence on corporate environmental responsiveness (Papagiannakis and Lioukas 2012). Managers' subjective norms and high levels of self-efficacy in handling environmental issues have also been shown to be strong predictors of corporate environmental responsiveness (Papagiannakis and Lioukas 2012). Papagiannakis and Lioukas (2012) have highlighted the importance of managers' environmental attitudes on corporate environmental responsiveness. Moreovet, they suggested that managers with an awareness of the consequences of human nature interaction and a sense of commitment to react and take the correct actions see their organization as an opportunity to materialize their environmental concerns and make appropriate strategic decisions, which are reflected through firms' environmental responsiveness (Papagiannakis and Lioukas 2012). In addition, Pujari et al. (2003) found that environmental new product development performance is positively affected by a higher degree of top management support. Managers also play a crucial role as mediators with regard to the stakeholders' pressure and influence (Madsen and Ulhøi 2001). Therefore, managers who perceive environmental protection as an important and integral part of a company's identity act accordingly, without formal controls and incentives (Sharma 2000). Similarly, Yen and Yen (2012) found that top management commitment positively and significantly affects environmental collaboration with suppliers and firm adoption of green purchasing and is thus the primary driver of firms' successful adoption of green purchasing standards.

According to the research of Qi et al. (2010) in the construction area, managerial concerns are one of the two most important driving forces for the adoption of green practices. Moreover, managerial environmental concern as a moderator generally affects the relationship between green product innovation, firm performance and competitive capability (Ar 2012). Furthermore, Triguero et al. (2013) have found that entrepreneurs to whom collaboration with research institutes, agencies, universities, and the increase of market demand for green products are important are also more active in all types of eco-innovation. According to Ferguson and Langford (2006 in Tseng et al. 2013) and Eiadat et al. (2008), firms are more motivated to adopt an environmental innovation strategy if their managers place a high value on and express concern about the environment and its protection. Therefore, managers with environmental knowledge, skills, and beliefs that environmental issues should be a top priority are key factors that trigger companies' adoption of an environmental innovation strategy (Eiadat et al. 2008). In addition, Dibrell et al. (2011) found a moderating effect of top managers' attitudes toward the environment. Even though they did not find a direct effect of managerial attitudes towards the environment on firm innovativeness, a significant moderating effect of managerial attitudes toward the environment was found on the relationship between market orientation and firm innovativeness. Moreover, Dibrell et al. (2011) showed that entrepreneurial activities toward the environment in the form of firm innovativeness are improved when the managerial environmental attitudes are embedded within a market-oriented firm. Personal environmental values and beliefs are the most significant factors that affect environmental over-compliance (Wu 2009). Hence, the greater is the degree to which companies' managers interpret environmental issues as opportunities, the higher is the likelihood that companies will engage in voluntary environmental strategies (Sharma 2000).

Finally, Rivera-Camino (2012) found that the relationship between managers' behavior and environmental policy is largely affected by society (i.e., its perceptions and judgments). The results of the study (Rivera-Camino 2012) support the basic premise of institutional theory regarding organizations' tendency towards compliance and conformance to the social influences from the environment (support and legitimacy can be achieved/acquired though conformance to social pressures). "Under certain conditions entrepreneurs are likely to supplement or surpass the efforts of governments, NGOs and existing firms to achieve environmental sustainability" (i.e., the uncertainty of environmental issues presents significant entrepreneurial opportunities) (York and Venkataraman 2010, 449). Researchers (York and Venkataraman 2010) add that, for known, well-understood environmental problems, clear command-and-control regulation is needed and effective, while with regard to more intractable and uncertain problems regulation can repress innovations and solutions. Thus, we conclude that managerial concerns with regard to the environment are positively related to the scope and the speed of firms' response to environmental issues (Tseng et al. 2013). Managers who express a high level of environmental concern are more keen to dedicate time and resources to environmental initiatives compared to those with a lower level of environmental concern (Naffziger et al. 2003).

Company's general characteristics (firm size and firm age)

Propensity to eco-innovate is positively related to firm size (De Marchi 2012), meaning that larger firms are more likely to eco-innovate (Horbach 2008; Kammerer 2009; Qi et al. 2010; Belin et al. 2011; Doran and Ryan 2012; Hofer et al. 2012; Agan et al. 2013; Horbach and Rennings 2013; Robinson and Stubberud 2013; Triguero et al. 2013). Dong et al. (2013), after a literature review, concluded that the majority of research works suggest a positive effect of firm size on eco-innovation performance (from the perspectives of resources, economies of scale, reputation advantage, R&D costs, risks, etc.). In more detail, Triguero et al. (2013) found a positive relationship between firm size and the decision to eco-innovate at all levels (product, process and organizational eco-innovation). Firm size can present a potential barrier to eco-innovation, because small companies face more difficulties in introducing eco-innovations (Triguero et al. 2013). Small businesses are often challenged in competition with larger businesses; furthermore, small businesses also desire to provide valuable products (goods or services) to their consumers and see an opportunity in environmental innovation, which can be an effective and sustainable way to do so (Robinson and Stubberud 2013). Firm size, which is related to available financial and human capital resources, affects a firm's decision to invest in eco-innovation. Therefore, on the one hand, larger businesses are more likely to undertake green innovation because they have more capital to invest (Robinson and Stubberud 2013), while on the other hand, small firms have the advantage to be more flexible and can more easily adapt and are thus more responsive to the needs and changes in customer demand to eco-innovate than larger firms (Sak and Taymaz 2004 in Doran and Ryan 2012). In summary, small firms have several advantages over larger ones regarding the adoption of environmental practices. First, smaller firms are seen by consumers as more environmentally friendly, and second, smaller firms are in a position to react more actively to the increasing demands of green products and services in almost all market segments (Osukoya 2007 in Ndubisi and Nair 2009).

Firms with higher profitability (often equated with firm size) can engage more resources and longer time periods to the development and implementation of environmental management activities, because of costs and investments associated with environmental management activities, where a long-term payoff can be speculative and uncertain (Tate et al. 2010 in Hofer et al. 2012). Hofer et al. (2012) found that more profitable firms, when threatened by competition, would allocate their financial resources and engage actively in implementation of environmental management activities and, moreover, will respond more aggressively. In addition, Murovec et al. (2012) found a positive impact of firm performance on the introduction of environmental technologies.

Related to the aforementioned, larger firms are in a better position with regard to the ability to fund long-term and more speculative projects because of a higher degree of financial and human capital (Baylis et al. 1998 in Doran and Ryan 2012). Larger firms implement more product eco-innovations than small firms, implement them on a wider range, and offer to market more novelties because of the aforementioned availability of financial and human resources (Kammerer 2009). For instance, investments in environmental management systems require substantial investments in information technology, which represents a tremendous burden to firms; therefore, large firms promote and implement environmental management activities that require specialized human, technical, financial and physical resources within the boundaries of the firm (del Río 2009; Hofer et al. 2012). As SMEs get larger and consequently possess more resources, their environmental performance also improves (Agan et al. 2013). Based on the aforementioned research work, we summarize that firm size is positively correlated to the environmental activities of innovating (Horbach 2008); moreover, larger firms are more likely to innovate (Horbach 2008; Kammerer 2009; Qi et al. 2010; Belin et al. 2011; Doran and Ryan 2012; De Marchi 2012; Hofer et al. 2012; Agan et al. 2013; Horbach and Rennings 2013; Robinson and Stubberud 2013; Triguero et al. 2013). Alvarez Gil (2001) found a positive association between hotel size and deployment of environmental management techniques. Many research works indicate that the larger the company is, the larger will be the extent of eco-innovations, meaning that larger companies introduce more product and process eco-innovations (Rehfeld et al. 2007; Chen 2008; Qi et al. 2010). In contrast, some researchers came to different conclusions. A negative relationship between firm size and eco-innovation performance has been found by Cole et al. (2005 in Dong et al. 2013), while other research findings suggest that there is no effect of firm size on eco-innovation performance (Ofezu 2006 in Dong et al. 2013; Wagner 2008).

Table 7: Summary of drivers of eco-innovation found in previous research works (focusing on factors explored in our study)

Eco-innovation drivers		References
Expected benefits	*Firm reputation*	Le et al. (2006); Kemp and Foxon (2007); Chen (2008); Eiadat et al. (2008); Frondel et al. (2008); Dangelico and Pujari (2010); Hillestad et al. (2010); Lewis and Cassells (2010); Pellegrini-Masini and Leishman (2011); van den Bergh et al. (2011); Doran and Ryan (2012); Holtbrügge and Dögl (2012); Klewitz et al. (2012); Agan et al. (2013); Chen (2013); Sarkar (2013); van den Bergh (2013); Govindan et al. (2014)
	Cost savings	Shrivastava (1995); Montabon et al. (2007); Ambec and Lanoie (2008); Horbach (2008); Lewis and Cassells (2010); Belin et al. (2011); Demirel and Kesidou (2011); Rave et al. (2011); Santolaria et al. (2011); Horbach et al. (2012); Kesidou and Demirel (2012); Klewitz et al (2012); Pereira and Vence (2012); Oxborrow and Brindley (2013); Triguero et al. (2013); Chassagnon and Haned (2014); Govindan et al. (2014); Murakami et al. (2014)
	New markets	Porter and van der Linde (1995b); Shrivastava (1995); Van Hemel and Cramer (2002); Lewis and Cassells (2010); Rave et al. (2011); Horbach et al. (2012); Chen (2013); Oxborrow and Brindley (2013)
	Market share	Le et al. 2006; Lewis and Cassells (2010); Horbach et al. (2012); Triguero et al. (2013)
Managerial environmental concern		Bansal and Roth (2000); Banerjee et al. (2003); Pujari et al. (2004); Ferguson and Langford (2006 in Tseng et al. 2013); Eiadat et al. (2008); Lewis and Cassells (2010); Qi et al. (2010); Dibrell et al. (2011); Ar (2012); Yen and Yen (2012); Agan et al. (2013); Tseng et al. (2013)
Market – customer demand		Rennings (2000); Van Hemel and Cramer (2002); Le et al. (2006); Triebswetter and Wackerbauer (2008); Kammerer (2009); Lee (2009); Lewis and Cassells (2010); Popp et al. (2011); Santolaria et al. (2011); van den Bergh et al. (2011); Weng and Lin (2011); Zeng et al. (2011); Doran and Ryan (2012); Horbach et al. (2012); Kesidou and Demirel (2012); Lai and Wong (2012); Murovec et al. (2012); Simpson (2012); Yen and Yen (2012); Agan et al. (2013); Lin et al. (2013a), Lin et al. (2013b); van den Bergh (2013); Cai and Zhou (2014); Govindan et al. (2014); Li (2014)
Competition		Bansal and Roth (2000); Banerjee et al. (2003); Brunnermeier and Cohen (2003); Zhu and Sarkis (2006); Triebswetter and Wackerbauer (2008); Yalabik and Fairchild (2011); Zeng et al. (2011); Inoue et al. (2013); Cai and Zhou (2014); Govindan et al. (2014); Li (2014)

Eco-innovation drivers		References
Environmental policy instruments	*Regulations*	Porter and van der Linde (1995b); Bansal and Roth (2000); Rennings (2000); Blum-Kusterer and Hussain (2001); Madsen and Ulhøi (2001); Van Hemel and Cramer (2002); Banerjee et al. (2003); Beise and Rennings (2005); Green (2005 in Triebswetter and Wackerbauer 2008); Zhu and Sarkis (2006); Rehfeld et al. (2007); Horbach (2008); Triebswetter and Wackerbauer (2008); Belin et al. (2009); Gadenne, Kennedy and McKeiver (2009); Kammerer (2009); Khanna et al. (2009); Camisón (2010); Belin et al. (2011); Demirel and Kesidou (2011); Heyes and Kapur (2011); Popp et al. (2011); Qi et al. (2010); Santolaria et al. (2011); Testa et al. (2011); van den Bergh et al. (2011); Weng and Lin (2011); Zeng et al. (2011); Brouillat and Oltra (2012); Doran and Ryan (2012); Holtbrügge and Dögl (2012); Horbach et al. (2012); Kneller and Manderson (2012); Murovec et al. (2012); Simpson (2012); Veugelers (2012); Yen and Yen (2012); Agan et al. (2013); Lin et al. (2013b); Triguero et al. (2013); van den Bergh (2013); Yabar et al. (2013); Cai and Zhou (2014); Chassagnon and Haned (2014); Ford et al. (2014); Govindan et al. (2014); Li (2014)
	Subsidies	Horbach (2008); Chappin et al. (2009); Rave et al. (2011); Brouillat and Oltra (2012); Desmarchelier et al. (2012); Doran and Ryan (2012); Murovec et al. (2012); Veugelers (2012)
	Taxation	Kesidou and Demirel (2011); Brouillat and Oltra (2012); Desmarchelier et al. (2013); Murovec et al. (2012); Horbach et al. (2012); Veugelers (2012)

With regard to the general characteristics of companies – firm size and firm age – we can conclude that company size is positively associated with eco-innovation propensity (De Marchi, 2012), meaning that larger companies are more likely than smaller companies to deploy eco-innovation (Alvarez Gil et al. 2001; Hofer et al. 2012; Kesidou and Demirel 2012). Pertaining to firm age, researchers (Ziegler and Rennings 2004; Rehfeld et al. 2007) found a U-shaped relationship between company age and the probability of the realization of product eco-innovation and/or process eco-innovation. In summary, the younger the company is, the more likely it is to be (eco-)innovative, while this (eco-)innovativeness decreases with company age (nonetheless, mature companies might have developed a broader internal knowledge base that consequently leads to the realization of further product eco-innovations) (Rehfeld et al. 2007). Likewise, Alvarez Gil (2001) found that the age of hotels' facilities negatively affects the deployment of environmental management practices.

In continuation, Table 7 offers a short summary synthesizing previously mentioned research works and their main findings, with an emphasis on the factors that we encompass in our research. Table 7 thus encompasses only references of research works that found positive and significant effect of these factors on eco-innovation.

Consequences of Eco-innovation Adoption

Companies initially hesitated to become environmentally friendly and adopt eco-innovations. At first, eco-innovations were seen as a response to legislation, pursuing compliance with regulations. In addition, eco-innovations were perceived as a burden, aiming to help only the environment while jeopardizing the firm's performance, especially in terms of profitability. The perspective of eco-innovation started to change with Porter's hypothesis, which many researchers were eager to test. Moreover, pioneering in innovation has been assumed to bring companies the opportunity to enjoy "first mover advantages" (Porter and van der Linde 1995a). Porter and van der Linde (1995a) stressed that properly designed environmental standards can trigger innovations, which lower the total cost of a product or improve its value. Such innovations allow companies to use a range of inputs more productively – from raw materials and energy to labor – and offset the costs of improving environmental impact. Meanwhile, regulations should be strict rather than lax, because lax regulations can be handled incrementally by end-of-pipe or secondary treatment solution, while stringent regulations promote real innovation (Porter and van der Linde 1995a).

Eco-innovations are "central to the promotion of sustainable and smart growth in regions because of their wide-ranging benefits for the economy and the environment" (European Commission 2012, 28). In other words, eco-innovations both protect the environment and affect growth and employment, although this impact is likely to vary and depends on the innovation type and the context in which it is used (Arundel and Kemp 2009). As an example, eco-innovations create jobs and wealth in the producing sector (Arundel and Kemp 2009).

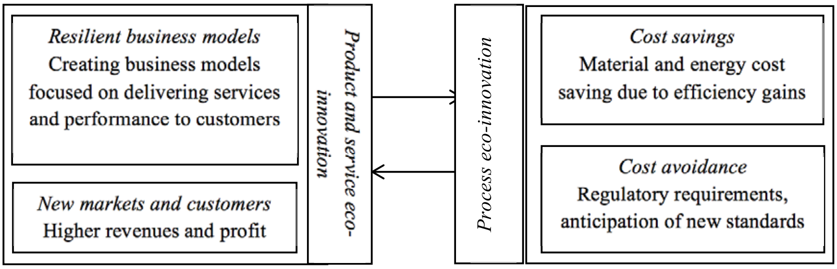

Figure 4: Business case for eco-innovation
Source: EIO and CfSD 2013, 9, Figure 3.

Furthermore, eco-innovations are beneficial for the environment, with the aim of releasing less harmful substances into the environment, using natural resources during the production process more effectively, and so forth. We can see that the benefits derived from eco-innovation performance pertain also to companies (see the scheme below in Figure 4). Eco-innovations can and do bring benefits to the adopting companies, thus resulting in a win-win situation (Horbach 2008). The benefits that firms can exploit from the successful introduction of eco-innovation implementation are cost savings, enhanced corporate image, improved relationship with local communities, access to new green markets and gain of superior competitive advantage (Shrivastava 1995). Sarkar (2013) presented the benefits derived from eco-innovation and divided them into direct and indirect benefits. The direct benefits consist of operational advantages, which are seen in cost savings and derive from greater resource productivity and better logistics, followed by sales from commercialization (Sarkar 2013), while the indirect benefits include better image, better relations with customers, suppliers and authorities, health and safety benefits, greater worker satisfaction and an enhanced innovation capability overall (Sarkar 2013). Sarkar (2013) emphasizes that companies increasingly recognize that the greening of businesses by improving resource productivity may increase their short and long-term competitiveness and create new markets.

According to Robinson and Stubberud (2013, 48) "many SMEs are reluctant to engage in eco-efficiency, possibly because they equate green with expensive". However, as Johnson (2009, 22) says, "when done properly, going green is good business"; in other words, it is not necessary for companies to choose between being green and being profitable.

Even though some companies "avoid" implementation of eco-innovation because of initial investments or an expectation that such innovation will be expensive (Robinson and Stubberud 2013), the literature provides empirical evidence to support the idea that eco-innovation can be a win-win situation for both the company and the environment (Horbach 2008). Summarizing the scheme in Figure 4, which depicts possible consequences related to the introduction of eco-innovations, we can see that product and technological eco-innovations are an opportunity for companies to consolidate their position on the domestic market and internationalize by entering or expanding to foreign markets, while they can also reduce their costs through material saving innovations along international material supply chains with the adoption of process eco-innovations (EIO 2011b).

Among the most important benefits for firms that go "green" and aim to create a more sustainable business model are the following:

- possibility to gain a green competitive advantage and competitiveness on the international markets (Tien et. al 2005; Chen et al. 2006; Triebswetter and Wackerbauer 2008; Johnson 2009; European Commission 2012; Ar 2012; Hofer et al. 2012; Wong 2012; Leonidou et al. 2013a),
- entry into foreign markets/internationalization (Beise and Rennings 2005; Martin-Tapia et al. 2010),
- improvement of firm performance (Clemens 2006; Johnson 2009; Zeng et al. 2011; European Commission 2012; Ar 2012; Doran and Ryan 2012; Lin et al. 2013a),
- gain of sustainable growth on domestic and international markets (European Commission 2012),
- achievement of global corporate sustainability goals and objectives in organizations (Paraschiv et al. 2012).

Other benefits that firms can seize from the adoption of eco-innovation are as follows: through cost efficiency, firms can gain in cost savings, corporate image can be enhanced and relationships with local communities can be improved, followed by access to new green markets and gain of superior competitive advantage (Shrivastava 1995). In addition, firms can achieve a cost advantage (operating at a lower cost than competitors but offering a comparable product) or a differentiation advantage (when customers consistently perceive the firm's offer as superior to its competitors' offer) (Porter 1985 in Zhou et al. 2009). Therefore, eco-innovations can, by cost efficiency or by introduction of eco-innovations that differ from others and bring additional value to the customers, gain and achieve a competitive advantage, whether on the domestic or international market (Tien et al. 2005; Chen et al. 2006; Triebswetter and Wackerbauer 2008; Chiou et al. 2011; Ar 2012; Hofer et al. 2012; Wong 2012; Leonidou et al. 2013a). Therefore, sustainable orientation in eco-innovation practices can lower costs because companies reduce the inputs they use, while they also generate additional revenues from better products and enable companies to create new businesses; hence, smart companies now treat sustainability as innovation's new frontier (Nidumolu et al. 2009). Sustainability and the eco-innovations related to it therefore impose pressure on companies to change the way they think about products, technologies, processes and business models (Nidumolu et al. 2009) and force them to act. Companies' orientation towards sustainability (usually expressed in companies' objectives and behavior with regard to sustainability) leads to a competitive advantage, which is hard for competitors to imitate (Nidumolu et al. 2009). Lastly, Marin (2014) argues that environmental innovations guarantee a return, but this return compared to return of non-environmental innovations is substantially lower. Moreover, referring to the Porter hypothesis, Marin (2014) concludes that the possible effects of policy-induced environmental innovation on competitiveness are likely to show up in the medium to long term (depending on early mover advantages of environmental innovation and on the creation of new markets for environmental technologies).

Firm performance

Ramanathan et al. (2010) warn that the relationship between environmental innovation and financial performance can be ambiguous. Mixed findings regarding this relationship identify environmental efforts as a financial burden, which can hurt firm's profitability, although findings also show that companies that pursue sustainability and implement environmental innovations benefit from enhanced efficiency and can exploit new growth opportunities, leading to higher profitability and competitive advantage (Schrettle et al. 2013). Companies endeavor to eco-innovate and hence sacrifice their short-term profitability in order to acquire higher mid-term and long-term business goals, although it is generally known that environmental innovations require higher costs for their development and introduction than other general innovations (Triguero et al. 2013). Introduction of new environmentally friendly products or significantly improved existing ones (in order to become more environmentally friendly) can, through the reduction of needed inputs through production, lead to improved productivity and ensure the compatibility of cost savings and reduction of environmental harm (Triguero et al. 2013). Therefore, on the one hand, product innovations have the potential to create new markets, lead to competitive advantages through greater differentiation from competitors' products and gain greater profit margins (Ramanathan et al. 2010). Meanwhile, researchers (Porter and van der Linde 1995a; Porter and van der Linde 1995b; Ramanathan et al. 2010) add that process innovations can also result in cost reduction through the increase of energy efficiency and less waste production. On the other hand, the uptake of innovation and its implementation may not necessarily result in benefits for the company that has undertaken those innovations; because of high initial investments in R&D, such financial benefits are not acquired in the short-term (Ramanathan et al. 2010).

Researchers (Ghisetti and Rennings 2014) emphasize another peculiarity regarding environmental innovations and their relationship with profitability, pertaining to different typologies of eco-innovation. Based on their research, they conclude that, while it pays to be green, the benefit depends on the way in which a company is green (Ghisetti and Rennings 2014). Their findings indicate that for those environmental innovations that aim to reduce externalities (e.g., harmful materials, air, water, noise and soil pollution), it does not pay to be green, in the sense that these innovations may be profitable in the long run (due to improved environmental regulation) but do not pay off in the short run (when companies cope with environmental regulations as restrictions) (Ghisetti and Rennings 2014). On the other hand, energy- and resource-efficient innovations lead to a potential "win win" situation (reduced environmental impact of production and improved companies' economic performance). Hence, it definitely pays to be green when engaging in environmental innovations, which lead to reduction in the use of resources and energy (Ghisetti and Rennings 2014). Energy and resource efficient innovations exert a positive and strongly significant effect on companies' profitability, while the externality-reducing innovations negatively affect companies' operating margins (Ghisetti and Rennings 2014). Similarly, Rexhäuser and Rammer (2013) pointed out that environmental innovations related to reduction of energy and material input demonstrate a positive impact on companies' profitability (driven by cost reduction), while environmental innovations focused on reduction of environmental pressures (driven by regulations) negatively and weakly affect companies' profitability. Furthermore, the following environmental management practices have the greatest impact on firm performance with regard to the research of Montabon et al. (2007): recycling, waste reduction, remanufacturing, environmental design and surveillance of the markets.

The majority of eco-innovations (80.4%) lead to lower or constant costs, while 32% of these eco-innovations are associated with higher turnover; in other words, these eco-innovations are also economically successful (Horbach et al. 2012). Molina-Azorin et al. (2009 in Huang and Wu 2010) reviewed 32 studies, 21 of which found a positive effect of environmental management and/or environmental performance on financial performance. Similar results about eco-innovation's impact on firms' financial performance were found by Paraschiv et al. (2012), who found that 35% of participant organizations have achieved encouraging results, whereas another 21% have reported significant results with a strong impact on the organization's financial performance, and 10% specified that the results of eco-innovations were insignificant. In more detail, we can see that material savings and energy-saving products within the firm lead to an increase in turnover, while an improvement of product recyclability significantly reduces turnover due to its relation to the higher costs within the firm (Horbach et al. 2012). The results regarding the relationship between eco-innovation and firm performance indicate that eco-product innovation had a relatively greater impact on firm performance than eco-organizational and eco-process innovations had (Cheng and Shiu 2012). A year later, Cheng et al. (2013) revealed that eco-product, process and organizational innovations directly and indirectly affect firm performance (measured by return on investment, profits, market share and sales). Lastly, Alvarez Gil et al. (2001) found a positive relationship between environmental management practices and firms' financial performance, indicating a positive effect on short-term financial performance.

Doran and Ryan (2012) conducted a survey from 2006 to 2008 including 2181 Irish firms. Their research showed that eco-innovation exerts a positive and significant impact on firm performance (eco-innovation can drive performance growth); therefore, firms that engage in eco-innovations have higher levels of turnover per employee (i.e., revenue per employee) than firms that do not introduce eco-innovations. A positive relationship between green innovations and financial performance has also been found in small firms (it is even greater when green economic incentives exist; Clemens 2006) and in manufacturing SMEs in Northern China (Zeng et al. 2011). Moreover, technological innovation efficiency (Cruz-Cázares et al. 2013), eco-friendly marketing strategy (Leonidou et al. 2013a), environmental innovation strategy (Eiadat et al. 2008) and green product innovation performance (Huang and Wu 2010; Ar 2012; Lin et al. 2013a) were all positively associated with firms' financial performance. Several researchers (Rexhäuser and Rammer 2013; Ghisetti and Rennings 2014) found that environmental innovations that improve firms' resource efficiency (in terms of material or energy consumption per unit of output) demonstrate a positive and significant effect on firm profitability, while this effect on firms' profits is not valid for environmental innovations, which do not improve firms' resource efficiency.

In more detail, Fraj-Andrés et al. (2009) found that environmental marketing positively affects firms' operational and commercial performance, and such improvement affects their economic results. We should stress that the effect of environmental performance on financial performance is a long-term project that brings long-term benefits. Horváthová (2012) found that the relationship between financial performance and environmental performance was negative after one year and turned positive after two years. Meanwhile, another study based on hotel tourism (Molina-Azorin et al. 2009) has also found a positive relationship between environmental management and firm performance, with the conclusion that environmentally proactive hotels have higher levels of financial performance. Meanwhile, the results of a study focused on green supply chains (Rao and Holt 2005) indicate that greening the supply chain can lead to competitiveness and economic performance. Therefore, the companies can exploit substantial cost savings and new market opportunities (which lead to greater profit margins), enhance sales, and increase market share, and most of the captured benefits result in improved firm performance (Rao and Holt 2005).

Furthermore, De-Burgos-Jiménez et al. (2013) emphasized in their analysis and survey that researchers adopt different measures, which consequently lead to different conclusions. After a review of contradictory research works, they have broken down the environmental variables into three different concepts: environmental activities (environmental management), environmental strategic orientation (environmental proactivity) and the real impact on the natural environment (environmental performance). The results of their survey (De-Burgos-Jiménez et al. 2013) found that the correlation between environmental management and financial performance is not significant, while it turned out to be positive and significant for environmental proactivity and environmental performance. This implies that firms with good environmental performance (especially environmentally proactive firms) tend to have positive financial performance (De-Burgos-Jiménez et al. 2013).

Findings derived from a meta-analysis comprising 37 empirical works (Horváthová 2010) show that the empirical evidence regarding the relationship between environmental performance and financial performance is inconclusive: half of studies find that the impact is positive, while the rest document either a negative or an insignificant impact. Horváthová (2010) emphasizes that, under certain conditions, studies investigating the relationship between environmental performance and financial performance are more likely to find a positive effect of environmental performance on financial performance. These conditions include the following: common law countries, appropriate time coverage and qualitative measures of environmental performance (Horváthová 2010). Researchers also came to negative conclusions. In contrast to researchers who found a positive association between eco-innovation and firm performance (Rao and Holt 2005; Clemens 2006; Montabon et al. 2007; Eiadat 2008; Fraj-Andrés et al. 2009; Molina-Azorin et al. 2009; Huang and Wu 2010; Zeng et al. 2011; Ar 2012; Cheng and Shiu 2012; Cheng et al. 2013; Cruz-Cázares et al. 2013; Leonidou et al. 2013a; Lin et al. 2013a), opposite findings also exist. Some researchers found a negative relationship between eco-innovation and firm performance in the short term (Ramanathan et al. 2010), while other researchers (Pickman 1998 in Ramananthan et al. 2010; Horváthová 2012; Ghisetti and Rennings 2014) argue that innovation brings benefits to companies after a few years' lag, whereas no immediate benefits are brought to companies deriving from innovation efforts. Thereby, Triguero et al. (2013) argue that environmental product innovations can be more costly than non-environmental ones and, therefore, companies have to sacrifice the short-term profits in order to achieve mid-term and long-term business goals. In addition, Horváthová (2012) has found that the relationship between financial performance and environmental performance was negative after one year and turned positive after two years. Finally, Li (2014) has not found any significant effect of environmental innovation practices on firms' financial performance. In conclusion, the relationship between eco-innovation and firm performance can vary according to the eco-innovation type – those focused on efficiency are profitable, while the externalities reducing eco-innovations are not (Rexhäuser and Rammer 2013; Ghisetti and Rennings 2014). In Table 8 below, we summarize findings of past research related to the relationship between eco-innovation and firm performance.

Table 8: Summary of the past findings and measures used to test the relationship between eco-innovation and firm performance

Authors	Measures	Findings
Rao and Holt (2005), International Journal of Operations & Production Management	In the last two years, because of implementing better management practices, there have been specific benefits achieved in each of the following categories (on a four-point scale of strongly disagree, disagree, agree, strongly agree). - Increased efficiency (C) - Quality improvement (C) - Productivity improvement (C) - Cost saving (C) - New market opportunities (EP) - Product price increase (EP) - Profit margin (EP) - Sales (EP) - Market share (EP)	The results of the study suggest that greening companies' supply chains would lead not only to the achievement of substantial cost savings but also to the enhancement of sales, market share, and exploitation of new market opportunities (leading to greater profit margins) – all together contributing to the economic performance of the company.
Clemens (2006), Journal of Business Research	Respondents answered on a 5-point Likert scale, anchored by "much worse" and "much better". - As compared to your competitors, your growth in earnings has been ______. - As compared to your competitors, your growth in revenue has been ______. - As compared to your competitors, your change in market share has been ______. - As compared to your competitors, your return on assets has been ______. - As compared to your competitors, your long run level of profitability has been ______.	The findings of this study indicate a positive relationship between green and financial performance. Therefore, small firms that perform better environmentally are also financially the most successful.
Montabon et al. (2007), Journal of Operations Management	- Return on investments - Sales growth - Product innovation - Process innovation	Environmental management practices are positively associated with firm performance.
Eiadat et al. (2008), Journal of World Business	Respondents were asked what effects their environmental practices have had on: (1) market share, (2) sales growth, and (3) return on investment. 5-point scale (Cronbach's alpha = 0.80), anchored by 'substantial negative effect' and 'substantial positive effect'. - Sales growth - Market share - Return on investment	The results of the study have found a significant positive relationship between environmental innovation strategy and firms' business performance.

Authors	Measures	Findings
Fraj-Andres et al. (2009), Journal of Business Ethics	- Firm's profitability - Sales growth - Firm's economic results - Profit before tax - Market share	Environmental marketing is positively associated with the firm's operational and commercial performance and this improvement will influence their economic results. Therefore, environmental strategies reduce environmental impact and positively affect the firm's competitiveness.
Molina-Azorín et al. (2009), Journal of Cleaner Production	- Room occupancy rate - Market share gain - Average sales growth in the last five years - Income per room - Total gross profit - Gross profit per room - Wealth creation (accounting value of the firm with respect to its market value) - Capacity to generate profit in times of crisis	The findings of the study revealed a positive relationship between environmental management practices and firm performance.
Huang and Wu (2010), Management Decision	- Green new product development project's return on investment - Growth in earning - Sales growth - Market share	Green product innovation performance has a positive influence on financial performance.
Ramanathan et al. (2010), Management Decision	- Gross value added (at constant prices)	Environmental innovation in the short run negatively affects economic performance in industrial sectors.
Zeng et al. (2011), Journal of Cleaner Production	- Sales - Profitability - ROE - Market share - Number of customers	Environmental performance and economic performance for SMEs with high or low pollution levels positively correlate. Environmental performance is moderately correlated with financial indexes but not significantly correlated with the non-financial indexes.
Ar (2012), Procedia - Social and Behavioral Sciences	What effect have your environmental product innovation practices had on these items – negative effect (1) and strongly positive effect (7) - Sales growth - Market share - Return on investment	Green product innovation positively and significantly influences firm performance.
Cheng and Shiu (2012), Technovation	Relative to competing new eco-products during the last three years, our unit's new eco-product performance is better with respect to: - Return on investment - Sales - Market share - Profitability	All three dimensions of eco-innovation (product, process and organizational) are positively linked to firm performance.

Authors	Measures	Findings
Doran and Ryan (2012), European Journal of Innovation Management	- Turnover per worker (i.e., revenue per employee)	Eco-innovation has a positive and significant effect on firm performance. Firms engaged in eco-innovation have higher levels of turnover per worker than firms that do not engage in eco-innovation or any innovation at all.
Horváthová (2012), Ecological Economics	- Debt to total assets - ROA - ROE - Sales - Profit in current accounting period	The results of the study have revealed that the effect of environmental performance on financial performance is negative after a one-year lag, while it becomes positive for a two-year lag.
Cheng et al. (2013), Journal of Cleaner Production	Relative to competing new eco-products during the last three years, our unit's new eco-product performance is better with respect to: - Return on investment - Sales - Market share - Profits	The results of the study demonstrate that eco-organizational innovation has the strongest effect on business performance. Moreover, eco-organizational, eco-process, and eco-product innovations have direct and indirect effect on business performance.
De Burgos-Jiménez et al. (2013), International Journal of Operations & Production Management	- ROA (return on assets) - ROS (return on sales) - Sales variation	The results indicate that it pays to be green. When environmental performance is better as an industrial average, and when companies are environmentally proactive, there is a positive effect on financial performance.
Leonidou et al. (2013a), Tourism Management	- Operating profits - Profit to sales ratio - Profit return on investment - Return on assets - Market share - Sales volume - Sales return on investment - Cash-flow	Eco-friendly marketing strategy has a positive influence on financial performance.
Lin et al. (2013a), Journal of Cleaner Production	- Market position improvement - Enhancing sale volume - Enhancing the profit rate - Enhancing the reputation	Green product innovation performance is positively associated with firm performance.
Rexhäuser and Rammer (2013), Environmental and Resource Economics	- ROS (return on sales)	Innovations that do not improve firms' resource efficiency do not provide positive returns to profitability, while innovations that increase a firm's resource efficiency (in terms of material or energy consumption per unit of output) have as well a positive effect on profitability.

Authors	Measures	Findings
Ghisetti and Rennings (2014), Journal of Cleaner Production	- Estimated Operating Margin (profit before taxes on income as a percentage of turnover)	The results indicate that innovations leading to a reduction in the use of energy or materials per unit of output positively affect firms' competitiveness. In contrast, externality-reducing innovations hamper firms' competitiveness.
Li (2014), Journal of Cleaner Production	- Improved capacity utilization - Decrease of fee for waste treatment - Increased profit through the sale of scrap and used materials and equipment - Decrease of penalty costs for environmental accidents	The results indicate that resource commitment works as a moderator between environmental innovation practices and financial performance. As resource commitment increases, financial performance regarding environmental innovation practices will improve.

Internationalization

Luostarinen (1979 in Ruzzier 2005) has defined internationalization as geographical expansion of economic activities over a national country's border. The reasons to "go international" are many and can stem from limited absorption power of the national market (Reuber and Fisher 1997; Kafouros et al. 2008; Ciszewska-Mlinarič and Mlinarič 2010; Kylläheiko et al. 2011), desire to gain a competitive advantage through innovation (López Rodríguez and García Rodríguez 2005; Pla-Barber and Alegre 2007; Ramadani and Gerguri 2011; Adalikwu 2011) and exploitation of an innovation's benefits (Kafouros et al. 2008; Kylläheiko et al. 2011; Ruzzier and Mlakar 2011).

Moreover, internationalization is considered an important asset in order to enhance SMEs' long-term growth and survival (Cerrato and Piva 2010); therefore, Lu and Beamish (2006) suggest that it is only a question of when many companies will expand their geographic scope from domestic to foreign markets. Internationalization, in its simplest form as an export activity, is a phenomenon that is gaining importance within small companies, where the propensity to export depends highly on the ability to innovate (Nassibeni 2001). We can add that "innovative firms are better equipped to exploit international market opportunities and perform better in such markets" (O'Cass and Weerawardena 2009, 1325). Researchers (Lu and Beamish 2006) suggest that once a company is ready for internationalization, it should not wait long to start the internationalization process, because the sooner it does so, the easier will be the learning in the international environment and the faster will be the firm growth. Meanwhile, Dai et al. (2013) found a positive relationship between internationalization and innovativeness; furthermore, they found that the least innovative firms have achieved greater international scope than firms that are moderately innovative. In more detail, they suggest that firms whose goal is entry in foreign markets should either use a low innovation strategy to minimize development costs or invest more effort to become sector leaders by investing in leading edge innovations (Dai et al. 2013).

Cassiman and Golovko (2011) found that successful product innovation spurs firm to get involved in international activities, usually in exports; moreover, investments in product innovation are associated with success on global export markets (D'Angelo et al. 2013). Thereby, firms that successfully implement eco-innovations expand their operations on foreign markets; they have an opportunity to internationalize because of successful implementation of eco-innovation. Martin-Tapia et al. (2008) found a positive relationship between advanced environmental strategies and internationalization (i.e., export intensity); moreover, proactive environmental strategy is positively related to a company's export performance (Martin-Tapia et al. 2010). This means that proactive environmental strategy helps to improve export performance, while its effect increases with firm size; that is, this effect is stronger for smaller enterprises than for micro enterprises, and it is greater for medium enterprises than for smaller ones (Martin-Tapia et al. 2010). Moreover, the study conducted on a sample of export firms from the Spanish food industry has shown that, for export firms that work and spend time in markets with different environmental institutional profiles, gaining a background of complex knowledge is positively related to the adoption of a proactive environmental strategy (Aguilera-Caracuel et al. 2012). Leonidou et al. (2013b) found in their study that eco-friendly marketing strategy contributes to the achievement of superior export performance (such a strategy has turned out to be of even greater necessity when firms are selling industrial goods versus consumer goods and targeting developed rather developing countries).

In addition, Beise and Rennings (2005) argued that national regulations, which stimulate environmental innovation, have to be properly set and need to comply with international markets, demand and international regulations in order for the "doors to international markets [to] be opened"; otherwise, these eco-products and services will only be niches just in regional and national markets. Therefore, countries that apply more stringent environmental standards and possess higher innovation capabilities have a greater export capacity for those environmental friendly technologies whose adoption is induced by regulations (Costantini and

Crespi 2008). Meanwhile, Costantini and Mazzanti (2012) have tested the Porter hypothesis (the weak and the strong version), and the results of their study revealed that environmental policies are not harmful for export competitiveness in the manufacturing sector, as well as that there is a positive impact of specific energy tax policies and innovation effort on export flow dynamics. They conclude that environmental policies and more incisive efforts of environmental innovation spur green exports (Costantini and Mazzanti 2012). Lastly, it has been found that internationalization modes vary from country to country; Romanian firms usually use exports through foreign agents for selling ecological products (they are export-oriented based on strategic alliances with foreign partners that often hold the organization for distribution of their products under foreign brand names), while British firms aim to control the foreign distribution channels and sell on foreign markets through specialized distributors with their own brand name (Gurǎu and Ranchhod 2005). Internationalization for Romanian firms presents the main center of profits and source of future competitive advantage gained in the domestic market, while for British firms the goal is expansion of sales and taking advantage of the positive eco-brand image (Gurǎu and Ranchhod 2005).

Competitive advantage

General innovation implies newness (Chetty and Stangl 2010) and is considered an important and vital source of competitive advantage and companies' productivity growth (López Rodríguez and García Rodríguez 2005; Carneiro 2007; Pla-Barber and Alegre 2007; Acs, Desai and Hessels 2008; Adalikwu 2011). According to López Rodríguez and García Rodríguez (2005), process innovation can generate competitive advantages through gains in process efficiencies, while product innovation can create a competitive advantage in customer value through greater differentiation in product characteristics. Nevertheless, to exploit an innovation's benefits, companies need a sufficient degree of internationalization (Kafourus et al. 2008; Kylläheiko et al. 2011; Ruzzier and Mlakar 2011). Therefore, in this section, we present the consequences of proactive and successful implementation of eco-innovations. Previous research works have found a positive relationship between eco-innovation and competitive advantage (Tien et. al 2005; Chen et al. 2006; Triebswetter and Wackerbauer 2008; Ar 2012; Hofer et al. 2012; Wong 2012; Leonidou et al. 2013a; Robinson and Stubberud 2013).

Investment in proactive environmental management contributes to enhanced competitiveness of the firm; thus, cost and differentiation competitive advantages positively affect financial performance (López-Gamero et al. 2010). Moreover, pioneering in innovation gives companies the opportunity to enjoy first mover advantages (Porter and van der Linde 1995a); that is, they can ask for higher prices for green products, and, at the same time, they improve the corporate image and have a chance to develop new markets and to gain competitive advantages (Peattie 1992 in Chen et al. 2006; Hart 1995 in Chen et al. 2006). Nevertheless, we should be aware that, without strict regulations and international policy diffusion, renewable energies would not be competitive (Beise and Rennings 2005).

Dealing with sustainability-related issues brings to SMEs the opportunity to realize competitive advantage in the sense of successful new products (Klewitz et al. 2012). Investment in green innovations (Chen et al. 2006) was helpful to the business (the more companies invested in green innovation, the stronger was their competitive advantage). The correlations between green product and green process innovation have turned out to be positively associated to the firm's competitive advantage (Chen et al. 2006). However, green product innovation has a stronger influence on competitive advantage and new product success than green process innovation has (Wong 2012). Therefore, when there are limited resources, green product innovation should be pursued first (Wong 2012).

Chiou et al. (2011) found that firms, by focusing on green product, process and managerial innovation, will gain cost savings, increase their efficiency and productivity and have better product quality, all of which will lead to improved competitive advantage. Indeed, many companies worldwide have followed environmental compliance and consequently transformed their entire business operations to become more eco-efficient and achieve a competitive advantage over their competitors (Mourad and Ahmed 2012). Fraj-Andrés et al. (2009) revealed that environmental marketing is an excellent strategy to pursue in order to obtain competitive advantages in costs and in product differentiation.

Moreover, Hofer et al. (2012) argue that companies should note that competitive advantages derived from environmental management activities (environmental innovations) are likely to be short-lived because of imitation by rival companies, but this can be avoided by protecting the innovation (when involving intellectual property; e.g., manufacturing processes, methods, and materials), which can prevent or at least slow down the erosion of competitive advantage caused by the imitation activity of other companies. Furthermore, a study on Greek hotels found that environmental marketing strategy leads to achievement of competitive advantage, while the positive effect of a green marketing strategy on competitive advantage is even more imperative when hotels face acute competition (Leonidou et al. 2013a). Leonidou et al. (2013a, 104) further argue that "the favorable effect of an eco-friendly marketing strategy on gaining a competitive advantage indicates that the adoption of an environmentalism approach can seriously reduce the firm's costs (e.g., energy savings, process efficiency, recyclable material) and/or differentiate its products/services (e.g., refillable packages, eco-friendly image, unique features)". Additionally, companies can, through environmental technologies, gain a competitive advantage by establishing unique and inimitable strategies; therefore, they distinguish themselves from the competition and become environmental leaders (Shrivastava 1995).

Hypotheses Development

This chapter pertains to the research hypotheses, which are developed and formulated based on prior research works on eco-innovation. Hypothesized relationships and development of hypotheses will be presented in two main groups, which include hypotheses about: a) the antecedents of eco-innovations (environmental policy instruments, customer demand, expected benefits, managerial environmental concern and competition) in Section 5.1, and b) the consequences of eco-innovation (impact of eco-innovations on firm performance, competitive benefits and internationalization) in section 5.2. Detailed hypotheses development and its theoretical underpinning are provided in the forthcoming pages.

Hypotheses concerning antecedents of eco-innovations

In this section, we provide theoretical arguments, which underpin hypotheses related to the drivers of eco-innovation. In our study we posited and tested the following determinants as driving forces of eco-innovation: environmental policy instruments (Section 5.1.1), customer demand (Section 5.1.2), managerial environmental concern (Section 5.1.3), expected benefits (Section 5.1.4) and competition (Section 5.1.5).

Environmental policy instruments and eco-innovation

Studies of environmental innovation over the last 15 years found regulation to be the most important stimulus of eco-innovation (Porter and van der Linde 1995b; Rennings 2000; Blum-Kusterer and Hussain 2001; Madsen and Ulhøi 2001; Van Hemel and Cramer 2002; Beise and Rennings 2005; Green 2005 in Triebswetter and Wackerbauer 2008; Rehfeld et al. 2007; Horbach 2008; Belin et al. 2009; Khanna et al. 2009; Popp et al. 2011; Qi et al. 2010; Testa et al. 2011; Weng and Lin 2011; Zeng et al. 2011; Brouillat and Oltra 2012; Holtbrügge and Dögl 2012; Horbach et al. 2012; Murovec et al. 2012; Triguero et al. 2013; Yabar et al. 2013; Chassagnon and Haned 2014). Prioritizing and complying with the existing regulations (Horbach 2008) has shaped the most eco-product and eco-organizational innovations (Triguero et al. 2013). Environmental regulation may "force" or "drive" firms to realize economically benign environmental innovation, while strict environmental regulations intended to stimulate implementation of eco-innovation (Porter and van der Linde 1995b; Beise and Rennings 2005) can also enhance competitiveness and may create lead markets (new markets, export opportunities for the pioneering country) (Porter and van der Linde 1995b). Hence, the regulations need to comply with international regulations, global demand or regulatory trends (Beise and Rennings 2005).

Furthermore, Desmarchelier et al. (2013), in a study of French service firms, found a sensitivity to environmental policies; especially effective seem to be eco-taxes, which along with financial incentives exert a positive and significant effect on environmental investments (Murovec et al. 2012). Moreover, subsidies trigger environmental innovations in particular, mostly because of negative external effects of environmental problems (Horbach 2008). Several research works pointed out important and positive effect of subsidies (Horbach 2008; Brouillat and Oltra 2012; Murovec et al. 2012; Veugelers 2012; Desmarchelier et al. 2013) and taxation (Kesidou and Demirel 2011; Brouillat and Oltra 2012; Murovec et al. 2012; Horbach et al. 2012; Veugelers 2012; Desmarchelier et al. 2013) on the implementation of eco-innovation.

In summary, previous literature and research works pinpointed the key role of regulation in spurring eco-innovation, which stems from the well-known eco-innovation peculiarity of the double externality problem (Porter and van der Linde 1995b; Rennings 2000; Horbach 2008; Wagner 2008; De Marchi 2012). Regulations have the influence to push companies into eco-innovation and therefore force companies to respond. However, the companies may be tempted to comply only minimally, or as little as possible, with the regulation (Nidumolu et al. 2009). On the other hand, companies that seek to exceed the minimum level of compliance often enjoy first mover advantages by pioneering in innovation (Porter and van der Linde 1995; Nidumolu et al. 2009). Porter and van der Linde (1995a) stressed that properly designed environmental regulations can trigger innovations, which lower the total cost of a product or improve its value. Several researchers (Horbach 2008; Qi et al. 2010; Zeng et al. 2011; Holtbrügge and Dögl 2012; Yabar et al. 2013; Chassagnon and Haned 2014) found that environmental regulation provides sufficient incentives to induce eco-innovation. However, the regulations' impact on eco-innovation is not always straightforward. For instance, Frondel et al. (2008) found that policy stringency has a positive effect on environmental innovation and abatement activities, while is not related to EMS adoption, while Eiadat et al. (2008) found a significant negative effect of environmental regulation on eco-innovation.

Another important issue pertains to the stream of research that focuses on the influences of different environmental policies – the command-and-control instrument vs. the economic incentive instrument – on eco-innovation practices. The basic lesson from ecological economics for a long time was that the economic incentive instrument is far more effective in triggering eco-innovation and is therefore superior to the command-and-control instrument (Cleff and Rennings 1999; Rennings et al. 2006). In contrast, Kemp and Pontoglio's (2011) synthesized findings indicated that the economic incentive instrument influence is far weaker than assumed. Furthermore, empirical evidence of a study undertaken by Li (2014) indicates that the command-and-control instrument works as a driver of eco-innovation, while the economic incentive instrument does not work. Oltra and Saint Jean (2009) argued that market-based instruments cannot be complete substitutes for the other policy instruments and by themselves are not sufficient for inducing environmental innovation; the most effective seems to be combination of both environmental and innovative policy. Brouillat and Oltra (2012) argued that the use and impact of each instrument depends on the policy design – in particular, on the level of stringency and on the reward system – that is implemented. Therefore, similar to Li (2014), we investigate the individual effects of the command-and-control instrument and the economic incentive instrument on eco-innovation practices. Therefore, we propose that:

Hypothesis 1a: There is a positive and significant relationship between the command-and-control instrument and companies' implementation of eco-innovation.
Hypothesis 1b: There is a positive and significant relationship between the economic incentive instrument and companies' implementation of eco-innovation.

Customer demand and eco-innovation

Environmentalism as a consumer attitude is spreading and growing in importance worldwide. As a result, consumers are willing to choose environmentally friendly products and are prepared to pay higher prices for them (Chen 2013). By gaining environmental awareness and expressing concerns related to environmental impacts, which affect their purchasing choices, they exert more pressure on companies to reduce their adverse impacts on the environment (Kemp and Foxon 2007). Consumers' "green" demands challenge companies to provide proper design, production, sales and recycling of products (Sarkar 2013). In addition, companies have realized that the market demand for environmentally friendly products is growing and can become profitable as a segment (Nidumolu et al. 2009). Consumer demand seems to be a strong driver of eco-innovation, especially when operating in product markets, which are close to final customers, where the pressure to eco-innovate is the strongest (Zeng et al. 2011; Doran and Ryan 2012). This in in line with other research works that found customer demand to be the most effective driver of eco-product innovation (Kammerer 2009; Horbach et al. 2012; Lin et al. 2013a) and eco-process innovations that increase material efficiency, reduce energy consumption, waste and the use of dangerous substances (Horbach et al. 2012). Furthermore, Van Hemel and Cramer (2002) found that customer demand is to be the most influential driver of eco-design innovations and has a significant influence on green innovation adoption in SMEs (Weng and Lin 2011). Thus, consumer demand for environmentally friendly products and processes encourages firms' decision to invest in and implement eco-innovation (they apply some or a minimum level of eco-innovation activities to respond to the market pressure, but they do not necessarily invest large amounts of resources into eco-innovation) (Kesidou and Demirel 2012). In conclusion, customer demand plays a critical role in today's business environment, because consumers demand that products are produced in an environmentally friendly way (Chiou et al. 2011). Moreover, customer demands and preferences have the potential to affect the direction and rate of eco-innovation (Horbach 2008). Based on the findings of previous research works (Rennings 2000; Van Hemel and Cramer 2002; Le et al. 2006; Kammerer 2009; Lee 2009; Lewis and Cassells 2010; Popp et al. 2011; Weng and Lin 2011; Zeng et al. 2011; Doran and Ryan 2012; Horbach et al. 2012; Kesidou and Demirel 2012; Lai and Wong 2012; Murovec et al. 2012; Lin et al. 2013a), we can conclude that one of the essential drivers of eco-innovations is customer demand. Therefore, we expect that:

Hypothesis 2: There is a positive and significant relationship between customer demand and companies' implementation of eco-innovation.

Managerial environmental concern and eco-innovation

Managers are entrusted with the responsibility to behave socially and environmentally responsibly, demonstrating their corporate social responsibility and environmental awareness. They also have an important task concerning the adoption of eco-innovations and concern for all stakeholders – the environment, employees, final consumers and society. According to the research of Qi et al. (2010), managerial concerns are one of the two most important drivers of the adoption of green practices. In addition, Ar (2012) found managerial environmental concern to be a moderator of the relationship between green product innovation, firm performance and competitive capability. Companies are more motivated to adopt an environmental innovation strategy if their managers place a high value on and express concern about the environment and its protection (Ferguson and Langford 2006 in Tseng et al. 2013). Moreover, top management commitment positively and significantly affects environmental collaboration with suppliers as well as firms' adoption of green purchasing (Yen and Yen 2012), while entrepreneurial activities towards the environment in the form of firm innovativeness are improved when the managerial environmental attitudes are embedded within a market-oriented firm (Dibrell et al. 2011). Managers who express a high level of environmental concern are also keener to dedicate more time and resources to environmental initiatives (Naffziger et al. 2003). Likewise, managerial concerns with regard to the environment are positively related to the scope and speed of the firm's response to environmental issues (Tseng et al. 2013), and are thus the strongest driver of environmental innovation strategy (Eiadat et al. 2008). In summary, managerial environmental concern is one of the two most important drivers of eco-innovation adoption (Qi et al. 2010) and is the strongest driver of environmental innovation strategy (Eiadat et al. 2008). In addition, managerial environmental concern exerts a positive effect on the increase of environmental process innovations (Triguero et al. 2013) and works as a stimulus of corporate environmental responsiveness (Papagiannakis and Lioukas 2012), environmental new product development (Pujari et al. 2003) and environmental collaboration with suppliers, reflected in the company's green purchasing (Yen and Yen 2012). In line with the aforementioned research works, we posit that:

Hypothesis 3: There is a positive and significant relationship between managerial environmental concern and companies' implementation of eco-innovation.

Expected benefits and eco-innovation

When companies are in pace with regulations, they start to act more proactively concerning environmental issues, and they try to make their value chains more sustainable by focusing on reduction of material, more efficient use of raw materials and manufacturing facilities and also reduction of waste (Nidumolu et al. 2009). The aim of companies' implementation of eco-innovation usually concerns creation of a better image, but outcomes also include reduced costs and new market opportunities (Nidumolu et al. 2009). Implementation of eco-innovation leads to benefits that concern the environment as well as the company, providing a win-win situation for both of them (Horbach 2008). The benefits that the company can exploit from successful introduction and implementation of eco-innovation are cost savings, enhanced corporate image, improved relationship with local communities, access to new green markets and gain of superior competitive advantage (Shrivastava 1995). Sarkar (2013) stated that eco-innovation's implementation can result in direct and indirect benefits. Among these, the direct benefits include operational advantages, which result in cost savings and derive from greater resource productivity and better logistics, followed by sales from commercialization (Sarkar 2013), while the indirect benefits include better image; better relations with customers, suppliers and authorities; health and safety benefits; greater worker satisfaction; and, because of knowledge holders, an enhanced innovation capability overall (Sarkar 2013). Past findings (Sarkar 2013) emphasize that among companies there is an increasing recognition that the greening of business by improving resource productivity may increase their short and long-term competitiveness and create new markets.

In prior research works, the most frequently mentioned and acknowledged benefits of eco-innovation implementation are:

- *enhanced / improved firm reputation* (Le et al. 2006; Kemp and Foxon 2007; Eiadat et al. 2008; Dangelico and Pujari 2010; Hillestad et al. 2010; Lewis and Cassells 2010; Pellegrini-Masini and Leishman 2011; Doran and Ryan 2012; Holtbrügge and Dögl 2012; Klewitz et al. 2012; Agan et al. 2013; Chen 2013; Sarkar 2013),

- *cost savings* (Shrivastava 1995; Montabon et al. 2007; Ambec and Lanoie 2008; Horbach 2008; Lewis and Cassells 2010; Belin et al. 2011; Demirel and Kesidou 2011; Horbach et al. 2012; Klewitz et al 2012; Pereira and Vence 2012; Triguero et al. 2013; Chassagnon and Haned 2014),
- *entry on new markets* (Porter and van der Linde 1995b; Shrivastava 1995; Van Hemel and Cramer 2002; Lewis and Cassells 2010; Horbach et al. 2012; Chen 2013),
- *increase of market share* (Le et al. 2006; Lewis and Cassells 2010; Horbach et al. 2012).

Firm reputation

Firms aim to maintain a certain image that is consistent with the current external regulatory pressures (Holtbrügge and Dögl 2012). A growing body of empirical studies demonstrates that companies foster eco-innovations in order to avoid social pressures, to comply with external regulatory pressures and thus to improve their reputation (Holtbrügge and Dögl 2012). Non-complying behavior is punished, while loss of reputation and social pressures eventually affect commercial activity (Pacheco et al. 2010). Companies' business strategies integrate corporate social responsibility and environmental awareness in order to gain and enhance reputational advantages (Eiadat et al. 2008; Hillestad et al. 2010). While the effect of environmental awareness on a company's gain of competitive advantage is indirect rather than direct (Hillestad et al. 2010), this indirect impact is valuable, especially because environmental awareness is difficult for competitors to imitate and provides the company an improved reputation as environmentally aware (Hillestad et al. 2010). Moreover, key factors in customer purchasing decisions are brand recognition and acceptance; therefore, being the owner of a "green brand" will be increasingly important for companies (Kemp and Foxon 2007). Doran and Ryan (2012) have shown identified that voluntary agreement has the largest impact on eco-innovations' implementation in firms, while firms are willing to pay to brand themselves as eco-friendly. To conclude, expected gain of firm reputation stemming from engagement in eco-innovations is recognized as an important driver for companies' implementation of eco-innovations (Eiadat et al. 2008; Hillestad et al. 2010; Pellegrini-Masini and Leishman 2011; Holtbrügge and Dögl 2012).

Cost savings

Cost savings are a more significant determinant of environmental innovations than of other innovations (Horbach 2008). Furthermore, cost savings (especially material and energy savings) were found to strongly trigger eco-innovations in Germany and in France (Belin et al. 2011). They play a very important role as a trigger of eco-innovation (Horbach et al. 2012); although some researchers (Triguero et al. 2013) found their effect to be significant only for eco-process innovations. Cost savings constitute one of the main criteria for decisions to invest in eco-innovations, although there are no immediate visible results; therefore, the lack of knowledge about the potential of technologies, material and energy savings can be seen as a barrier to the implementation of eco-innovations (Pereira and Vence 2012). In addition, cost savings are most closely associated with the most advanced eco-innovations, because they are derived from elimination or re-use of waste; hence, they appear to have a lower potential for creating savings for companies with less advanced eco-innovations (Demirel and Kesidou 2011).

Regarding the expected benefits captured from successful implementation of eco-innovation, we propose the following hypothesis:

> *Hypothesis 4:* There is a positive and significant relationship between expected benefits and companies' implementation of eco-innovation.

Competition and eco-innovation

Another important driver that triggers eco-innovation is competition (Bansal and Roth 2000; Dangelico and Pontrandolfo 2010; Yalabik and Fairchild 2011; Inoue et al. 2013; Li 2014). Competitiveness has been defined as "the potential for ecological responsiveness to improve long-term profitability" (Bansal and Roth 2000, 724). In addition, improved competitiveness encompasses energy and waste management, source reductions resulting in a higher output for the same inputs (process intensification), eco-labeling and green marketing and, finally, the development of eco-products (Bansal and Roth 2000). Firms motivated by competitiveness expect that their implemented ecological responsiveness will lead to a sustained advantage and, consequently, to improved long-term profitability (Bansal and Roth 2000). Therefore, competition can be considered an effective driver of environmental innovation when dealing with environmentally sensitive customers (Yalabik and Fairchild 2011). In our study, our hypothesis related to competition as a driver of eco-innovation has been broken into two individual components – competitive intensity and competitive pressure. Building on institutional theory, we assume that companies' implementation of eco-innovation can result from a mimetic pressure, as a result of which companies follow their competitors' actions and pursue the same goals – that is, they mimic their actions, especially those that turn out to be lucrative (Spence et al. 2010; Li 2014). Eco-innovations have become an area in which companies have an opportunity to gain a competitive advantage over competitors through differentiation of a firm product, especially when operating in a highly competitive market (Lin et al. 2013a). Therefore, companies that operate in fiercely competitive markets are more likely to seek to be greener than their competitors (implementing new products or new management methods) to yield extra profits in future (Lin et al. 2013b). Past research on competitive pressure found it to be an effective driver of eco-innovation practices as well (Li 2014). The importance of providing green products through environmental innovation in order to establish a green image, increase market share and achieve sustainable development in an increasingly intense competitive environment is rising worldwide (Li 2014). The development of green products serves as means for companies to achieve a competitive advantage (Dangelico and Pontrandolfo 2010). The above discussion leads to the following hypotheses:

> *Hypothesis 5a:* There is a positive and significant relationship between competition intensity and companies' implementation of eco-innovation.
> *Hypothesis 5b:* There is a positive and significant relationship between competition pressure and companies' implementation of eco-innovation.

Hypotheses concerning consequences of eco-innovation

This section describes the development of hypotheses focused on eco-innovation outcomes. Hypotheses related to the eco-innovation outcomes pertain to firm performance (Section 5.2.1), economic performance (Section 5.2.2), competitive performance (Section 5.2.3) and internationalization (Section 5.2.4).

Eco-innovation and firm performance

Findings of previous research pertaining to the exploration of eco-innovation's influence on firm performance provide mixed results and can lead to misleading conclusions. Researchers (Rexhäuser and Rammer 2013;

Ghisetti and Rennings 2014) found that process eco-innovations that increase a company's resource efficiency (in terms of material or energy consumption per unit of output) lead to higher profitability and also increase the company's competitiveness. Meanwhile, externality-reducing innovations hamper both profitability and competitiveness (Ghisetti and Rennings 2014). Additionally, process eco-innovations exert a positive impact on the number of employees and the level of turnover (Rennings et al. 2006) and therefore contribute positively to the company's growth. Moreover, companies that engage in eco-innovation demonstrate higher levels of turnover per employee than companies which introduce non eco-innovations, and companies which do not engage in innovation activity (Doran and Ryan 2012, 435). In our study, we posit that eco-innovations exert a positive and significant impact on firm performance (in terms of company growth and profitability). We rely on the results of prior research works, which found a positive association between eco-innovations and firm performance. The relationship between eco-innovation and financial performance was found to be positive in a study focused on SMEs (Clemens 2006) and for specific industries such as manufacturing (Zeng et al. 2011). Moreover, technological innovation efficiency and firm performance were positively related (Cruz-Cázares et al. 2013), eco-friendly marketing strategy showed a positive impact on financial performance (Leonidou et al. 2013a), environmental innovation strategy was positively related to a firm's positive business performance (Eiadat et al. 2008) and green product innovation performance has been positively associated with firm financial performance (Huang and Wu 2010; Ar 2012; Lin et al. 2013a). In addition, prior research works that focused on eco-product, process and organizational innovation found a positive impact of these factors on firm performance (Cheng and Shiu 2012; Cheng et al. 2013), while other studies (Ar 2012; Lin et al. 2013a) also found that green product innovation positively affects firm performance. Concluding with an overview of eco-innovation performance, Horbach et al. (2012) found that the majority of eco-innovations (80.4%) lead to lower or constant cost, while 32% of these eco-innovations are associated with higher turnover; in other words, these eco-innovations are also economically successful. Likewise, the results of the study undertaken by Paraschiv et al. (2012) revealed that 35% of participant organizations achieved encouraging results, whereas another 21% reported significant results with a strong impact on the organization's financial performance; finally, 10% specified that the results of eco-innovations were insignificant. Therefore, we expect that:

> *Hypothesis 6a:* The relationship between eco-innovation's performance and company growth is direct and positive.
> *Hypothesis 6b:* The relationship between eco-innovation's performance and company profitability is direct and positive.

Eco-innovation and economic performance

In addition to the previous hypothesis, we also explore the relationship between eco-innovation's performance and economic performance by using self-reported measures. This hypothesis is added because in the previous one (Hypotheses 6a and 6b), we employ "harder" measures of firm performance, pertaining to company growth (in terms of growth over two business years pertaining to number of employees and net sales) and profitability (profitability indicator ratios, such as ROA, ROE and ROS), and those data are collected through the database GVIN. In this case, we adopt "soft" self-reported measures, in order to test the relationship between a company's adoption of eco-innovation and the effect on economic performance. This results from the discussion of how financial performance (especially regarding profitability indicator ratios) of a company's eco-innovation implementation becomes positive over a two-year lag, while it is negative after a one-year lag (Horváthová 2012). Economic performance, therefore, will be tested in this hypothesis by obtaining company respondents' perception of the effect of eco-innovation on companies' economic performance. Many research works have adopted self-reported measures to estimate the effect of eco-innovation on firm performance (Rao and Holt 2005; Clemens 2006; Eiadat et al. 2008; Cheng and Shiu 2012; Cheng et al. 2013). In our case, this approach presents added value, because we will be able to see whether there are any differences between using profitability indicator ratios or self-reported measures when testing the relationship between eco-innovation and firm performance. The above discussion leads us to postulate the following hypothesis:

> *Hypothesis 7:* The relationship between eco-innovation's performance and economic performance is direct and positive.

Eco-innovation and competitive benefits

Implementation of eco-innovations may result in other competitive benefits related to company performance (Sharma and Vredenburg 1998). The benefits that companies can seize from successful implementation of eco-innovation are as follows: cost savings, enhanced corporate image, improved relationship with local communities, access to new green markets and gain of superior competitive advantage (Shrivastava 1995). Further, Sarkar (2013) differentiated direct and indirect benefits. Direct benefits consist of operational advantages, which are seen in cost savings and derive from greater resource productivity and better logistics, followed by sales from commercialization (Sarkar 2013). Indirect benefits include better image; better relations with customers, suppliers and authorities; health and safety benefits; greater worker satisfaction; and, because of knowledge holders, enhanced innovation capability overall. Chen et al. (2006) stressed that investing in eco-innovation helps companies to improve their competitive advantage. The association of product and process eco-innovation with the company's competitive advantage has been found to be positive (Chen et al. 2006), whereas product eco-innovation exerts a stronger influence on competitive advantage than does process eco-innovation (Wong 2012). Moreover, companies' deployment of green product, process and managerial innovation will lead to cost savings, better product quality, increased efficiency and productivity and, consequently, improved competitive advantage (Chiou et al. 2011). Indeed, many companies worldwide have transformed their entire business operations to become more eco-efficient and thereby achieved a competitive advantage over their competitors (Mourad and Ahmed 2012). In summary, the past findings (Sarkar 2013) emphasize that companies increasingly recognize the fact that greening their business by improving resource productivity may increase their short and long-term competitiveness and create new markets. The above discussion leads us to propose the following hypothesis:

> *Hypothesis 8:* The relationship between eco-innovation's performance and competitive benefits is direct and positive.

Eco-innovation and internationalization

This hypothesis aims to test the relationship between eco-innovation's performance and firms' internationalization. Prior research has found a positive relationship between advanced environmental strategies and internationalization (i.e., export intensity; Martin-Tapia et al. 2010). Furthermore, a proactive environmental strategy is positively related to a company's export performance (Martin-Tapia et al. 2008). In addition, Beise and Rennings (2005) argued that regulations to stimulate eco-innovation have to be properly set; if national regulations comply with international markets, demand and international regulations, the "doors to international markets will be open"; otherwise, these eco-products and services will be only niches just in regional and national markets. Thus, we postulate the following hypothesis:

Hypothesis 9: The relationship between eco-innovation's performance and internationalization is direct and positive.

The overall hypotheses presented in this section can be summarized (Table 9) to form the basis of the eco-innovation model (Figure 5).

Table 9: Summary of research hypotheses

Construct variable	Hypothesis	Hypothesized relationships
Environmental policy instruments		
Command-and-control instrument	H1a	Command-and-control instrument (+) Eco-innovation
Economic incentive instrument	H1b	Economic incentive instrument (+) Eco-innovation
Customer demand	H2	Customer demand (+) Eco-innovation
Managerial environmental concern	H3	Managerial environmental concern (+) Eco innovation
Expected benefits from eco-innovation	H4	Expected benefits (+) Eco-innovation
Competition		
Competitive intensity	H5a	Eco-innovation (+) Competitive intensity
Competitive pressure	H5b	Eco-innovation (+) Competitive pressure
Company performance		
Company growth	H6a	Eco-innovation (+) Company growth
Company profitability	H6b	Eco-innovation (+) Company profitability
Economic benefits	H7	Eco-innovation (+) Economic benefits
Competitive benefits	H8	Eco-innovation (+) Competitive benefits
Internationalization	H9	Eco-innovation (+) Internationalization

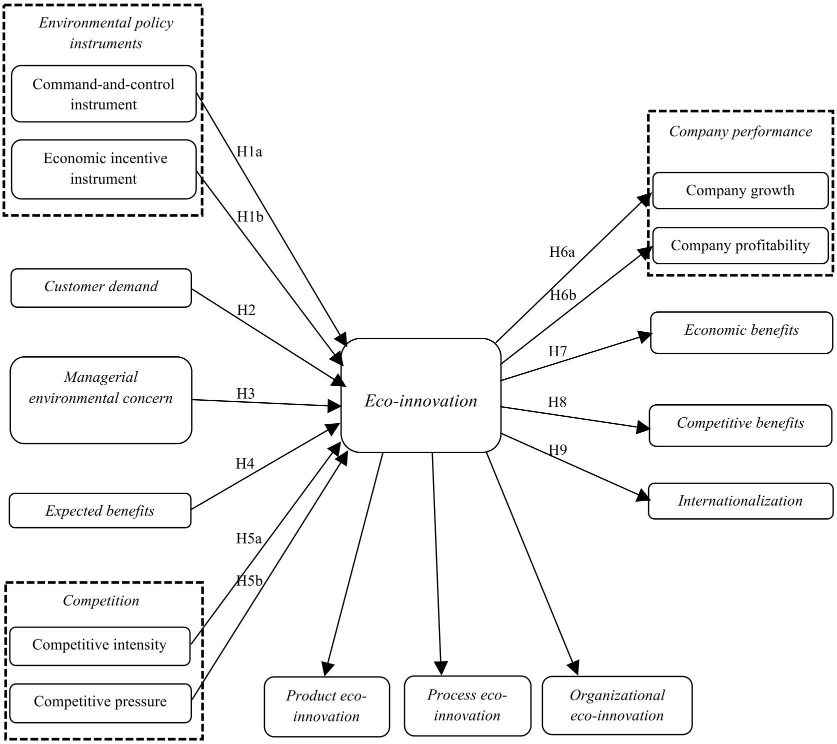

Figure 5: The eco-innovation conceptual model (for the construct-level model)

Methodology

The methodology will be discussed in terms of preliminary testing of the questionnaire, sampling and data collection and, lastly, data analysis and its evaluation.

Preliminary testing of questionnaire

Prior to data collection, the survey instrument was pre-tested for content validity through two stages. In the first stage, we asked eight experienced researchers to review and comment on the questionnaire to determine the clarity, ambiguity and appropriateness of the items used to operationalize each construct. We have prepared a list with all constructs' descriptions, including the definition and main aim of measurement for each one. Then, based on the feedback received from these eight researchers, we modified the instrument in order to enhance the clarity and appropriateness of the measures. In the second stage, we asked five environmental managers from five different industry sectors and different company sizes to agree to a one-hour meeting in which they would review and comment on the questionnaire. We asked them in face-to-face interviews to review and comment on the questionnaire regarding its clarity, ambiguity, completeness, readability and structure. Finally, feedback on the questionnaire was also received from person who was dealing with ISO 14001 certification. We used their feedback to further improve the questionnaire.

In this study, we have measured 15 latent variables: the command-and-control instrument, the economic incentive instrument, customer demand, managerial environmental concern, expected benefits, competitive intensity, competitive pressure, eco-innovation practices (eco-product, eco-process and eco-organizational innovation), company performance (company growth and profitability), economic performance, competitive benefits and internationalization. The validity and reliability of the survey instrument, as aforementioned, were supported by a comprehensive literature review and pilot tests using in-depth managerial interviews in five Slovenian companies active in eco-innovating, and the final version of questionnaire was completed online by respondents from 10 Slovenian companies. Wordings for some items were modified based on feedback and insights from the managerial interviews to tailor them to Slovenian eco-innovation practices, and some items were also added upon their suggestion. A seven-point Likert scale was utilized in this study.

Research instrument and operationalization of variables and measures

Our questionnaire is composed of five different content areas. In the first area, we asked respondents to indicate their level of agreement with items linked to the antecedents of eco-innovation. In the second area, we focused on eco-innovation implementation (encompassing three dimensions of eco-innovation: product eco-innovation, process eco-innovation and organizational eco-innovation). In the third area, we asked respondents about the consequences related to eco-innovation implementation (competitive benefits, company performance, economic performance and internationalization). The fourth area is dedicated to the company data (year of company's establishment, type of industry, size of the company in terms of the number of employees and overall sales, year when eco-innovation activities were started, and commerce transactions – B2B/B2C). Finally, the fifth area is related to general information about the respondents who completed the questionnaire. A seven-point Likert scale was utilized.

Measures for eco-innovation antecedents

Respondents were asked to indicate their level of agreement for each statement on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). The measures were adopted and adapted from previous research works, while some of items were added and adapted based on the comments and insight from pilot tests using in-depth managerial interviews.

First, following Eiadat et al. (2008), we used four items to measure managerial environmental concern. Expected benefits were measured by nine items, adapted from Agan et al. (2013). We also added one item of our own, based on the literature review and recommendations from the in-depth interviews with Slovenian environmental managers during the pilot testing of the questionnaire. Finally, four items, following Agan et al. (2013), measured customer demand. We asked each respondent to indicate the extent (1 = strongly disagree, 7 = strongly agree) to which they agreed with the posited statements.

Table 10: Items for three latent variables (Managerial environmental concern, Expected benefits, Customer demand)

Measurement variable	Source
Managerial environmental concern	
Eco-innovation is an important component of the company's environmental management strategy.	Eiadat et al. (2008)
Most eco-innovations are worthwhile.	Eiadat et al. (2008)
Eco-innovation is necessary to achieve high levels of environmental performance.	Eiadat et al. (2008)
Environmental innovation is an effective environmental management strategy.	Eiadat et al. (2008)
Expected benefits	
To reduce costs (energy, material, etc.).	Adapted from Agan et al. (2013)
To improve profitability.	Agan et al. (2013)
To increase productivity.	Agan et al. (2013)
To increase market share.	Agan et al. (2013)
To enter new markets.	Own
To improve firm reputation.	Adapted from Agan et al. (2013)
To strengthen the brand.	Agan et al. (2013)
Competitive advantage.	Agan et al. (2013)
Adjustment to EU.	Agan et al. (2013)
Customer demand	
Environment is a critical issue for our important customers.	Agan et al. (2013)
Our important customers often bring up environmental issues.	Agan et al. (2013)
Customer demands motivate us in our environmental efforts.	Agan et al. (2013)
Our customers have clear demands regarding environmental issues.	Agan et al. (2013)

In Table 11, we show the items used to measure the command-and-control instrument and the economic incentive instrument, both of which are latent variables pertaining to the construct environmental policy instruments. The first latent variable was measured using a 4-item scale, which was tailored to adapt to the Slovenian environment, with regard to the environmental policy instruments. The second latent variable, the economic incentive instrument, was measured using a 7-item scale, adapted from Li (2014) to align to the Slovenian environment. We asked each respondent to indicate the extent of their agreement with the statements given in Table 11 (1 = strongly disagree, 7 = strongly agree).

Table 11: Items for two latent variables (Command-and-control instrument, Economic incentive instrument)

Measurement variable	Source
Command-and-control instrument	
Our products should meet the requirements of national environmental regulations.	Li (2014)
Our products should meet the requirements of international and/or EU environmental regulations.	Adapted from Li (2014)
Our production processes should meet the requirements of national environmental regulations.	Adapted from Li (2014)
Our production processes should meet the requirements of international and/or EU environmental regulations.	Adapted from Li (2014)
Economic incentive instrument	
The government provides preferential subsidies for environmental innovation (availability of government grants, subsidies or other financial incentives for environmental innovation).	Adapted from Li (2014)
The government provides preferential tax policies for environmental innovation.	Li (2014)
Environmental taxes – taxes on energy, transport, pollution/resources.	Own
The government promotes environmental protection.	Li (2014)
The government provides green public procurement.	Own
The government provides opportunity to undertake environmental tenders/calls.	Own
The government provides opportunity to undertake environmental projects.	Zeng et al. (2011)

In Table 12, we present the items used for measuring two latent variables: competitive intensity and competitive pressure. Competitive intensity is oriented more towards the general intensity in the industry, while competitive pressure focuses on competition through the green concept. Three items, adopted from Jaworski (1993), measured competitive intensity. In addition, three items were used to measure the variable of competitive pressure, adopted from Li (2014) and focusing on the green concept.

For the variables of competitive intensity and competitive pressure, we used a 7-point scale anchored by "strongly disagree" and "strongly agree".

Table 12: Items for two latent variables (Competitive intensity and Competitive pressure)

Measurement variable	Source
Competitive intensity	
Competition in our industry is cutthroat.	Jaworski and Kohli (1993), Slovenian translation Bodlaj (2009)
Anything that one competitor can offer, others can match readily.	Jaworski and Kohli (1993), Slovenian translation Bodlaj (2009)
Price competition is a hallmark of our industry.	Jaworski and Kohli (1993), Slovenian translation Bodlaj (2009)
Competitive pressure	
We establish the company's environmental image compared to competitors through the green concept.	Li (2014)
We increase the company's market share through green concept.	Li (2014)
We improve the company's competitive advantage over competitors through the green concept.	Li (2014)

Measures for eco-innovation dimensions

Eco-innovation activities were measured with three latent variables: product, process and organizational eco-innovation. Respondents were asked to indicate their level of agreement with each statement on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). The measures were adapted from previous research works, while some of the items were added and adapted based on the comments and insight from pilot tests using in-depth managerial interviews.

Following Chen et al. (2006), Chen et al. (2008) and Chiou et al. (2011), we used seven items to measure product eco-innovation (see Table 13) using a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree).

Table 13: Items for the latent variable of Product eco-innovation

Measurement variable	Source
The company is using less or non-polluting/toxic materials (i.e., using environmentally friendly material).	Chiou et al. (2011), based on Chen et al. (2006, 2008)
The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	Chiou et al. (2011), based on Chen et al. (2006, 2008)
The company is recovering end-of-life products and recycling.	Chiou et al. (2011), based on Chen et al. (2006, 2008)
The company is using eco-labeling.	Chiou et al. (2011), based on Chen et al. (2006, 2008)
The company chooses product materials that consume the least amount of energy and resources for conducting the product development or design.	Chen et al. (2006, 2008)
The company uses the smallest amount of materials necessary for the product development or design.	Chen et al. (2006, 2008)
The company deliberately evaluates whether the product is easy to recycle, reuse and decompose when conducting the product development or design.	Chen et al. (2006, 2008)

Table 14: Items for the latent variable of Process eco-innovation

Measurement variable	Source
Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	Chiou et al. (2011), based on Chen et al. (2006, 2008)
Recycle, reuse and remanufacture material.	Chiou et al. (2011), based on Chen et al. (2006, 2008)
Use of cleaner technology to generate savings and prevent pollution (e.g., energy, water and waste).	Chiou et al. (2011), based on Chen et al. (2006, 2008)
The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	Chen et al. (2006, 2008)
The manufacturing process of the company reduces the use of raw materials.	Chen et al. (2006, 2008)

Items for process eco-innovation are adopted from Chen et al. (2006), Chen et al. (2008) and Chiou et al. (2011) and adapted based on interviews conducted in June 2014 with environmental managers from five different Slovenian companies active in implementation of eco-innovation. Five items were used to measure process eco-innovation (see Table 14), and respondents were asked to indicate their level of agreement with each statement on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree).

Finally, six items were selected to measure the variable of organizational eco-innovation (see Table 15), adapted from Cheng and Shiu (2012). A seven-point Likert scale (1 = strongly disagree, 7 = strongly agree) was utilized.

Table 15: Items for the latent variable of Organizational eco-innovation

Measurement variable	Source
Our firm management often uses novel systems to manage eco-innovation.	Cheng and Shiu (2012)
Our firm management often collects information on eco-innovation trends.	Cheng and Shiu (2012)
Our firm management often actively engages in eco-innovation activities.	Cheng and Shiu (2012)
Our firm management often communicates eco-innovation information with employees.	Cheng and Shiu (2012)
Our firm management often invests substantially in R&D on eco-innovation.	Cheng and Shiu (2012)
Our firm management often communicates experiences among various departments involved in eco-innovation.	Cheng and Shiu (2012)

Measures for consequences/outcomes of eco-innovation

The consequences of eco-innovation implementation were measured by four latent variables: company performance (measured as company growth and profitability), economic performance, competitive benefits and internationalization. Where the measures were self-reported (in the case of the last three variables listed above), a seven-point Likert scale was utilized. For the variable of company performance (company growth and profitability), we gathered the data from an objective source, the commercial firm database GVIN.

Companies' business performance (Table 16) was operationalized in terms of sales growth (Montabon et al. 2007; Eiadat et al. 2008; Fraj-Andres et al. 2009; Huang and Wu 2010; Ar 2012), return on assets (ROA; Horváthová 2012; Leonidou et al. 2013a), return on equity (ROE; Zeng et al. 2011; Horváthová 2012), return on sales (ROS; De Burgos-Jiménez et al. 2013); Rexhäuser and Rammer 2013) and number of employees (growth over two business years). The financial data of the analyzed companies were obtained from the commercial firm database GVIN, part of the international business group Bisnode AB, which is Europe's largest provider of business and credit information, operating in 17 European countries (GVIN 2015). The database provides firms' full balance sheets and profit-loss statements for Slovenian companies.

Table 16: Items for latent variable of Firm performance (growth and profitability)

Measurement variable	Source
ROA (return on assets)	GVIN database, secondary data
ROE (return on equity)	GVIN database, secondary data
ROS (return on sales)	GVIN database, secondary data
Number of employees – growth through 2 business years	GVIN database, secondary data
Net sales – growth through 2 business years	GVIN database, secondary data

We also measured economic performance (Table 17) using self-reported measures. We used nine items, following Wagner (2011). Respondents were asked what effects their environmental practices have had on: (1) sales, (2) market share, (3) new market opportunities, (4) corporate image, (5) management satisfaction, (6) employee satisfaction, (7) short-term profits, (8) cost savings and (9) productivity (we used a 7-point scale, anchored by 'substantial negative effect' and 'substantial positive effect').

Table 17: Items for latent variable of Economic performance

Measurement variable	Source
Sales	Wagner (2011)
Market share	Wagner (2011)
New market opportunities	Wagner (2011)
Corporate image	Wagner (2011)
Management satisfaction	Wagner (2011)
Employee satisfaction	Wagner (2011)
Short-term profits	Wagner (2011)
Cost savings	Wagner (2011)
Productivity	Wagner (2011)

Twelve items, following Sharma and Vredenburg (1998), measured competitive benefits (see Table 18). The respondents were asked to indicate the extent to which the company's environmental practices have led to a variety of competitive benefits (1 = no contribution, 7 = very large contribution).

Table 18: Items for latent variable of Competitive benefits

Measurement variable	Source
Reduction in material costs	Sharma and Vredenburg (1998)
Reduction in process/production costs	Sharma and Vredenburg (1998)
Reduction in costs of regulatory compliance	Sharma and Vredenburg (1998)
Increased process/production efficiency	Sharma and Vredenburg (1998)
Increased productivity	Sharma and Vredenburg (1998)
Increased knowledge about effective ways of managing operations	Sharma and Vredenburg (1998)
Improved process innovations	Sharma and Vredenburg (1998)
Improved product quality	Sharma and Vredenburg (1998)
Improved product innovations	Sharma and Vredenburg (1998)
Better relationships with stakeholders, such as local communities, regulators, and environmental groups	Sharma and Vredenburg (1998)
Improved employee morale	Sharma and Vredenburg (1998)
Overall improved company reputation or goodwill	Sharma and Vredenburg (1998)

Three items adopted from Ruzzier et al. (2014a; 2014b) measured internationalization as a latent factor. Thus, following Ruzzier et al. (2014a; 2014b), we used a combination of three different measures: number of foreign markets, number of operation modes and percentage of sales abroad in 2013. The items number of foreign markets and number of operation modes both measure the qualitative scope of internationalization, while the performance dimension of internationalization was measured by the extent of sales on foreign markets in 2013, ranging from 0 to 100%. The dependent variable of number of operation modes was constructed by summing up all operation modes (including direct export, export through intermediary, franchising, product or service licensing, contract, joint venture direct investment, sole venture direct investment).

Sampling and data collection

Data were collected using web research (email with attached link to the survey). The questionnaire and letter of intent were emailed to Slovenian companies in November 2014. The questionnaire was addressed to a top executive or environmental manager of the selected companies (in the larger companies, we addressed environmental managers or consultants that deal with environmental issues of the company or take care of ISO 14001 or EMAS in that company, while in the smaller companies generally the top executive was addressed, called the "director" in Slovenia). They were chosen as respondents because they were considered to be the most knowledgeable person with respect to the issue of environmental care in their company. However, if these respondents felt that they were not the most appropriate informants to complete the survey, we asked them to pass the questionnaires on to the most appropriate informants in their companies (a cover letter highlighting the study's background and objectives and a link to the survey were included in the email) or to introduce them to us, to finish the survey. Moreover, the respondents were assured of anonymity in reporting results. A variety of industries and company sizes were included, since the focus of the study is on eco-innovation in companies, which required us to include companies operating in all industry sectors, excluding public administration.

Data were collected from companies in Slovenia, in collaboration with an external research company specializing in data collection, which sent the questionnaire and invitation letter to a total of 6564 email addresses. The data were collected between November 2014 and January 2015. In the first round, the questionnaire was sent to 864 email addresses of ecological companies in Slovenia (i.e., companies with environmental certificates, such as ISO 14001, EMAS or environmental certificates, environmental prizes as identifies them also Gospodarska Zbornica Slovenije – Slovenian Chamber of Commerce) as well as to to 5,700 other email addresses (companies without environmental certificates but that might implement eco-innovations as well). In total, three reminders were sent to companies in order to urge them to collaborate in this study and complete the questionnaire.

The usual response rate for postal surveys in Slovenia varies from 10% to 25% (Ruzzier 2005), while research distributed via email gives a much lower response – as high as 2% at best (Nagy 2013). Given the fact that our survey has been conducted through email, the response rate was much lower than the average for postal surveys. Due to the length of the questionnaire in this study (requiring at least 20 minutes to complete), a conservative response rate was expected. As aforementioned, the questionnaire, with a short description of the project and invitation to executives/environmental managers to collaborate in this study, was emailed to 6564 companies in total. At the end of the questionnaire, respondents were asked to choose whether they wanted to receive a summary of the research results, an invitation to the public presentation of the results or neither. The number of responses received was 223 (a 3.40% response rate), which was similar to what we expected due to the length of the questionnaire, the lack of an established relationship with the companies and the use of email to gather the results. Many of the emails sent were not delivered to the recipients, and not all of the companies to which the questionnaire was sent were dealing with eco-innovations.

The 223 completed questionnaires were further analyzed for missing data. We followed Hair et al. (2006), who suggest that an observed unit (in our case, one questionnaire) missing less than 10% of values can be retained for further analysis and that a separate variable (measurement item) missing less than 15% of values can be retained as well. Therefore, the extent and the pattern of missing data were checked.

We first checked for the extent of missing data concerning variables. The overall amount of missing data was small, totaling 3.947% of missing values. In more detail, only two variable measurement items in the questionnaire demonstrated missing data (measurement items had 0.4% to 1.3% missing values) and therefore no variable measurement items were removed from the analysis. The percentage of missing data is a bit higher for firm performance, for which the data were required separately from the collected questionnaires for all the included companies (secondary data). With regard to firm performance (profitability indicator ratios and company growth), two measurement items (growth of net sales through two business years and ROS) had 0.4% of missing values, one measurement item (ROE) had 1.3% of missing values and one measurement item had 9.9% of missing values (growth of number of employees over two business years). We did not remove these items from the analysis. The higher proportion of missing data for these items may be due to the fact that some companies do not report certain data because they do not pertain to them (e.g., growth of employees through the last two business years does not apply to a sole proprietorship).

The pattern of missing data was also examined. Missing data must always be addressed if the missing data are in a nonrandom pattern or more than 10 percent of the data are missing (Hair et al. 2006). Missing data can be considered random if the pattern of missing data for a variable does not depend on any other variable in the data set or on the values of the variable itself (Hair et al. 2006). We checked for a pattern among the cases (questionnaires/companies) and found that there are only four cases (companies) with missing values, and the overall amount of missing data was 1.794%. When we add the firm performance variables (profitability indicator ratios and company growth), there are 25 cases with a total of 11.21% of missing data. As we have explained previously, companies that are of the legal form of a sole proprietorship do not report some data, such as growth of employees, which can lead to the missing data. We investigated data for missing values and concluded that data were missing completely at random since no pattern of missing data was found. Regarding the missing data related to the company's financial data (profitability indicator ratios and regarding the company's growth), as we explained above, in such a case imputation is not an appropriate solution. Thus, the number of retained responses usable for analysis is 223.

Common method variance assessment

Since we used a single informant from each of the companies to complete the survey, concerns of common method variance (hereinafter CMV) should be addressed (Podsakoff et al. 2003). CMV is addressed because the majority of data are self-reported (using a single informant from each of the companies) and the data were collected through the same questionnaire during the same period of time with a cross-sectional research design. Thus, the CMV is attributed to the measurement method rather than the constructs of interest and may cause systematic measurement error and further bias the estimates of the true relationship among the theoretical constructs. Therefore, we also analyzed data for common method variance problems by following the recommendations of Podsakoff et al. (2003). The potential for common method variance has been reduced by ensuring confidentiality to respondents participating in our study and, as aforementioned, by pre-testing the questionnaire items for their unambiguity, clearness and familiarity of wording. In this study, CMV is examined by Harman's single factor test, which is the most widely used method to assess the possibility of CMV. Podsakoff and Organ (1986) stressed that if CMV is present, a single factor will emerge from the factor analysis of all survey items. Therefore, we used all survey items from the 223 questionnaires to conduct an exploratory factor analysis in SPSS. The un-rotated principal components factor analysis results demonstrate that no single factor accounts for the majority of the variance and that the first factor captures only 34.189% of the variance, which suggests that CMV is not present.

Data analyses

The data were analyzed using univariate and multivariate statistical methods conducted with the statistical program SPSS (version 21). For each construct used in our eco-innovation model, we tested the reliability of the construct (using Cronbach's alpha), and we further conducted exploratory and confirmatory factor analysis for all constructs used in the eco-innovation model using two statistical packages, SPSS and EQS 6.1. Furthermore, to test the hypotheses pertaining to the influence of eco-innovation antecedents (environmental policy instruments, managerial environmental concern, customer demand, expected benefits and competitive pressure) on eco-innovation (product, process and organizational eco-innovation and eco-innovation construct) and its consequences (company performance (in terms of growth and profitability), economic performance, competitive benefits and internationalization), we used the multivariate technique of structural equation modeling (hereinafter SEM) employing the statistical program EQS 6.1. Therefore, the model and hypotheses were tested by using SEM, which allows for simultaneous evaluation of multiple related dependent and independent relationships and takes into account measurement error (estimates) in the evaluation process (Hair et al. 1998).

Most scales used in this study were examined for convergent and discriminant validity using exploratory and confirmatory factor analyses. For each construct used in this study, exploratory factor analysis has been performed. We have therefore tested whether the number of factors proposed by the exploratory factors analysis is in line with the expected number of factors. We used the Maximum Likelihood method and Direct Oblimin rotation (oblique rotation, which expects correlations between factors). After conducting the exploratory factors analysis, we have also conducted confirmatory factor analysis for each construct to assess the reliability, validity and goodness-of-fit of each construct. Confirmatory factor analysis (CFA) enables us to test how well the measured variables represent the constructs (Hair et al. 2009). Regarding the eco-innovation construct, which was measured as a second-order construct, we first checked for construct reliability, which measures the reliability and internal consistency of the measured variables representing a latent construct (Hair et al. 2009). Before assessing the construct validity which deals with the accuracy of measurement (the extent to which a set of measured variables actually reflects the theoretical latent construct those items are designed to measure), we have to establish construct reliability (Hair et al. 2009). After this, we checked the eco-innovation construct, which includes three dimensions for convergent validity (the extent to which indicators of a specific construct converge or share a high proportion of variance in common) and discriminant validity (the extent to which a construct is truly distinct from other constructs). There are several ways to estimate the relative amount of convergent validity among item measures. The size of factor loadings is one important consideration. In the case of high convergent validity, high loadings on a factor would indicate that they converge on some common point. At a minimum, all factor loadings should be statistically significant, and the standardized loading estimates should be 0.50 or higher, and ideally 0.70 or higher. The rationale behind this rule can be understood in the context of an item's communality; the square of standardized factor loading represents how much variation in an item is explained by the latent factor (meaning that a loading of 0.71 squared equals 0.50; the factor explains half the variation in the item, with the other half being error variance). The second indicator of convergence is variance extracted; with CFA, the average percentage of variance extracted among a set of construct items is a summary indicator of convergence. A value of variance extracted of 0.50 or higher is a good indicator of adequate convergence. Moreover, reliability is also an indicator of convergent validity; coefficient alpha remains a commonly applied estimate, although it may understate reliability. The rule of thumb for either reliability estimate is that 0.70 or higher suggests good reliability, while reliability between 0.60 and 0.70 may be acceptable. High construct reliability indicates that internal consistency exists, meaning that the measures all consistently represent the same latent construct (construct reliability should be 0.70 or higher to indicate adequate convergence or internal consistency) (Hair et al. 2009).

The eco-innovation construct in our study is composed of three dimensions – product, process and organizational eco-innovation – and is thus a second-order latent factor. Items were grouped together in the expected grouping by dimension. Poorly fitting items – those that had low communalities, or had low correlations with other items pertaining to the same dimension or loaded onto two dimensions – have been excluded. The convergence and divergence of dimensions were checked by assessing the fit of confirmatory models and inter-dimension correlations. Furthermore, the contributions of the eco-innovation dimensions-only model versus contributions of the overall factor-only model were examined by comparing nested models (dimensions-only and one factor-only) with an overall model that included both dimension factors and the overall eco-innovation factor, by employing confirmatory factor analysis. These contributions were analyzed using a test of significant improvements in the model fit (the NFI for the two model differences, computed with a formula from Bentler 1990).

For testing the proposed hypotheses, we used structural equation modeling (SEM). The typical application of SEM is to a system of relations, collectively referred to as a model. A model can include relations among measured variables and latent variables (i.e., factors, constructs) as well as nondirectional and directional (direct and indirect) relations. The model typically is presented at two levels: conceptual and statistical (Hoyle and Panter 1995). The conceptual model specifies the relations among concepts that are operationalized in the empirical study, while the precise statistical model that will be tested cannot be deduced from the presentation of the conceptual model. As such, each construct represented in the conceptual model must be operationalized, and the model must be translated into the statistical manifestation that has been or is to be tested. A path diagram can be an effective means of communicating structural equation models at the statistical level (Hoyle and Panter 1995). Also, in our study, a structural equation model was used to test the theoretical model. SEM is a statistical methodology that takes a confirmatory (i.e., hypothesis-testing) approach to the multivariate analysis of a structural theory bearing on some phenomenon (Byrne 2006 in Murovec et al. 2012). Typically, this theory represents "causal" processes that generate observations on multiple variables (Bentler 1995).

SEM is a family of statistical models that seek to explain the relationships among multiple variables (Hair et al. 2009). It therefore examines the structure of interrelationships expressed in a series of equations, similar to a series of multiple regression equations. These equations depict all of the relationships among constructs (the dependent and independent variables) involved in the analysis. Constructs are unobservable or latent factors represented by multiple variables (much like variables representing a factor in factor analysis). So far, each multivariate technique has been classified either as an interdependence or a dependence technique. SEM can be thought of as a unique combination of both types of techniques because SEM's foundation lies in two familiar multivariate techniques: factor analysis and multiple regression analysis (Hair et al. 2009).

Hair et al. (2009) emphasized three main characteristics based on which SEM models can be distinguished:

- Estimation of multiple and interrelated dependence relationships,
- An ability to represent unobserved concepts in these relationships and correct for measurement error in the estimation process,
- Defining a model to explain the entire set of relationships.

SEM has also the ability to incorporate latent variables into the analysis. A latent variable, or latent construct, is a hypothesized and unobserved concept that can be represented by observable or measurable variables. It is measured indirectly by examining consistency among multiple measured variables, sometimes referred to as manifest variables, or indicators, which are gathered through various data collection methods (e.g., surveys, tests, observational methods) (Hair et al. 2009). The standard method of estimating free parameters in SEM is to employ maximum likelihood (ML). A growing body of research indicates that ML performs reasonably well under a variety of less-than-optimal analytic conditions (e.g., small sample size, excessive kurtosis) (Hoyle and Panter 1995). Moreover, Hair et al. (2006) pointed out that several readily available statistical programs are convenient for performing SEM. Traditionally, the most widely used program is LISREL. EQS is another widely available program that also can perform regression and factor analysis and can test structural models. AMOS is a third program that has gained popularity because it is user-friendly and available as an addition to SPSS.

Evaluation of the results

For all the constructs measured in this survey, we first conducted an exploratory factor analysis, which is a class of procedures primarily used for data reduction and summarization (Malhotra 1993). Our main aim was to see how many factors are extracted based on the variables that were used to measure different constructs.

When evaluating exploratory factor analysis, the key statistics associated with factor analysis are as follows (Malhotra 1993):

- *Bartlett's test of sphericity* is a test statistic used to examine the hypothesis that the variables are uncorrelated in the population. In other words, the population correlation matrix is an identity matrix in which each variable correlates perfectly with itself (r = 1) but has no correlation with the other variables (r = 0).
- *Correlation matrix* is a lower triangle matrix showing the simple correlations between all possible pairs of variables included in the analysis.
- *Communality* is the amount of variance a variable shares with all the other variables being considered. This is also the proportion of variance explained by the common factors.
- *Eigenvalue* represents the total variance explained by each factor.

- *Factors loadings* are simple correlations between the variables and the factors.
- *Factor matrix* contains the factor loadings of all the variables on all the factors extracted.
- *Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy* is an index use to examine the appropriateness of factor analysis. High values (between 0.50 and 1) indicate that factor analysis is appropriate. Values below 0.50 imply that factor analysis may not be appropriate.
- *Percentage of variance* is the percentage of the total variance attributed to each factor.

Exploratory factor analysis was performed using the Maximum Likelihood extraction method and Direct Oblimin rotation. Most research using EFA has extracted factors that are orthogonal – that is, uncorrelated with or independent of one another (Maruyama 1998). In our study, we used the oblique rotation (e.g., Direct Oblimin), which predicts that factors are correlated with or dependent on one another and is in line with what the structural equation approaches hypothesize; factors in structural equation models usually will be hypothesized to correlate with one another (Maruyama 1998). Moreover, Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) test were used to determine whether data were appropriate for factor analysis. KMO values of 0.80 or above are excellent, 0.70 or above are middling, 0.60 or above are mediocre, 0.50 or above are poor, and below 0.50 are unacceptable (Hair et al. 1998). In our study, all the KMO values were above 0.50, and the sig. value of Bartlett's test of sphericity was less than 0.05, which means that our data justify the use of exploratory factor analysis.

After the exploratory factor analysis, we also conducted confirmatory factor analysis. Evaluating the results of SEM involves theoretical criteria, statistical criteria, and an assessment of fit. Although the issue of fit is discussed in literature in greater detail than the other issues, it should be remembered that fit is of no interest unless the results meet theoretical and statistical criteria. A model submitted to an SEM program should be based as much as possible on "theory" in the sense of a systematic set of relationships providing a consistent and comprehensive explanation of a phenomenon. After the parameters of the models are estimated, they should be assessed from a theoretical perspective (e.g., the signs and magnitudes of the coefficients should be consistent with "theory"). Besides the theoretical criteria mentioned above, there are also two major statistical criteria. The first pertains to the identification status of the model

(Klem 2000); a model can be either under-identified (this happens when a structural model has a negative number of degrees of freedom, meaning that we aim to estimate more parameters than is possible with the input matrix) or over-identified (this happens when a structural model has a positive number of degrees of freedom and thus indicates that some level generalizability may be possible). The researchers' objective is always steered towards achievement of maximum model fit, with the largest number of degrees of freedom (Ruzzier 2005). The statistical reasonableness of the parameters concerns the second major statistical criterion. A model with negative variances and correlations greater than one is misspecified and can further result in improper results (Klem 2000).

When it comes to determining the adequacy of a structural equation model, various measures of model fit are available. The two most popular ways of evaluating model fit are those that involve the chi-square goodness-of-fit statistic (χ^2 test) and the so-called fit indexes that have been offered in order to supplement the χ^2 test (Hu and Bentler 1995). The χ^2 test enjoyed substantial popularity at first, while the problems associated with the goodness-of-fit χ^2 tests were recognized quite early. One of the concerns has centered on the sample size issue. The statistical theory for T is asymptotic; that is, it holds as sample size gets arbitrarily large. Therefore, T may not be χ^2 distributed in a small sample; therefore, it may not be correct for model evaluation in practical situations. Furthermore, T may not be χ^2 distributed when the typical underlying assumption of multivariate normality is violated. Therefore, the standard χ^2 test may not be a sufficient guide to model adequacy, because a significant goodness-of-fit χ^2 value may be a reflection of model misspecification, the power of the test, or a violation of some technical assumption underlying the estimation method (Hu and Betler 1995).

When an SEM model that looks theoretically sensible is identified and there are no signs of statistically improper estimates, we check whether the data fit the model using various goodness-of-fit measures (Ruzzier 2005). With the measurement model specified, sufficient data collected, and key decisions such as the estimation technique already made, the researcher comes to the most fundamental question in SEM testing: "Is the measurement model valid?" Measurement model validity depends on goodness-of-fit for the measurement model and specific evidence of construct validity (Hair et al. 2009).

Among the fit indexes, we can distinguish three types of fit measures: 1) absolute fit measures, 2) incremental fit measures and 3) parsimonious fit measures. An absolute fit index directly assesses how well an a priori model reproduces the sample data (Hu and Bentler 1995). Absolute fit indexes are a direct measure of how well the model specified by the researcher reproduces the observed data; they provide the most basic assessment of how well a researcher's theory fits the sample data (Hair et al. 2009). They do not explicitly compare the goodness-of-fit of a specified model to any other model; rather, each model is evaluated independently of other possible models (Hair et al. 2009). Absolute-fit measures (e.g., $\chi 2$ statistic, GFI, RMSR, SRMR, RMSEA etc.) only assess the overall goodness-of-fit for both the structural and measurement models collectively and do not make any comparison to a specified null model (incremental fit measure) or adjust for the number of parameters in the estimated model (parsimonious fit measure) (Hair et al. 2006). An incremental fit index measures the proportionate improvement in fit by comparing a target model with a more restricted, nested baseline model (Hu and Bentler 1995). Incremental fit indexes differ from absolute fit indexes in that they assess how well a specified model fits relative to some alternative baseline model (Hair et al. 2009). The most common baseline model is referred to as a null model, one that assumes all observed variables are uncorrelated (Hair et al. 2009). It implies that no data reduction could possibly improve the model because it contains no multi-item factors, thus making impossible any multi-item constructs or relationships between them (Hair et al. 2009). Incremental fit indexes are: NFI, CFI, TLI, RNI (Hair et al. 2009). Finally, the third group of indexes is designed specifically to provide information about which model among a set of competing models is best, considering its fit relative to its complexity. A parsimony fit measure (e.g. PR, PGFI, PNFI) is improved either by a better fit or by a simpler model. In this case, a simpler model is one with fewer estimated parameter paths. Parsimony fit indexes are conceptually similar to the notion of an adjusted R^2 in the sense that they relate model fit to model complexity. More complex models are expected to fit the data better. The indexes are not useful in assessing the fit of a single model but are quite useful in comparing the fit of two models when one is more complex that the other (Hair et al. 2009).

There are three major problems involved in using fit indexes for evaluating goodness of fit: a) small sample bias, b) estimation effects and c) effects of violation of normality and independence. The previously mentioned problems are a natural consequence of the fact that these indexes typically are based on χ^2 tests. As noted previously, these χ^2 tests may not perform adequately at all sample sizes; moreover, because the adequacy of an χ^2 statistic may depend on the particular assumptions it requires about the distributions of variables, these same factors can be expected to influence evaluation of model fit (Hu and Bentler 1995). In our study, we report the values of χ^2 tests notwithstanding that these are high and consistently statistically significant, which is the result of the influence exerted by the sample size – performing more poorly in smaller samples that are considered to be not "asymptotic" enough. In addition, some other fit indexes, such as NFI, perform more poorly when they have a small sample size. Therefore, Bearden, Sharma and Teel (1982 cited in Hu and Bentler 1995) found that the mean of NFI is positively related to sample size and that NFI values tend to be far less than 1.00 when sample size is small (NFI is therefore not a good indicator for evaluating model fit when *N* is small).

In our study, we will report the following fit indexes:

- *Chi-square (χ^2 test)* – the fundamental measure used in SEM to quantify the differences between the observed and estimated covariance matrices. Chi-square is influenced by the difference in covariance matrices and by sample size. Moreover, increasing the size of the covariance matrix (i.e., using more indicator variables) increases the chance that the differences in matrices will be large (i.e., significant p-values can be expected). In SEM, we do not want the p-value for the χ^2 test to be small (statistically significant). Rather, if our theory is to be supported by this test, we want a small χ^2 value (and corresponding large p-value), thus indicating no statistically significant difference between the matrices (meaning that the observed sample and SEM estimated covariance matrices are equal and the model fits perfectly) (Hair et al. 2009).
- *SRMR (Standardized Root Mean Square Residual)* – an alternative statistic based on the residuals is the standardized root mean residual, which is a standardized value of RMSR and thus is more useful for comparing fit across models. Lower SRMR values represent better fit and higher values represent worse fit, which puts the SRMR into a category of indexes sometimes known as badness-of-fit measures, in which high values are indicative of poor fit (Hair et al. 2009). The average SRMR value is 0, meaning that both positive and negative residuals can occur. Thus, a predicted covariance lower than the observed value results in a positive residual, while a predicted covariance larger than the observed value results in a negative residual. It is difficult to provide a hard-and-fast rule indicating when a residual is

too large, but the researcher should carefully scrutinize any standardized residual exceeding |4.0| (below -4.0 or above 4.0) (Hair et al. 2006) With regard to the SRMR values, Hu and Bentler (1999 in Murovec et al. 2012) suggest that SRMR values of less than 0.08 indicate an acceptable fit.

- *RMSEA (Root Mean Square Error of Approximation)* – another measure that attempts to correct for the tendency of the χ^2 goodness-of-fit test statistic to reject models with large samples or a large number of observed variables. It differs from the RMSR in that it has a known distribution. Thus, it better represents how well a model fits a population, not just a sample used for estimation. Lower RMSEA values indicate better fit; typically, "good" RMSEA values are below 0.10 for most acceptable models (Hair et al. 2009).
- *NFI (Normed Fit Index)* – the NFI is a ratio of the difference in the χ^2 value for the fitted model and a null model divided by the χ^2 value for the null model. It ranges between 0 and 1; a model with perfect fit would produce an NFI of 1 (Hair et al. 2009).
- *CFI (Comparative Fit Index)* – the CFI is an incremental fit index that is an improved version of the normed fit index (NFI). The CFI is normed so the values range between 0 and 1, with higher values indicating better fit (Hair et al. 2009).

The ultimate goal of any of these fit indexes is to assist the researcher in discriminating between acceptably and unacceptably specified models (Hair et al. 2009). Academic journals are replete with SEM results citing a 0.90 value on key indexes, such as the TFI, CFI, NFI and GFI, as indicating an acceptable model (Hair et al. 2009). Hoyle and Panter (1995) suggest that 0.90 stands as the agreed-upon cutoff for overall fit indexes (in our case, pertaining to the NFI, NNFI and CFI). In general, 0.90 is the "magic number" for good-fitting models (Hair et al. 2009). In addition, Hair et al. (2009) stressed that more complex models with larger samples should not be held to the same strict standards; thus, when samples are large and the model contains a large number of measured variables and parameter estimates, cutoff values of 0.95 on key goodness-of-fit measures are unrealistic.

Results

Findings on the eco-innovations of analyzed companies will first be analyzed in terms of general findings. This section presents the study results in four sections. First, we present the sample characteristics (Section 7.1), followed by analyses of different constructs – general descriptive statistics, followed by exploratory and confirmatory analyses for each construct. The findings on eco-innovations of analyzed companies will first be analyzed in terms of general findings (descriptive statistics). Second, all the constructs will be analyzed and tested by employing an exploratory analysis in SPSS and further conducting confirmatory factor analysis in EQS. Therefore, we will first present the relevant descriptive statistics, conduct exploratory and confirmatory analyses for the determinants of eco-innovation (Sections 7.2), followed by the same analyses done for all three eco-innovation types (product, process and organizational eco-innovation), presented in Section 7.3. We will conclude with the constructs that measure eco-innovation outcomes (competitive benefits, economic benefits, company performance and internationalization), which will be presented in the same way as previously described (Section 7.4).

Sample characteristics

We received 223 usable responses from 223 companies. As previously mentioned, the questionnaire, with cover letter and invitation, was sent via email and addressed to the top executives, who were asked to forward the questionnaire to the most appropriate person in their company for responding on the subject of environmental issues. The respondents held the following positions: top executive (*N* = 49), environmental manager or management representative for environment (*N* = 36), quality manager or management representative for quality (*N* = 29), HSE (health and safety) manager (*N* = 2), ecologist (*N* = 3), management representative for EMS (environmental management systems) (*N* = 8), R&D sector (*N* = 8), HR manager (*N* = 3), consultant for the environment (*N* = 6), technologist (*N* = 9), commercialist (*N* = 11), assistant director (*N* = 7), administrator (*N* = 3), board member (*N* = 2), owner (*N* = 5), founder or cofounder (*N* = 3), project manager (*N* = 2), accountant (*N* = 4), business secretary (*N* = 5), and procurator (*N* = 4).

Additionally, the respondents' demographic structure shows that the majority of respondents were men (124; 55.6%), and the majority (81 respondents; 36.3%) were between 41-50 years old, followed by 73 respondents (32.7%) who were between 31 and 40 years old and 53 respondents (23.8%) who were older than 51. Only 16 respondents (7.2%) were less than 30 years old. Related to their years of working experience, the majority (67 respondents; 30%) have between 21 and 30 years of working experience, followed by 46 respondents (20.6%) with between 16 and 20 years of working experience and 38 respondents (17%) with 31 or more years of working experience. Continuing, 28 respondents (12.6%) have between 11 and 15 years of working experience, while 26 respondents (11.7%) indicated that they have between 6 and 10 years of working experience, followed by 11 respondents (4.5%) that have between 1 and 3 years of working experience and seven respondents (3.1%) with between 4 and 5 years of working experience. Lastly, we asked them about their highest degree of education. The majority of respondents have acquired a bachelor's degree (78 respondents; 35%), followed by 77 respondents (34.5%) who have finished high/higher professional college and 39 respondents (17.5%) who have finished vocational or high school. Also, 22 respondents (9.9%) reported finishing a specialization, MBA or master's degree and 7 respondents (3.1%) have completed doctorate.

Regarding the sample characteristics (see Table 19) and focusing on firm size (number of employees), the results of the descriptive statistics show that the sample of analyzed companies includes 52 (23.3%) micro companies (having less than 9 employees), followed by 68 (30.5%) small companies (between 10-49 employees), 56 (25.1%) medium-sized companies (between 50-249 employees) and 47 (21%) large companies (250 or more employees). When focusing on firm size with regard to the company's profitability (annual sales in 2013), we can see that 27 (12.1%) companies had earned 400,000 EUR or less in year 2013, while another 27

(12.1%) of companies reported between 400,000-800,000 EUR of annual sales in 2013. Moreover, 29 (13%) companies reported between 800,000-1,600,000 EUR of annual sales in 2013, followed by 41 (18.4%) companies that reported between 1,600,000-4,000,000 EUR; lastly, 46 (20.6%) of companies reported between 4,000,000 and 20,000,000 EUR of sales in 2013.

Table 19 shows also the firm age of the analyzed companies. We can see that the majority of companies included in our sample are between 21 and 50 years old (78 companies; 35%), followed by 62 companies (27.6%) that are more than 50 years old and 52 companies (23.3%) that are between 11 and 20 years old. Additionally, 20 companies (9%) have between 6 and 10 years, followed by 9 companies (4%) that are between 2 and 5 years old and only 2 companies (0.9%) that are less than 2 years old.

Table 19: Sample characteristics

	Number of companies	Percent
Firm size (number of employees)		
0-9 employees	52	23.3%
10-49 employees	68	30.5%
50-100 employees	27	12.1%
101-249 employees	29	13.0%
250-500 employees	17	7.6%
501-1000 employees	15	6.7%
More than 1000 employees	15	6.7%
Firm size (annual sales in 2013)		
400,000 EUR or less	27	12.1%
Between 400,000-800,000 EUR	27	12.1%
Between 800,000-1,600,000 EUR	29	13.0%
Between 1,600,000-4,000,000 EUR	41	18.4%
Between 4,000,000 and 20,000,000 EUR	46	20.6%
Above 20,000,000 EUR	53	23.8%
Firm age		
Less than 2 years	2	0.9%
Between 2-5 years	9	4%
Between 6-10 years	20	9%
Between 11-20 years	52	23.3%

	Number of companies	Percent
Between 21-50 years	78	35%
More than 50 years	62	27.8%
Operating on foreign markets		
Yes	151	67.7%
No	72	32.3%
Commerce transactions		
B2B (business-to-business)	113	50.7%
B2C (business-to-customer)	109	48.9%
Both	1	4%

Concerning the internationalization aspect, 151 companies (67.7%) are internationalized (operating on foreign markets), while 72 companies (32.3%) are not. Lastly, pertaining to the commerce transactions, 113 (50.7%) of companies operate on a business-to-business level and 109 (48.9%) operate on a business-to-customer level, while one company (4%) operates on both.

Furthermore, Table 20 illustrates the main industry in which the analyzed companies operate. We can see that the majority of companies operates in the service industry (110 companies; 49.3%), followed by manufacturing (82 companies, 36.8%), while some companies have not identified themselves with either of the given categories (28 companies; 12.6%). These companies indicated that they operate in several types of industries, such as: ICT (6 companies; 2.7%), followed by cleaning services (5 companies; 2.2%), waste management and distribution (4 companies each; 1.8%). Moreover, companies also identified energy industry and municipal activities as their main industry type (3 companies each; 1.4%), followed by the electro industry and, lastly, the automotive industry (0.4%).

Table 20: Main industry types in which analyzed companies operate

Main industry		Number	Percent	Total
Manufacturing	Production of industrial goods	58	26.0%	82 (36.8%)
	Production of consumer goods	15	6.7%	
	Other manufacturing	9	4.0%	
Services	Construction	25	11.2%	110 (49.3%)
	Retail and wholesale	24	10.8%	
	Transportation and public goods	14	6.3%	
	Engineering, research and development	8	3.6%	
	Consulting and business services	7	3.1%	
	Consumer services	6	2.7%	
	Tourism	4	1.8%	
	Banking, investment banking, insurance	2	0.9%	
	Mining, extraction, oil	1	0.4%	
	Other services	19	8.5%	
Other (please specify)	ICT	6	2.7%	28 (12.6%)
	Cleaning services	5	2.2%	
	Waste management	4	1.8%	
	Distribution	4	1.8%	
	Energy industry	3	1.4%	
	Municipal activities	3	1.4%	
	Electro industry	2	0.9%	
	Automotive industry	1	0.4%	
Not specified:		3	1.4%	3 (1.4%)
Total		223	100%	223 (100%)

Continuing, Table 21 depicts the environmental certificates or prizes acquired by the companies in our sample. We can see that more than a third of the included companies are ISO 14001 accredited (86 companies or 38.6%). In addition, 4 companies (1.8%) are EMAS accredited. Moreover, there are also other environmental certificates; the Chamber of Commerce Slovenia on their website gathers them together and publishes a list of environmental certificates/prizes with the names of companies that obtained them. Therefore, 25 companies (11.2%) possess Environment friendly company certificates, followed by 20 companies (9%) that have acquired certificates for Energy efficient projects, 18 companies (8.1%) have acquired Energy efficient company certificates and 17 companies (7.6%) with Clean production certificates. There are also 13 companies (5.8%) that obtained Environment friendly process certificates, followed by 12 companies (5.4%) that possess Responsible care certificates (common for the chemical industry). Companies have also acquired other certificates, such as: eco-product of the year (7; 3.1%), Eco label (6; 2.7%), International environmental partnership (4; 1.8%) and Eco profit (3; 1.3%). Lastly, 12 companies (5.4%) reported other certificates, such as ISO 50001, ISO 9001 and ISO 18001.

Table 21: Environmental certificates/prizes that have obtained the included companies

Environmental certificates/prizes	Number of companies	Percent
ISO 14001	86	38.6%
EMAS	4	1.8%
Eco label	6	2.7%
Eco profit	3	1.3%
Clean production	17	7.6%
Environment friendly company	25	11.2%
Responsible care	12	5.4%
Eco-product of the year	7	3.1%
International environmental partnership	4	1.8%
Environment friendly process	13	5.8%
Energy efficient company	18	8.1%
Energy efficient project	20	9%
Other (e.g., ISO 50001, ISO 9001, ISO 18001)	12	5.4%

In addition, we asked companies when they started engaging in environmental activities in their company. On average, they started in the year 2002. However, 101 companies (45.3%) began environmental activities less than 10 years ago, while 107 companies (48%) started more than 10 years ago with their first activities related to the environment.

Lastly, we present the level of innovativeness in the analyzed companies (see Table 22). We can see that 100 companies (44.8%) indicated that they have not launched a new product or service in the global level, while 22 (9.9%) have. Furthermore, 44 companies (19.7%) have launched a new product or service in their company's offering even though similar products or services exist on the market, while 58 companies (26%) have not introduced either type of innovation. Moreover, 43 companies (19.3%) enlarged their present offering with new types, while 32 companies (14.3%)

have not done so. Quite encouraging is the fact that almost half of the analyzed companies, 107 companies (48%), rejected the statement that they have not implemented any innovation or new product/service, while only 23 companies (10.3%) stated that they have not implemented any innovation (new product or service) in the past three years. Lastly, 135 companies (60.5%) rejected the statement that they have reduced their offering of products and services, while only one company (0.4%) agreed. This leads us to the conclusion that innovations are no longer only a source of competitive advantage, as has been traditionally assumed; rather, they are becoming vital for companies' survival. If they want to stay on the market and operate successfully, they are forced to innovate, to expand their offering, and to present new products and services within the company and the market they serve.

Table 22: The level of innovativeness of included companies in the past three years (2011-2013)

Level of innovativeness	*N* (%) Not true at all	*N* (%) Not true	*N* (%) Partially true	*N* (%) Neither true nor false	*N* (%) Partially true	*N* (%) True	*N* (%) Completely true
Company has launched new product or service at the global level.	100 (44.8%)	27 (12.1%)	21 (9.4%)	23 (10.3%)	18 (8.1%)	12 (5.4%)	22 (9.9%)
Company has launched new product or service in your company's offer, even though that on marker already exist similar products or services.	58 (26%)	19 (8.5%)	17 (7.6%)	30 (13.5%)	33 (14.8%)	22 (9.9%)	44 (19.7%)
Company has enlarged present offering with new types.	32 (14.3%)	15 (6.7%)	23 (10.3%)	35 (15.7%)	31 (13.9%)	44 (19.7%)	43 (19.3%)
Company has not implemented any innovation or new products/services.	107 (48%)	27 (12.1%)	13 (5.8%)	21 (9.4%)	17 (7.6%)	15 (6.7%)	23 (10.3%)
Company has reduced its offering of products and services.	135 (60.5%)	29 (13%)	13 (5.8%)	23 (10.3%)	15 (6.7%)	7 (3.1%)	1 (0.4%)

Concluding with the sample characteristics, we can summarize that the average company in the sample had 50-100 employees, between

1,600,000 and 4,000,000 EUR of annual sales in year 2013, was 43 years old and began its environmental activities in the year 2002.

In order to compare the distribution of the sample to the population, a Chi-square was used. It was found that the distribution of the sample differs from the population (see Table 23). We compared the distribution of the sample to the population regarding company size. The results indicate a significant difference for company size in terms of full-time employees. This difference is mainly due to the lower number of responses received from micro companies (0-9 employees) and the higher rate of participation of small (10-49 employees), medium (50-249 employees) and large companies (250 or more employees).

Table 23: The sample in comparison with the population

Firm size (number of employees)	Sample		Population*		Difference
	N of companies	Percent	N of companies	Percent	Chi-square
Micro company (0-9 employees)	52	23.32%	172983	94.99%	χ^2 = 6393.619 df = 3 sig. = 0.000
Small company (10-49 employees)	68	30.49%	6788	3.73%	
Medium company (50-249 employees)	56	25.11%	1988	1.09%	
Large company (more than 250 employees)	47	21.08%	330	0.18%	
Σ	223	100%	182089	100%	

Note: *Population in our case stands for the entire number of all Slovenian companies. Data were retrieved from Statistical Office RS, 2015.

Eco-innovation determinants

In this section, we will present the analyses of all factors that work as determinants/drivers of eco-innovation. The descriptive statistics will be presented, and the normality of distribution of various constructs will also be checked. This will be followed by exploratory factor analysis, conducted in SPSS and concluded by confirmatory factor analysis for each determinant of eco-innovation. The five determinants of eco-innovation that we will encompass in our eco-innovation model are as follows: managerial environmental concern (Section 7.2.1), expected benefits (Section 7.2.2), environmental policy instruments (further divided into two individual components, the command-and-control instrument and the economic incentive instrument; Section 7.2.3), customer demand (Section 7.2.4) and competition (Section 7.2.5).

Managerial environmental concern

Table 24: Descriptive statistics for determinant Managerial environmental concern

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Eco-innovation is an important component of the company's environmental management strategy.	223	4.87	1.743	-0.372	0.163	-0.797	0.324
Most eco-innovations are worthwhile.	223	5.43	1.412	-0.854	0.163	0.192	0.324
Eco-innovation is necessary to achieve high levels of environmental performance.	223	5.87	1.272	-1.357	0.163	2.040	0.324
Eco-innovation is an effective environmental management strategy.	223	5.83	1.274	-1.198	0.163	1.375	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

Table 24 illustrates the level of respondents' agreement with statements related to the managerial environmental concern. Respondents on average agreed to the largest extent with the statement that eco-innovation is necessary to achieve high levels of environmental performance (mean value 5.87 on a seven-point Likert scale), followed by the statement "Eco-innovation is an effective environmental management strategy" (M = 5.83). The statement that most eco-innovations are worthwhile also shows a high mean value (M = 5.43), which is very encouraging, because eco-innovations are typically believed to be expensive and more of a burden for the company that implements them than for others. It can be seen that the common thinking about eco-innovations is paving the way towards the belief that eco-innovations can be a win-win situation – meaning that they are beneficial for both the environment and the company that implements them. The lowest level of agreement among respondents (M = 4.87) was received by the statement "Eco-innovation is an important component of the company's environmental management strategy"; however, this mean value is still above average relative to the 7-point scale and thus reflects more agreement than disagreement.

Exploratory factor analysis was further conducted by using the whole sample (all 223 observations) and by employing statistical package SPSS version 21. Before the analysis, all measurement items were checked for normality of distribution (see Table 24). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, and thus the normality of distribution is confirmed. If the value of this ratio is lower than -2 or higher than 2, then the normality of distribution is rejected (Gomezelj Omerzel 2008). In our case, all the values of all items range between -2 and 2. The method of extraction in the exploratory analysis was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation, which assumes that different factors are related.

The appropriateness of factor analysis was determined by examining the correlation matrix of managerial environmental concern items. The existence of sufficient correlations (the Bartlett's test of sphericity) and the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.50 are more critical issues. The Bartlett's test of sphericity that statistically tests for the presence of correlations among the underlying variables showed that the correlation matrix has significant correlations ($p < 0.05$). In our case, the Bartlett's test of sphericity showed that the correlation matrix has significant correlations (sig. = 0.000 for all items). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.732, which indicates a middling sample adequacy.

Table 25: KMO and Bartlett's test of sphericity (Managerial environmental concern)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.732
Bartlett's test of sphericity	Approx. chi-square	435.886
	df	6
	Sig.	0,000

The number of expected factors was one, and the extracted factor was one, as expected and already tested in previous research works, when using this construct. In addition, the scree plot of the initial run indicated one factor as an appropriate number. Further, one factor explains 59.816% of variance.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.331). In the process of analysis, usually researchers delete or exclude the items that have low communalities after extraction – below the threshold of 0.20.

Further, a confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of four items. This has also been confirmed by the confirmatory factor analysis. The eco-innovation determinant of managerial environmental concern comprises four items. All the coefficients were found to be positive, high and significant, and are indicated in Table 26 and Figure 6.

Table 26: Standardized coefficients and their squares (Managerial environmental concern)

	Standard. coeff.	R-square
Eco-innovation is an important component of the company's environmental management strategy.	0.58	0.34
Most eco-innovations are worthwhile.	0.79	0.62
Eco-innovation is necessary to achieve high levels of environmental performance.	0.85	0.72
Eco-innovation is an effective environmental management strategy.	0.84	0.71

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Statistical information of the construct managerial environmental concern, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in Figure 6. The construct of managerial environmental concern showed good reliability (Cronbach's alpha = 0.836). Also, the goodness-of-fit indexes are shown in Figure 6 (NFI = 0.909; NNFI = 0.724; CFI = 0.909; SRMR = 0.058; RMSEA = 0.29). NFI and CFI showed good fit (over the threshold of 0.90), while NNFI and RMSEA showed slightly worse fit.

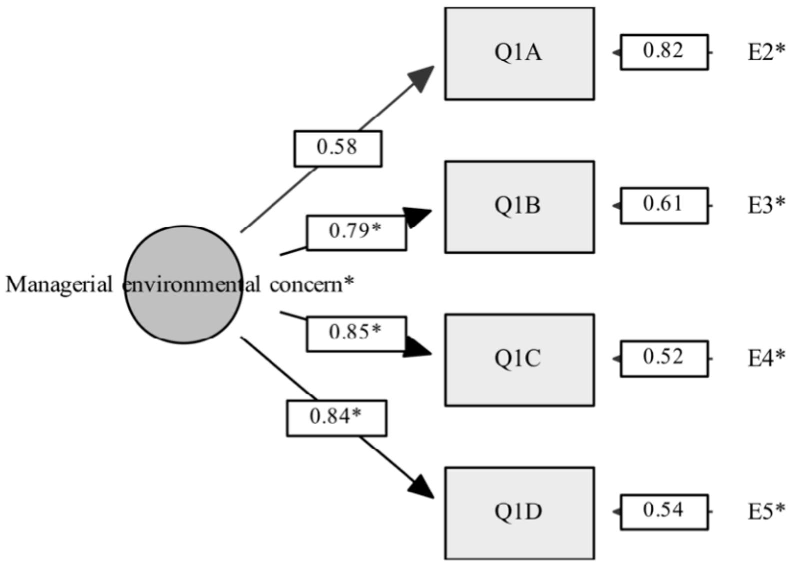

Figure 6: Diagram of construct Managerial environmental concern with the standardized solution

Note: Measurement items: Q1A = Eco-innovation is an important component of the company's environmental management strategy; Q1B = Most eco-innovations are worthwhile; Q1C = Eco-innovation is necessary to achieve high levels of environmental performance; Q1D = Environmental innovation is an effective environmental management strategy; Chi-square = 39.39; p = 0.00; Goodness-of-fit indexes: NFI = 0.909; NNFI = 0.724; CFI = 0.909; SRMR = 0.058; RMSEA = 0.29; Reliability coefficients: Cronbach's alpha = 0.836; RHO = 0.832; Internal consistency reliability = 0.879.

Expected benefits

Respondents were also asked what benefits they expected to seize from eco-innovation implementation. The results (Table 27) show that the most commonly expected benefit from eco-innovation was improvement of firm reputation (mean value 5.90 on a seven-point Likert scale), followed by cost reduction (M= 5.68). Among the expected benefits from eco-innovation, the following also showed high mean values: adjustment to EU (M = 5.30), to strengthen the brand (M = 5.29), to gain a competitive advantage (M = 5.28) and to enter new markets (M = 4.94). On the other hand, improvement of profitability (M = 4.78), increase of market share (M = 4.78) and increase of productivity (M = 4.70) seem to be the least commonly expected benefits among those listed. However, the mean values of all three are still above the central anchor. These findings lead us to the conclusion that Slovenian companies are aware of the potential of eco-innovation for their companies.

Table 27: Descriptive statistics for determinant Expected benefits

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
To reduce costs (energy, material, etc.)	223	5.68	1.459	-0.987	0.163	0.166	0.324
To improve profitability	223	4.78	1.597	-0.251	0.163	-0.635	0.324
To increase productivity	223	4.70	1.600	-0.286	0.163	-0.673	0.324
To increase market share	223	4.78	1.631	-0.408	0.163	-0.658	0.324
To enter new markets	223	4.94	1.650	-0.580	0.163	-0.453	0.324
To improve firm reputation	223	5.90	1.264	-1.304	0.163	1.420	0.324
To strengthen the brand	223	5.29	1.565	-0.834	0.163	0.104	0.324
Competitive advantage	223	5.28	1.537	-0.761	0.163	-0.107	0.324
Adjustment to EU	223	5.30	1.431	-0.736	0.163	0.074	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

Exploratory factor analysis was also conducted for this construct by using the overall sample (all 223 observations) and by employing statistical package SPSS version 21. Before the analysis, all measurement items were checked for normality of distribution (see Table 27). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution. The method of extraction in the exploratory analysis was Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation, which assumes that different factors are related.

The appropriateness of factor analysis was determined by examining the correlation matrix of expected benefits items. The existence of sufficient correlations (the Bartlett's test of sphericity) and the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.50 are more critical issues. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.909, which indicates an excellent sample adequacy.

The number of expected factors was one, and the extracted factor was one. In addition, the scree plot of the initial run indicated one factor as an appropriate number. Further, one factor explains 53.902% of variance.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.335). In the process of analysis, researchers usually delete or exclude items that have low communalities after extraction – below the threshold of 0.20.

Table 28: KMO and Bartlett's test of sphericity (Expected benefits)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.909
Bartlett's test of sphericity	Approx. chi-square	1190.240
	df	36
	Sig.	0.000

Table 29: Standardized coefficients and their squares (Expected benefits)

	Standard. coeff.	R-square
To reduce costs (energy, material, etc.)	0.58	0.34
To improve profitability	0.76	0.58
To increase productivity	0.77	0.59
To increase market share	0.85	0.72
To enter new markets	0.80	0.64
To improve firm reputation	0.62	0.38
To strengthen the brand	0.77	0.59
Competitive advantage	0.85	0.72
Adjustment to EU	0.53	0.28

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

A confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of nine items. This was also confirmed by the confirmatory factor analysis. The eco-innovation determinant of expected benefits comprises nine items. All the coefficients were found to be positive, high and significant; these are indicated in Table 29 and Figure 7.

Statistical information of the construct expected benefits, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N= 223), is as follows. The construct expected benefits showed good reliability (Cronbach's alpha= 0.911). The goodness-of-fit indexes are as follows: NFI = 0.889; NNFI = 0.879; CFI = 0.909; SRMR = 0.058; RMSEA = 0.13. CFI showed good fit (over the threshold of 0.90), while other goodness-of-fit indexes showed slightly worse fit.

From Table 29, we can see that three items have lower standardized coefficients (approximately 0.60); these are: "To reduce costs (energy, material, etc.)", "To improve firm reputation" and "Adjustment to EU". In addition, the goodness-of-fit model indexes are also low. Therefore, we decided to conduct another exploratory factor analysis, in which we eliminated these three items due to their low correlations with other items. For instance, the item "To reduce costs (energy, material, etc.)" had correlations with other items ranging between 0.310 and 0.571, followed by the item "To improve firm reputation", which had correlations with other items ranging between 0.363 and 0.666 and "Adjustment to EU," which had correlations with other items ranging between 0.310 and 0.488. Moreover, communalities of those items are as follows: "To reduce costs (energy, material, etc.)" = 0.335, "To improve firm reputation" = 0.383 and "Adjustment to EU" = 0,283. After eliminating those three items, we conducted exploratory factor analysis once more, and the value of the Kaiser-Meyer-Olkin measure for sampling adequacy was 0.896. Bartlett's test of sphericity also showed a statistically significant value (chi-square = 865.338; df = 15; p = 0.000), meaning that the correlation matrix has significant correlations. The communality index shown good communalities for almost all items (the lowest communality after extraction was 0.546), while variance explained was estimated at 64.096%. We can see that with fewer items (six instead of nine items), we are able to explain more variance; therefore, we conducted the confirmatory factor analysis again to check whether the goodness-of-fit indexes are any better.

A confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of six items. This has also been confirmed by the confirmatory factor analysis. The eco-innovation determinant expected benefits comprises six items. All the coefficients were found to be positive, high and significant. These are indicated in Table 30 and Figure 7.

Table 30: Standardized coefficients and their squares (Expected benefits)

	Standard. coeff.	R-square
To improve profitability	0.74	0.55
To increase productivity	0.77	0.59
To increase market share	0.88	0.77
To enter new markets	0.82	0.67
To strengthen the brand	0.74	0.55
Competitive advantage	0.85	0.72

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

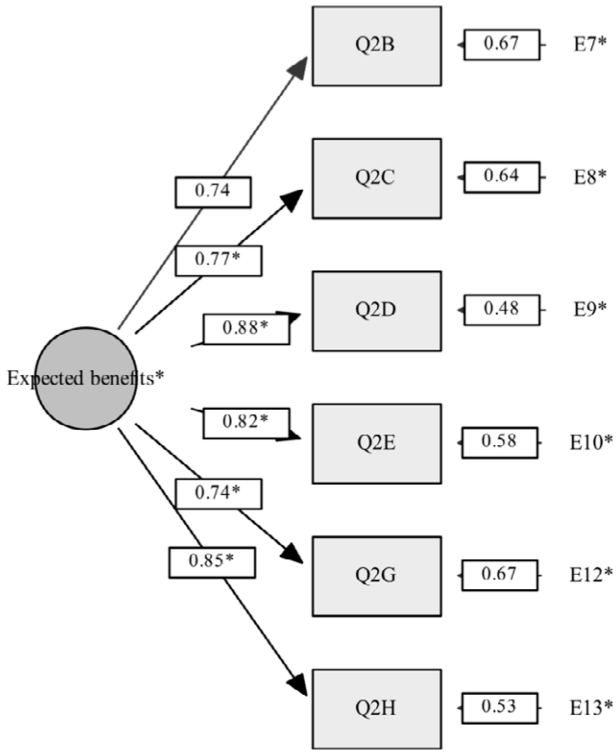

Figure 7: Diagram of construct Expected benefits with the standardized solution
Note: Measurement items: Q2B = To improve profitability; Q2C = To increase productivity; Q2D = To increase market share; Q2E = To enter new markets; Q2G = To strengthen the brand; Q2H = To gain competitive advantage; Chi-square = 37.418; p = 0.00; Goodness-of-fit indexes: NFI = 0.957; NNFI = 0.945; CFI = 0.967; SRMR = 0.033; RMSEA = 0.119; Reliability coefficients: Cronbach's alpha = 0.914; RHO = 0.914; Internal consistency reliability = 0.922.

Statistical information of the construct expected benefits, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N= 223), is as follows. The construct expected benefits showed good reliability (Cronbach's alpha= 0.914), while the goodness-of-fit indexes also improved and are as follows: NFI = 0.957; NNFI = 0.945; CFI = 0.967; SRMR = 0.033; RMSEA = 0,119. We can see that CFI, NFI and NNFI all showed good fit (over the threshold of 0.90), also SRMR showed good fit (less than 0.05), while RMSEA showed slightly worse fit; however, the fit is better than it was initially for all nine items.

Environmental policy instruments

The driver called environmental policy instruments is divided into two separate dimensions (see Table 31): the command-and-control instrument and the economic incentive instrument. We followed Li (2014) in distinguishing these two separate dimensions in order to obtain more valuable and detailed insights. The command-and-control instrument covers regulations, while the economic incentive instrument covers preferential tax policy, subsidies and government's promotion of environmental protection. In this way, we can test individual effects of both on eco-innovation in order to see if the alleged superiority of the economic incentive instrument over the command-and-control instrument really holds.

We can see (Table 31) that, when focusing on the command-and-control instrument, all of the listed statements had high average values, expressing high levels of respondents' agreement with the statements. The command-and-control instrument focuses on regulations. Respondents agreed at the highest level with the statement that their production processes should meet the requirements of national environmental regulations (mean value of 6 on a seven-point Likert scale), followed by the statement that products should meet the requirements of national environmental regulations (M = 5,99). The highest level of agreement was therefore found for statements pertaining to the national environmental regulations, followed closely by the mean values of the statements that focus on international and/or EU environmental regulations. This can be expected, because more than two thirds of the analyzed companies (67.7%) are operating on foreign markets and therefore have to comply with the foreign regulations of those markets. Therefore, respondents also agreed with the statements that production processes should meet the requirements of international and/or EU environmental regulations

(M = 5.95) and that products should meet the requirements of international and/or EU environmental regulations (M = 5.89).

Table 31: Descriptive statistics for determinant Environmental policy instruments

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Command-and-control instrument							
Our products should meet the requirements of national environmental regulations.	223	5.99	1.547	-1.828	0.163	2.867	0.324
Our products should meet the requirements of international and/or EU environmental regulations.	223	5.89	1.577	-1.600	0.163	1.969	0.324
Our production processes should meet the requirements of national environmental regulations.	223	6.00	1.519	-1.845	0.163	2.990	0.324
Our production processes should meet the requirements of international and/or EU environmental regulations.	223	5.95	1.468	-1.578	0.163	2.080	0.324
Economic incentive instrument							
The government provides preferential subsidies for environmental innovation (availability of government grants, subsidies or other financial incentives for environmental innovation).	223	4.00	1.649	0.188	0.163	-0.810	0.324
The government provides preferential tax policies for environmental innovation.	223	3.43	1.699	0.540	0.163	-0.526	0.324
The government provides environmental taxes – taxes on energy, transport, pollution/resources.	223	4.80	1.713	-0.368	0.163	-0.818	0.324

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
The government promotes environmental protection.	223	4.18	1.710	0.016	0.163	-0.960	0.324
The government provides green public procurement.	223	3.78	1.727	0.275	0.163	-0.770	0.324
The government provides an opportunity to undertake environmental tenders/calls.	223	4.02	1.594	0.092	0.163	-0.817	0.324
The government provides an opportunity to undertake environmental projects.	223	3.93	1.638	0.171	0.163	-0.790	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

With regard to the economic incentive instrument (Table 31), the results show that respondents agreed at the highest level with the statement "The government provides environmental taxes on energy, transport, pollution/resources" (M = 4.80). Concerning incentives, we can see that only two statements were above the central anchor: "The government promotes environmental protection" (M = 4.18) and "The government provides the opportunity to undertake environmental tenders/calls" (M = 4.02). Respondents agreed the least with the statement "The government provides preferential tax policy on environmental innovation" (M = 3.43). Concerning environmental policy measures, we can see from the descriptive statistics that there are more regulations imposed from the side of government than incentives offered to companies to eco-innovate or engage in environmental activities.

As the other constructs presented in previous sections, for the environmental policy instruments an exploratory factor analysis was conducted by using the overall sample (all 223 observations), and by employing statistical package SPSS version 21. Before the analysis, all measurement items were checked for normality of distribution (see Table 31). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution. The method of extraction in the exploratory analysis was Maximum

Likelihood Method, while the selected rotation was Direct Oblimin rotation, which assumes that different factors are related.

The appropriateness of factor analysis was determined by examining the correlation matrix of the command-and-control instrument items. The existence of sufficient correlations (the Bartlett's test of sphericity) and the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.50 are more critical issues. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). In our case, the Bartlett's test of sphericity showed that correlation matrix has significant correlations (sig. = 0.000 for all items). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.741, which means a middling sample adequacy.

The number of expected factors was one, and the extracted factor was one, as expected and already tested in previous research works, when using this construct. In addition, the scree plot of the initial run indicated one factor as an appropriate number. Further, one factor explains 81.487% of variance.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.779). In the process of analysis, researchers usually delete or exclude the items that have low communalities after extraction – below the threshold of 0.20.

Table 32: KMO and Bartlett's test of sphericity (Command-and-control instrument)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.741
Bartlett's test of sphericity	Approx. chi-square	967.439
	df	6
	Sig.	0.000

A confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of four items. This has also been confirmed by the confirmatory factor analysis. The eco-innovation determinant the command-and-control instrument comprises four items. All the coefficients were found to be positive, high and significant, and are indicated in Table 33 and Figure 8.

Table 33: Standardized coefficients and their squares (Command-and-control instrument)

	Standard. coeff.	R-square
Our products should meet the requirements of national environmental regulations.	0.90	0.81
Our products should meet the requirements of international and/or EU environmental regulations.	0.93	0.86
Our production processes should meet the requirements of national environmental regulations.	0.89	0.79
Our production processes should meet the requirements of international and/or EU environmental regulations.	0.88	0.77

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

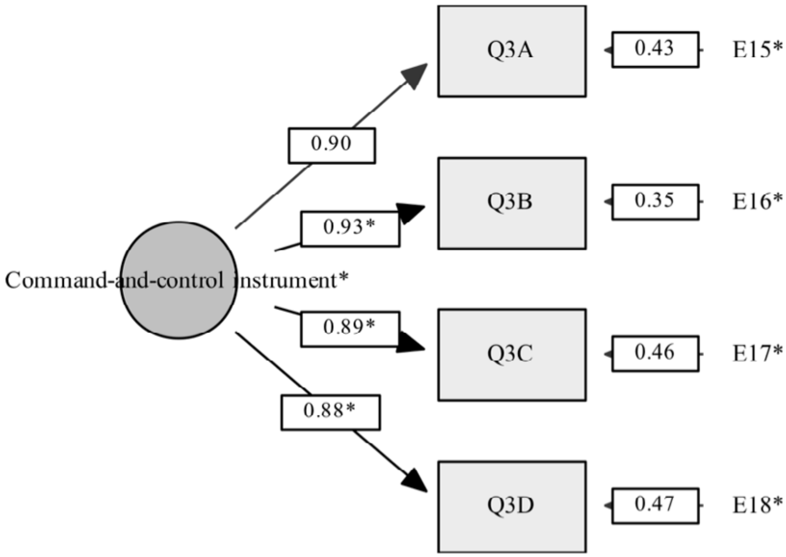

Figure 8: Diagram of construct Command-and-control instrument with the standardized solution
Note: Measurement items: Q3A = Our products should meet the requirements of national environmental regulations; Q3B = Our products should meet the requirements of international and/or EU environmental regulations; Q3C = Our production processes should meet the requirements of national environmental regulations; Q3D = Our production processes should meet the requirements of international and/or EU environmental regulations; Chi-square = 119.95; p = 0.00; Goodness-of-fit indexes: NFI = 0.877; NNFI = 0.636; CFI = 0.879; SRMR = 0.043; RMSEA = 0.52; Reliability coefficients: Cronbach's alpha = 0.946; RHO = 0.947; Internal consistency reliability = 0.949.

Statistical information of the construct command-and-control instrument, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in Figure 8. The construct command-and-control instrument showed good reliability (Cronbach's alpha = 0,946). Also the goodness-of-fit indexes are shown in Figure 8 (NFI = 0.877; NNFI = 0.636; CFI = 0.879; SRMR = 0.043; RMSEA = 0.52), where we can see that all the goodness-of-fit indexes showed slightly worse fit, except for SRMR and RMSEA.

Second, the appropriateness of factor analysis was determined by examining the correlation matrix of the economic incentive instrument items. The existence of sufficient correlations (the Bartlett's test of sphericity) and the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.50 are more critical issues. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.860, which indicates an excellent sample adequacy. The number of expected factors was one, and the extracted factor was one. In addition, the scree plot of the initial run indicated one factor as an appropriate number, explaining 60.265% of variance. Furthermore, the communality index showed good communalities (above the threshold of 0.20), except for the item "The government provides environmental taxes on energy, transport, pollution/resources," which had a communality index of 0.182. We deleted the item that had low communalities after extraction – below the threshold of 0.20 and conducted the exploratory factor analysis once again.

This time, the KMO value was a bit lower (0.848), while the Bartlett's test of sphericity showed that the correlation matrix has significant correlations (sig. = 0.000 for all items). Moreover, the communality index showed good communalities (all items after extraction had communalities above the threshold of 0.20; the lowest communality was 0.448) and one factor was extracted, explaining 67.169% of variance. However, we decided to remove the other three items that had high correlations with each other in the correlation matrix ("The government provides green public procurement", "The government provides an opportunity to undertake environmental tenders/calls" and "The government provides an opportunity to undertake environmental projects").

The third time we conducted an exploratory factor analysis, the value of KMO was 0.660, and the Bartlett's test of sphericity showed that thecorrelation matrix has significant correlations (sig. = 0.000 for all items). Furthermore, the communality index showed good communalities (above the threshold of 0.20), where the lowest communality was 0.372. One factor was extracted (comprising three items), explaining 66.538% of variance, which is similar to the variance explained when measuring this construct with six items.

Table 34: KMO and Bartlett's test of sphericity (Economic incentive instrument)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.660
Bartlett's test of sphericity	Approx. chi-square	323.764
	df	3
	Sig.	0.000

Further, a confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of three items. This has also been confirmed by the confirmatory factor analysis, where all the coefficients were found to be positive, high and significant (Table 35 and Figure 9).

Table 35: Standardized coefficients and their squares (Economic incentive instrument)

	Standard. coeff.	R-square
The government provides preferential subsidies for environmental innovation (availability of government grants, subsidies or other financial incentives for environmental innovation).	0.71	0.50
The government provides preferential tax policies for environmental innovation.	1.00	1
The government provides propagations on environmental protection.	0.54	0.29

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination; since this construct has been measured by only three items, an additional constraint (factor has been fixed to one) has been imposed in order to estimate the goodness-of-fit indexes.

Statistical information of the construct economic incentive instrument, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in Figure 9. The construct economic incentive instrument showed good reliability (Cronbach's alpha = 0.838), and the following goodness-of-fit indexes: NFI = 0.945; NNFI = 0.843; CFI = 0.948;

SRMR = 0.196; RMSEA = 0.276. We can see that NFI, NNFI and CFI showed good fit, while RMSEA and SRMR showed worse fit.

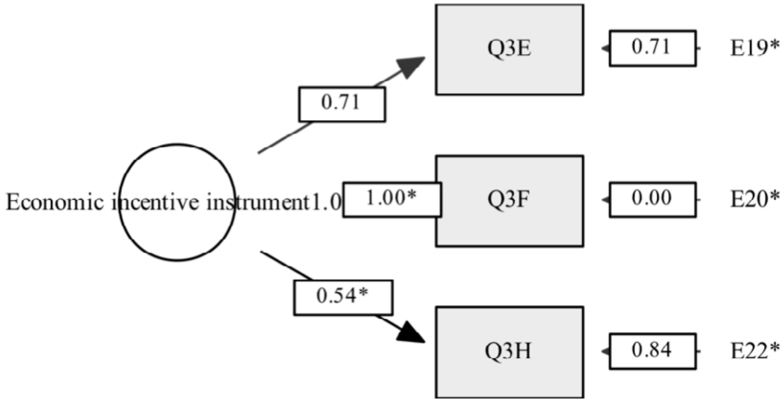

Figure 9: Diagram of construct Economic incentive instrument with the standardized solution
Note: Measurement items: Q3E = The government provides preferential subsidy on environmental innovation (availability of government grants, subsidies or other financial incentives for environmental innovation); Q3F = The government provides preferential tax policy on environmental innovation: Q3H = The government promotes environmental protection; Chi--square = 17.879; p = 0.00; Goodness-of-fit indexes: NFI = 0.945; NNFI = 0.843; CFI = 0.948; SRMR = 0.196; RMSEA = 0.276; Reliability coefficients: Cronbach's alpha = 0.838; RHO = 0.800; Internal consistency reliability = 1.000.

Customer demand

Moreover, Table 36 illustrates the level of respondents' agreement with statements related to the driver customer demand. We can see that respondents, on average, agreed to the greatest extent with the statement "The environment is a critical issue for our important customers" (mean value 4.69 on a seven-point Likert scale), while they agreed the least with the statement "Our customers have clear demands regarding environmental issues" (M = 4.24). We can see that all four statements concerning customer demand are above the central anchor, reflecting the importance of customer demand pertaining to eco-innovations and environmental issues.

Table 36: Descriptive statistics for determinant Customer demand

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Environment is a critical issue for our important customers.	223	4.69	1.703	-0.353	0.163	-0.716	0.324
Our important customers often bring up environmental issues.	223	4.33	1.762	-0.246	0.163	-0.933	0.324
Customer demands motivate us in our environmental efforts.	223	4.54	1.710	-0.319	0.163	-0.751	0.324
Our customers have clear demands regarding environmental issues.	223	4.24	1.764	-0.065	0.163	-0.870	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

Continuing, an exploratory factor analysis (the method of extraction was the Maximum Likelihood Method, and the selected rotation was Direct Oblimin rotation) was also conducted for this construct. Before the analysis, all measurement items were checked for normality of distribution (see Table 36). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution.

The appropriateness of factor analysis was determined by examining the correlation matrix of customer demand items. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations ($p < 0.05$) and, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.867, which indicates an excellent sample adequacy.

The number of expected factors was one, and the extracted factor was one, explaining 79.711% of variance. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.721).

Table 37: KMO and Bartlett's test of sphericity (Customer demand)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.867
Bartlett's test of sphericity	Approx. chi-square	793.942
	df	6
	Sig.	0.000

A confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of four items. This has also been confirmed by the confirmatory factor analysis. The eco-innovation determinant customer demand comprises four items. All the coefficients were found to be positive, high and significant, and are indicated in Table 38 and Figure 10.

Table 38: Standardized coefficients and their squares (Customer demand)

	Standard. coeff.	R-square
Environment is a critical issue for our important customers.	0.91	0.83
Our important customers often bring up environmental issues.	0.92	0.85
Customer demands motivate us in our environmental efforts.	0.85	0.72
Our customers have clear demands regarding environmental issues.	0.89	0.79

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination

Statistical information of the construct customer demand, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N= 223), is indicated in Figure 10. The construct customer demand showed good reliability (Cronbach's alpha = 0.940). In addition, the goodness-of-fit indexes are shown in Figure 10 (NFI = 0.999; NNFI = 1.005; CFI = 1.000; SRMR = 0.004; RMSEA = 0.000). We can see that NFI, NNFI, CFI (over the threshold of 0.90) and RMSEA (below the threshold of 0.10) showed good fit.

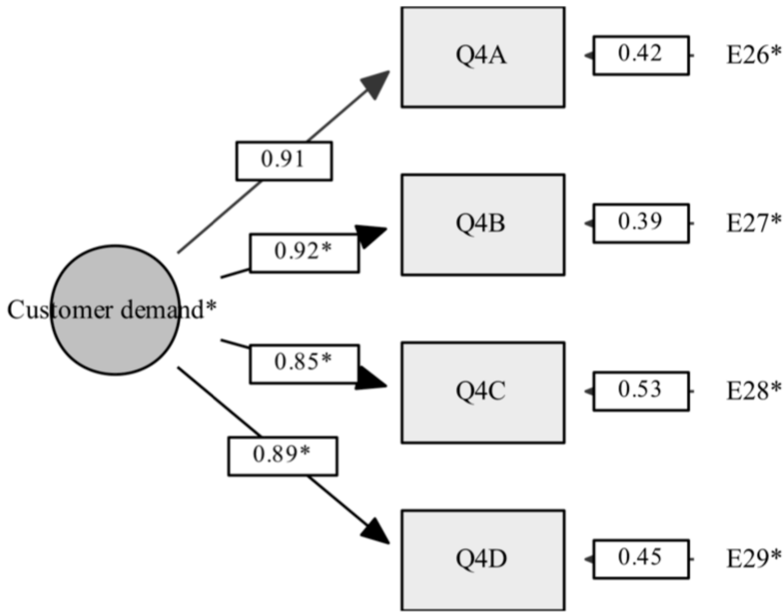

Figure 10: Diagram of construct Customer demand with the standardized solution
Note: Measurement items: Q4A = The environment is a critical issue for our important customers; Q4B = Our important customers often bring up environmental issues; Q4C = Customer demands motivate us in our environmental efforts; Q4D = Our customers have clear demands regarding environmental issues; Chi-square = 0.70; p = 0.71; Goodness-of-fit indexes: NFI = 0.999; NNFI = 1.005; CFI = 1.000; SRMR= 0.004; RMSEA = 0.000; Reliability coefficients: Cronbach's alpha = 0.940; RHO = 0.940; Internal consistency reliability = 0.944.

Competition (Competitive intensity and Competitive pressure)

In addition, we also focused on competition as a driver of eco-innovation in companies. According to the institutional theory, companies can engage in environmental activities, acquire environmental certificates or start to eco-innovate as a result of mimicking their competitors' successful actions. In this section, we focus on competition, which we divide into two different individual components that are tested separately: competitive intensity, which focuses on competition in the industry in which a company operates, and competitive pressure, which focuses on environmental activities – that is, the establishment of the green concept in companies.

We can see in Table 39 that respondents most agreed with the statement that competition in their industry is cutthroat (mean value 5.88 on a seven-point Likert scale), followed by the statements "Price competition is a hallmark of our industry" (M= 5.73) and "Anything that one competitor can offer, others can match readily" (M= 5.39). All the statements are above the central anchor, reflecting their importance and high level of agreement.

Moreover, concerning competitive pressure, the results show that respondents most agreed with the statement that they establish a company's environmental image compared to competitors through the green concept (M= 4.09), and they agreed the least with the statement that they increase a company's market share through the green concept (M = 3.67).

Table 39: Descriptive statistics for determinant Competition (Competitive intensity and Competitive pressure)

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Competitive intensity							
Competition in our industry is cutthroat.	223	5.88	1.385	-1.260	0.163	0.869	0.324
Anything that one competitor can offer others can match readily.	223	5.39	1.393	-0.745	0.163	0.206	0.324
Price competition is a hallmark of our industry.	223	5.73	1.539	-1.261	0.163	0.793	0.324
Competitive pressure							
We establish a company's environmental image compared to competitors through the green concept.	223	4.09	1.662	-0.119	0.163	-0.805	0.324
We increase a company's market share through the green concept.	223	3.67	1.656	0.029	0.163	-0.864	0.324
We improve a company's competitive advantage over competitors through the green concept.	223	4.03	1.719	-0.112	0.163	-0.976	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

An exploratory factor analysis was also conducted for these two constructs. As in the case of environmental policy instruments, we have in this case investigated competitive intensity and competitive pressure individually. Before the analysis, all measurement items were checked for normality of distribution (see Table 39). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution. The method of extraction in the exploratory factor analysis was Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation.

As in the previous analyses, the appropriateness of factor analysis was determined by examining the correlation matrix of competitive intensity items. The existence of sufficient correlations (the Bartlett's test of sphericity) and the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.50 are critical issues. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.633.

The number of expected and extracted factors for the construct competitive intensity was one, explaining 36.733% of variance. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.274).

Table 40: KMO and Bartlett's test of sphericity (Competitive intensity)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.633
Bartlett's test of sphericity	Approx. chi-square	78.141
	df	3
	Sig.	0.000

After conducting analysis for competitive intensity, an exploratory factor analysis was conducted for competitive pressure. As in the previous analyses, the appropriateness of factor analysis was determined by examining the correlation matrix of competitive pressure items. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations ($p < 0.05$), and the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.750, which indicates a middling sample adequacy.

The number of expected factors was one, and the extracted factor was one. In addition, the scree plot of the initial run indicated one factor as an appropriate number, explaining 82.367% of variance. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.773).

Table 41: KMO and Bartlett's test of sphericity (Competitive pressure)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.750
Bartlett's test of sphericity	Approx. chi-square	560.824
	df	3
	Sig.	0.000

When considering the results of the exploratory factor analyses, these demonstrate better fit for the construct of competitive pressure (more variance explained for the competitive pressure than for the competitive intensity). Therefore, we decided that, in the final testing of the model, we would retain only the construct of competitive pressure and leave out the construct of competitive intensity, which explains too low share of variance (only 36.733%)sx and thus seems to not play as important a role as a driver of eco-innovation in the analyzed companies as does competitive pressure. In the literature, we can see that the construct of competitive pressure fits better when focusing on eco-innovations, and researchers have used it in models of eco-innovation, while the construct of competitive intensity is used more often for regular innovation.

Even though we decided to eliminate competitive intensity from further analyses, we have still conducted a confirmatory factor analysis to validate the findings of the previous exploratory factor analysis for competitive intensity. The eco-innovation determinant competitive intensity comprises three items, and the standardized coefficients were found to be positive and significant but demonstrating lower values. They are shown in Table 42 and Figure 11.

Table 42: Standardized coefficients and their squares (Competitive intensity)

	Standard. coeff.	R-square
Competition in our industry is cutthroat.	0.72	0.52
Anything that one competitor can offer others can match readily.	0.52	0.27
Price competition is a hallmark of our industry.	0.55	0.30

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination; since this construct has been measured by only three items, an additional constraint (factor has been fixed to one) has been imposed in order to estimate the goodness-of-fit indexes.

Statistical information of the construct of competitive intensity, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N= 223), is indicated in the Figure 11. The construct of competitive intensity showed acceptable reliability (Cronbach's alpha = 0.621), while the goodness-of-fit indexes showed excellent fit (NFI = 1.000; NNFI = 1.040; CFI = 1.000; SRMR = 0.001 and RMSEA = 0.000).

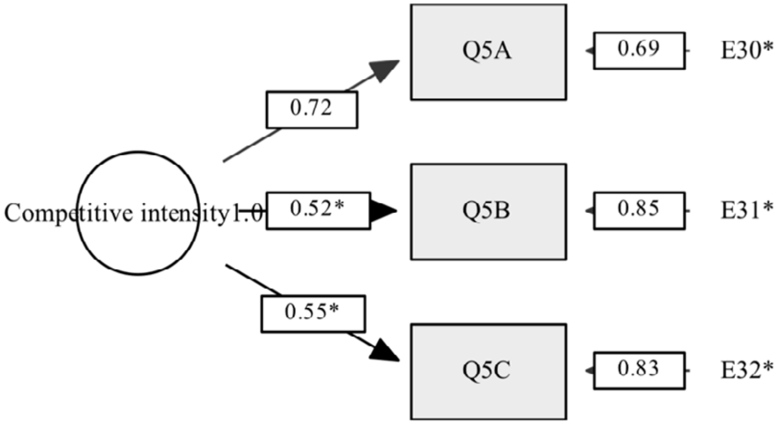

Figure 11: Diagram of construct Competitive intensity with the standardized solution
Note: Measurement items: Q5A = Competition in our industry is cutthroat; Q5B = Anything that one competitor can offer, others can match readily; Q5C = Price competition is a hallmark of our industry; Chi-square = 0.001; p = 0.979; Goodness-of-fit indexes: NFI = 1.000; NNFI = 1.040; CFI = 1.000; SRMR = 0.001; RMSEA = 0.000; Reliability coefficients: Cronbach's alpha = 0.621; RHO = 0.626; Internal consistency reliability = 0.656.

Further, a confirmatory factor analysis was also conducted for the construct of competitive pressure in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of three items. This has also been confirmed by the confirmatory factor analysis. The eco-innovation determinant competitive pressure comprises three items. All the coefficients were found to be positive, high and significant, and they are indicated in Table 43 and Figure 12.

Table 43: Standardized coefficients and their squares (Competitive pressure)

	Standard. coeff.	R-square
We establish a company's environmental image compared to competitors through the green concept.	0.75	0.56
We increase a company's market share through the green concept.	0.83	0.69
We improve a company's competitive advantage over competitors through the green concept.	0.97	0.94

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination; since this construct has been measured by only three items, an additional constraint (factor has been fixed to one) has been imposed in order to estimate the goodness-of-fit indexes.

Statistical information of the construct of competitive pressure, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in the Figure 12. The construct of competitive pressure showed good reliability (Cronbach's alpha = 0.933), while the majority of goodness-of-fit indexes also show good fit (NFI = 0.936; NNFI = 0.812; CFI = 0.937), except for SRMR = 0.295 and RMSEA = 0.398 showed worse fit.

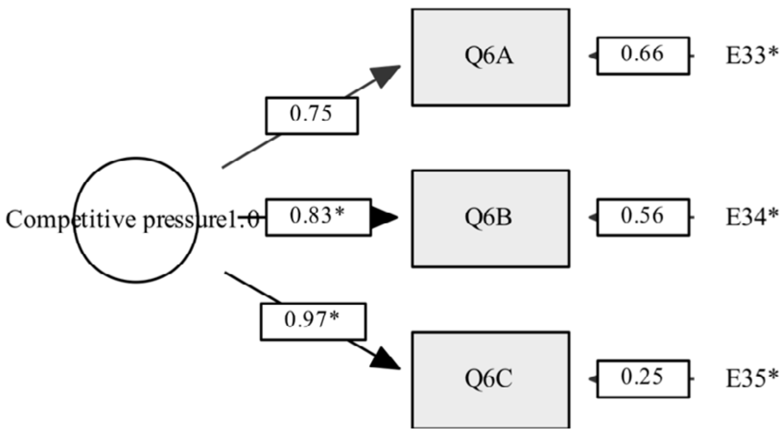

Figure 12: Diagram of construct Competitive pressure with the standardized solution
Note: Measurement items: Q6A = We establish the company's environmental image by comparing to competitors through the green concept; Q6B = We increase the company's market share through the green concept; Q6C = We improve the company's competitive advantage over competitors through the green concept; Chi-square = 36.174; p = 0.00; Goodness-of-fit indexes: NFI = 0.936; NNFI = 0.812; CFI = 0.937; SRMR = 0.295; RMSEA = 0.398; Reliability coefficients: Cronbach's alpha = 0.933; RHO = 0.893; Internal consistency reliability = 0.950.

Eco-innovation types

This section deals with different eco-innovation types (product, process and organizational eco-innovation, as well as the eco-innovation construct, which contains all the aforementioned dimensions). Therefore, we present the analyses for each eco-innovation type separately. The descriptive statistics will be presented, and we will also check for the normality of distribution of various constructs, followed by exploratory factor analysis, conducted in SPSS, and finally confirmatory factor analysis for each eco-innovation type.

This section is divided into three subsections; we reveal the findings that pertain to product eco-innovation (Section 7.3.1), followed by process eco-innovation (7.3.2) and organizational eco-innovation (Section 7.3.3), and we conclude with the eco-innovation construct, which covers all three dimensions (Section 7.3.4).

Product eco-innovation

Regarding product eco-innovation, Table 44 depicts descriptive statistics for each item related to product eco-innovation. We can see that, among the listed types of product eco-innovations, the analyzed companies on average implement environmentally friendly materials the most (mean value 5.20 on a seven-point Likert scale), followed by environmentally friendly packaging (M = 5.13) and eco-labeling (M = 2.59) the least.

Table 44: Descriptive statistics for Product eco-innovation

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
The company is using less or non-polluting/ toxic materials (i.e., using environmentally friendly material).	223	5.20	1.605	-0.828	0.163	-0.042	0.324
The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	223	5.13	1.685	-0.934	0.163	0.140	0.324
The company is recovering and recycling end-of-life products.	223	3.91	2.321	0.023	0.163	-1.551	0.324

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
The company is using eco-labeling.	223	2.59	1.993	0.979	0.163	-0.410	0.324
The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design.	223	4.61	1.789	-0.443	0.163	-0.718	0.324
The company uses the smallest amount of materials to comprise the product for conducting the product development or design.	223	4.89	1.786	-0.686	0.163	-0.467	0.324
The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.	223	4.50	1.917	-0.391	0.163	-0.972	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

Exploratory factor analysis (the method of extraction was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation) was also conducted for this construct (see Table 44). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution.

In the first exploratory factor analysis, we comprised all seven items to measure product eco-innovation. The appropriateness of factor analysis was determined by examining the correlation matrix of product eco-innovation items. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations (sig. = 0.000 for all items). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.856, which indicates an excellent sample adequacy.

The number of expected factors was one, and the extracted factor was one. In addition, the scree plot of the initial run indicated one factor as an appropriate number. Further, one factor explains 50.254% of variance. After consideration of each item's communality index and its contribution, we removed one item called "The company is using eco-labeling", which had communality index below the threshold of 0.20 (0.194).

We then conducted exploratory factor analysis again to see how the factor characteristics behave with six items to measure the construct of product eco-innovation. In the second run, we noted in the correlation matrix that one item –"The company is recovering end-of-life products and recycling" – has low correlations with other items, ranging between 0.299 and 0.354. However, KMO was 0.846, which is still excellent for sampling adequacy, and the Bartlett's test of sphericity showed that the correlation matrix has significant correlations (sig. = 0.000 for all items). Moreover, the communalities after extraction were all above the threshold of 0.20. The aforementioned item, "The company is recovering end-of-life products and recycling", had the lowest communality (0.283); however, this value did not imply that it should be removed. Moreover, the percentage of variance explained has risen. With six items, we could explain 55.245% of variance.

For the aforementioned reasons, we decided to eliminate the item "The company is recovering end-of-life products and recycling" and conducted the exploratory factor analysis again. This time, KMO was 0.836, still demonstrating an excellent sampling adequacy. Moreover, the Bartlett's test of sphericity showed that the correlation matrix has significant correlations (sig. = 0.000 for all items). After extraction, all the communalities were above the threshold of 0.20 (the lowest was 0.401), and we retained all five items. The percentage of variance explained has risen for approximately 5%. With five items, we are able to explain 60.687% of variance. The reason we retained only four items in the final model to measure product eco-innovation is explained further in Section 7.3.4. When conducting an exploratory factor analysis for all three dimensions (product, process and organizational eco-innovation), one item ("The company is using less or non-polluting/toxic materials (i.e., using environmentally friendly material)") loaded on both the product and process eco-innovation factors. Moreover, while it loaded a bit higher on process eco-innovation, it loaded on both with a low loading value. Therefore, we excluded this item to improve the results. In addition, Table 45 indicates the KMO value and Bartlett's test of sphericity for product eco-innovation, including only four items. The lowest extracted communality was 0.355, and no further items were excluded; all four items were retained to measure product eco-innovation. Additionally, with four items, we are able to explain 64.316% of variance (a higher percentage than for the five items tested above); lastly, one factor is extracted.

Table 45: KMO and Bartlett's test of sphericity (Product eco-innovation)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.808
Bartlett's test of sphericity	Approx. chi-square	484.648
	df	6
	Sig.	0.000

A confirmatory factor analysis was conducted to validate the findings of the exploratory factor analysis, which resulted in one factor composed of four items. This has also been confirmed by the confirmatory factor analysis. The dimension of product eco-innovation comprises four items. All the coefficients were found to be positive, high and significant, and they are indicated in Table 46 and Figure 13.

Table 46: Standardized coefficients and their squares (Product eco-innovation)

	Standard. coeff.	R-square
The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	0.60	0.36
The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design.	0.89	0.79
The company uses the smallest amount of materials to comprise the product for conducting the product development or design.	0.89	0.79
The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.	0.80	0.64

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Statistical information of the dimension product eco-innovation, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in Figure 13. The dimension of product eco-innovation showed good reliability (Cronbach's alpha = 0.872). Also, the goodness-of-fit indexes are showed in Figure 13 (NFI = 0.993; NNFI = 0.992; CFI = 0.997; SRMR = 0.017; RMSEA = 0.053); NFI, NNFI and CFI all showed good fit (over the threshold of 0.90), and the other goodness-of-fit indexes (SRMR and RMSEA) also showed good fit.

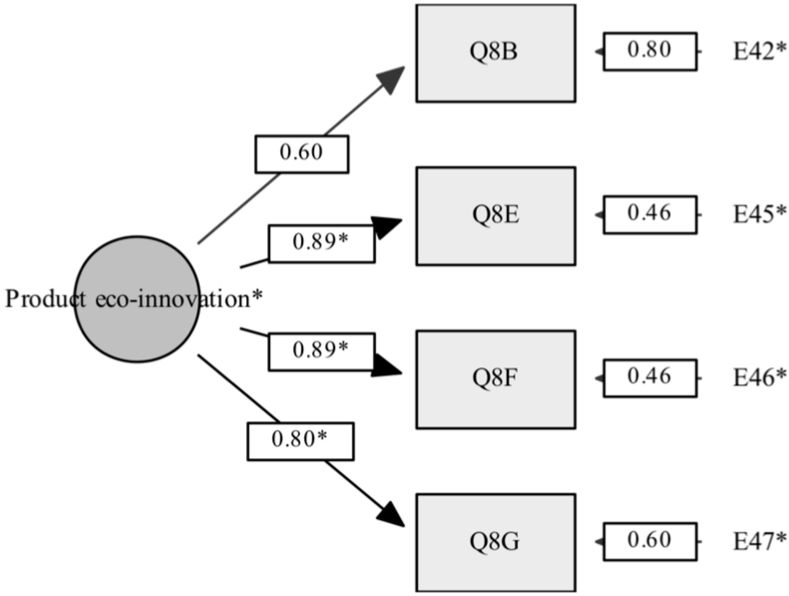

Figure 13: Diagram of eco-innovation dimension of Product eco-innovation with the standardized solution

Note: Measurement items: Q8B = The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products; Q8E = The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design; Q8F = The company uses the smallest amount of materials to comprise the product for conducting the product development or design; Q8G = The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design; Chi-square = 3.257; p = 0.196; Goodness-of-fit indexes: NFI = 0.993; NNFI = 0.992; CFI = 0.997; SRMR = 0.017; RMSEA = 0.053; Reliability coefficients: Cronbach's alpha = 0.872; RHO = 0.879; Internal consistency reliability = 0.907.

Process eco-innovation

When focusing on process eco-innovation, we can see (Table 47) that the analyzed companies primarily implement waste treatment (mean value 6.48 on a seven-point Likert scale) as a type of process eco-innovation, followed by low energy consumption during production/use/disposal (M = 5.78). Companies implement closed water loops (reuse of water) the least frequently (M = 4.40%).

Table 47: Descriptive statistics for Process eco-innovation

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
*Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	223	5.78	1.502	-1.286	0.163	0.870	0.324
*Recycle, reuse and remanufacture material.	223	5.33	1.818	-1.084	0.163	0.149	0.324
Closed water loops (reuse of water).	223	4.40	2.211	-0.273	0.163	-1.371	0.324
Recycle, reuse and remanufacture waste.	223	4.99	1.978	-0.752	0.163	-0.643	0.324
Waste treatment.	223	6.48	0.900	-2.449	0.163	0.010	0.324
Decreasing use of solvents or replacing them with substitutes.	223	5.32	1.688	-0.999	0.163	0.179	0.324
*Use of cleaner technology to generate savings and prevent pollution (such as energy, water and waste).	223	5.40	1.573	-0.982	0.163	0.326	0.324
*The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	223	5.49	1.530	-1.160	0.163	0.969	0.324
*The manufacturing process of the company reduces the use of raw materials.	223	5.31	1.571	-1.037	0.163	0.522	0.324
Reduced CO_2 emissions.	223	5.42	1.639	-1.070	0.163	0.384	0.324
Reduced other air emissions (e.g., SOx, NOx).	223	5.38	1.743	-1.042	0.163	0.170	0.324
Reduced water pollution.	223	5.69	1.519	-1.262	0.163	1.107	0.324

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Reduced soil pollution.	223	5.73	1.507	-1.400	0.163	1.579	0.324
Reduced noise pollution.	223	5.53	1.524	-1.190	0.163	1.008	0.324
Replaced materials with less hazardous substitutes.	223	5.60	1.433	-1.285	0.163	1.513	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis. *Measurement items for process eco-innovation used also in the final analyses pertaining to the model testing.

As above, we conducted an exploratory factor analysis. Before the analysis, all measurement items were checked for normality of distribution (see Table 47). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution. The method of extraction in the exploratory analysis was Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation, which assumes that different factors are related.

The appropriateness of factor analysis was determined by examining the correlation matrix of process eco-innovation items. The Bartlett's test of sphericity showed that correlation matrix has significant correlations (sig. = 0.000 for all items). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.861, which indicates an excellent sample adequacy.

The number of expected factors was one, and the extracted factor was one, explaining 68.441% of variance. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.512).

Table 48: KMO and Bartlett's test of sphericity (Process eco-innovation)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.861
Bartlett's test of sphericity	Approx. chi-square	807.261
	df	10
	Sig.	0.000

A confirmatory factor analysis was conducted to validate the findings of the exploratory factor analysis, which resulted in one factor composed of five items. This has also been confirmed by the confirmatory factor analysis. The dimension process of eco-innovation comprises five items. All the coefficients were found to be positive, high and significant and are indicated in Table 49 and Figure 14.

Table 49: Standardized coefficients and their squares (Process eco-innovation)

	Standard. coeff.	R-square
Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	0.76	0.58
Recycle, reuse and remanufacture material.	0.72	0.52
Use of cleaner technology to generate savings and prevent pollution (such as energy, water and waste).	0.81	0.66
The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	0.92	0.85
The manufacturing process of the company reduces the use of raw materials.	0.91	0.83

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Statistical information of the dimension of process eco-innovation, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in the Figure 14. The dimension of process eco-innovation showed good reliability (Cronbach's alpha = 0.912). Also, the goodness-of-fit indexes are shown in Figure 14 (NFI = 0.964; NNFI = 0.939; CFI = 0.970; SRMR = 0.036; RMSEA = 0.15); the majority of goodness-of-fit indexes showed good fit: NFI, NNFI and CFI (over the threshold of 0.90) and also the SRMR (below the threshold of 0.08), while RMSEA showed somewhat worse fit.

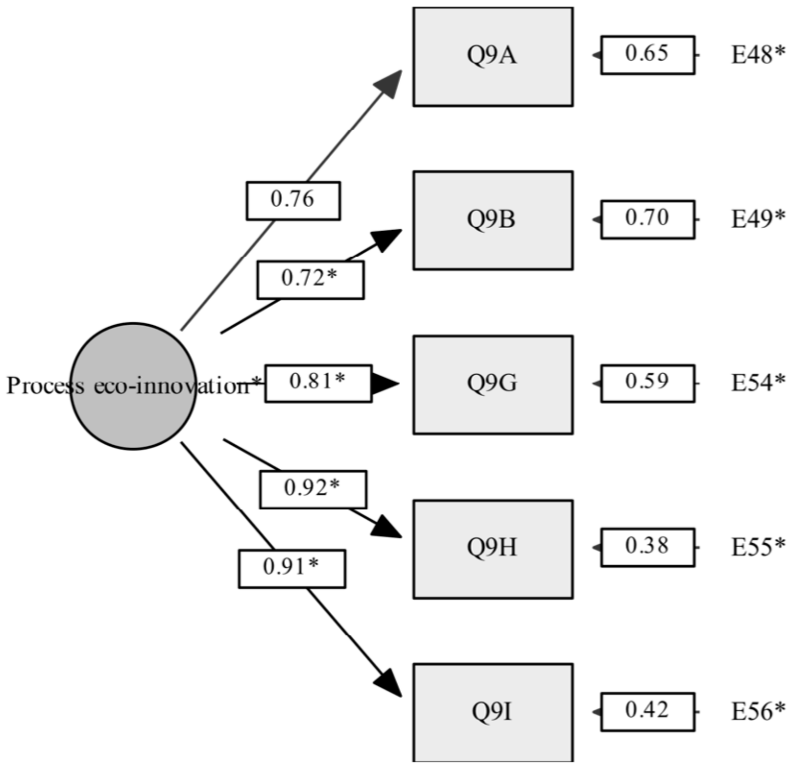

Figure 14: Diagram of eco-innovation dimension of Process eco-innovation with the standardized solution
Note: Measurement items: Q9A = Low energy consumption such as water, electricity, gas, and petrol during production/use/disposal; Q9B = Recycle, reuse, and remanufacture material; Q9G = Use of cleaner technology to create savings and prevent pollution (such as energy, water, and waste); Q9H = The manufacturing process of the company effectively reduces the emission of hazardous substances or waste; Q9I = The manufacturing process of the company reduces the use of raw materials; Chi-square = 29.41; p = 0.00; Goodness-of-fit indexes: NFI = 0.964; NNFI = 0.939; CFI = 0.970; SRMR = 0.036; RMSEA= 0.15; Reliability coefficients: Cronbach's alpha = 0.912; RHO = 0.911; Internal consistency reliability = 0.937.

Organizational eco-innovation

Lastly, Table 50 illustrates the types of organizational eco-innovation that the analyzed companies implement. We can see that companies, on average, use the environmental management system the most (mean value 5.30 on a seven-point Likert scale), while the least implemented organizational eco-innovation type among the analyzed companies is the use of life cycle analysis (M = 3.62).

Table 50: Descriptive statistics for Organizational eco-innovation

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
*Our firm management often uses novel systems to manage eco-innovation.	223	4.39	1.670	-0.225	0.163	-0.792	0.324
*Our firm management often collects information on eco-innovation trends.	223	4.61	1.715	-0.399	0.163	-0.728	0.324
*Our firm management often actively engages in eco-innovation activities.	223	4.49	1.770	-0.296	0.163	-0.818	0.324
*Our firm management often communicates eco-innovation information with employees.	223	4.41	1.763	-0.307	0.163	-0.786	0.324
*Our firm management often invests a high ratio of R&D in eco-innovation.	223	3.92	1.864	0.082	0.163	-1.064	0.324
*Our firm management often communicates experiences among various departments involved in eco-innovation.	223	4.24	1.779	-0.199	0.163	-0.882	0.324
The firm uses an environmental management system.	223	5.30	1.935	-0.993	0.163	-0.152	0.324
The firm publishes an environmental policy.	223	4.74	2.233	-0.463	0.163	-1.273	0.324
The firm has specific targets for environmental performance.	223	5.06	1.946	-0.703	0.163	-0.680	0.324
The firm publishes an annual environmental report.	223	3.93	2.432	0.027	0.163	-1.640	0.324
The firm applies environmental considerations to purchasing decisions.	223	4.95	1.791	-0.518	0.163	-0.794	0.324
The firm provides employee environmental training.	223	4.63	2.088	-0.350	0.163	-1.236	0.324
The firm uses life cycle analysis.	223	3.62	2.135	0.217	0.163	-1.320	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis. *Measurement items for organizational eco-innovation included in the final testing on the path model.

Next, we conducted an exploratory factor analysis by using the overall sample (the method of extraction in the exploratory analysis was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation). Before the analysis, all measurement items were checked for normality of distribution (see Table 50).

The appropriateness of factor analysis was determined by examining the correlation matrix of organizational eco-innovation items. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.901, which indicates means an excellent sample adequacy.

The number of expected factors was one, and the extracted factor was one. Further, one factor explains 78.368% of variance. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.642).

Table 51: KMO and Bartlett's test of sphericity (Organizational eco-innovation)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.901
Bartlett's test of sphericity	Approx. chi-square	1454.634
	df	15
	Sig.	0.000

A confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of six items. This has also been confirmed by the confirmatory factor analysis. The dimension of organizational eco-innovation comprises six items. All the coefficients were found to be positive, high and significant, and they are indicated in Table 52 and Figure 15.

Table 52: Standardized coefficients and their squares (Organizational eco-innovation)

	Standard. coeff.	R-square
Our firm management often uses novel systems to manage eco-innovation.	0.80	0.64
Our firm management often collects information on eco-innovation trends.	0.89	0.79
Our firm management often actively engages in eco-innovation activities.	0.93	0.87
Our firm management often communicates eco-innovation information with employees.	0.93	0.87
Our firm management often invests a high ratio of R&D in eco-innovation.	0.87	0.77
Our firm management often communicates experiences among various departments involved in eco-innovation.	0.89	0.79

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

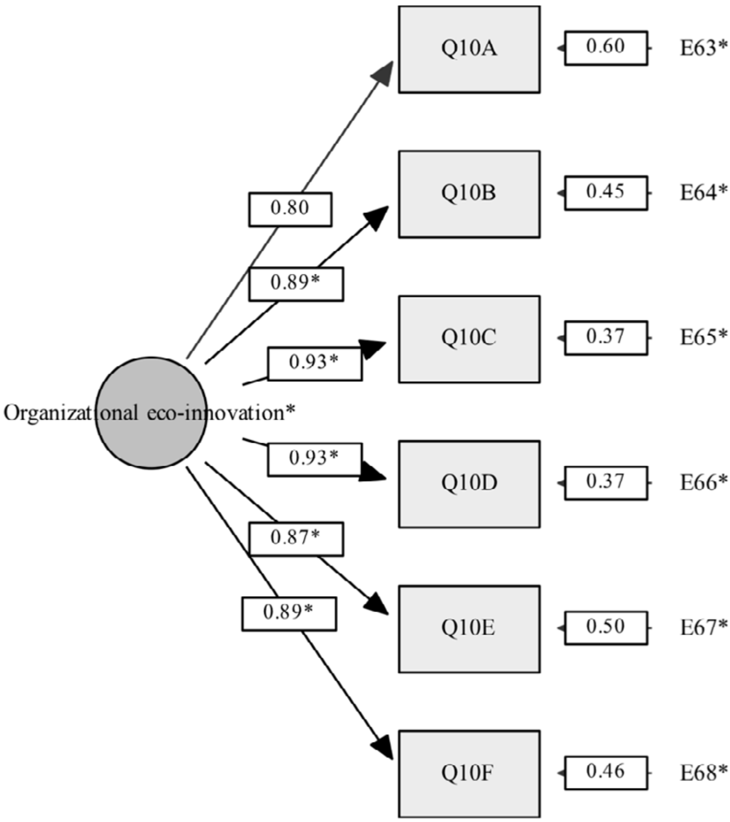

Figure 15: Diagram of eco-innovation dimension of Organizational eco-innovation with the standardized solution

Note: Measurement items: Q10A = Our firm management often uses novel systems to manage eco-innovation; Q10B = Our firm management often collects information on eco-innovation trends; Q10C = Our firm management often actively engages in eco-innovation activities; Q10D = Our firm management often communicates eco-innovation information with employees; Q10E = Our firm management often invests a high ratio of R&D in eco-innovation; Q10F = Our firm management often communicates experiences among various departments involved in eco-innovation; Chi-square = 80.33; p = 0.00; Goodness-of-fit indexes: NFI = 0.945; NNFI = 0.918; CFI = 0.951; SRMR = 0.030; RMSEA = 0.19; Reliability coefficients: Cronbach's alpha = 0.956; RHO = 0.956; Internal consistency reliability = 0.962.

Statistical information of the dimension of organizational eco-innovation, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), are indicated in the Figure 15. The dimension of organizational eco-innovation showed good reliability (Cronbach's alpha = 0.956). Also, the goodness-of-fit indexes are shown in Figure 15 (NFI = 0.945; NNFI = 0.918; CFI = 0.951; SRMR = 0.030; RMSEA = 0.19). We can see that the majority of the goodness-of-fit indexes – NFI, NNFI and CFI – showed good fit (over the threshold of 0.90) and also the SRMR (below the threshold of 0.08), while RMSEA showed somewhat worse fit.

Eco-innovation construct

We repeated the same procedure as above for eco-innovation construct. First the exploratory factor analysis was conducted, followed by the confirmatory factor analysis. The exploratory factor analysis was conducted by using the overall sample (all 223 observations) and by employing statistical package SPSS version 21. The method of extraction in the exploratory analysis was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation, which assumes that different factors are related.

The appropriateness of factor analysis was determined by examining the correlation matrix of eco-innovation items. The existence of sufficient correlations (the Bartlett's test of sphericity) and the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.50 are more critical issues. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.939, which indicates an excellent sample adequacy.

The number of expected factors was three, while the extracted factors were two (Table 53). The product eco-innovation dimension loaded together with the process eco-innovation dimension into one factor, while organizational eco-innovation represents an independent factor. In addition, the scree plot of the initial run indicated two factors as an appropriate number, explaining 66.326% of variance.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.422).

Table 53: The eco-innovation dimensions' (product and process eco-innovation factor and organizational eco-innovation factor) items factor loadings

Items	Factors	
	Product & Process eco-innovation	Organizational eco-innovation
Product and process eco-innovation (PD & PC)		
The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	0.917	
The manufacturing process of the company reduces the use of raw materials.	0.852	
Use of cleaner technology to generate savings and prevent pollution (such as energy, water and waste).	0.821	
Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	0.792	
The company uses the smallest amount of materials to comprise the product for conducting the product development or design.	0.762	
The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design.	0.708	
The company is using less or non-polluting/toxic materials (i.e., using environmentally friendly material).	0.703	
Recycle, reuse and remanufacture material.	0.702	
The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	0.659	
The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.	0.603	

Items	Factors	
	Product & Process eco-innovation	Organizational eco-innovation
Organizational eco-innovation (OR)		
Our firm management often communicates eco-innovation information with employees.		-1.003
Our firm management often actively engages in eco-innovation activities.		-0.952
Our firm management often invests a high ratio of R&D in eco-innovation.		-0.856
Our firm management often collects information on eco-innovation trends.		-0.852
Our firm management often communicates experiences among various departments involved in eco-innovation.		-0.831
Our firm management often uses novel systems to manage eco-innovation.		-0.736

N = 2234
Extraction Method: Maximum Likelihood
Rotation Method: Oblimin with Kaiser Normalization (absolute factor loadings equal or higher than 0.20 displayed)
Bartlett's test of sphericity: Chi-square = 3297.073; 120 df; sig. = 0.000
Kaiser-Meyer-Olkin measure of sample adequacy = 0.933
Variance explained = 66.326

According to the theory, a three-factor solution was expected. Therefore, we again conducted an exploratory factor analysis by prior determination of three expected factors (product, process and organizational eco-innovation). We fixed the number of extracted factors to three. The exploratory factor analysis was conducted by using the overall sample (all 223 observations) and by employing statistical package SPSS. The method of extraction in the exploratory analysis was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation, which assumes that different factors are related.

The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.933, which indicates an excellent sample adequacy.

The number of extracted factors was three, as previously determined. In addition, the scree plot of the initial run indicated three factors as an appropriate number, explaining 70.513% of variance. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.414).

Table 54: The eco-innovation dimension's item factor loadings (three eco-innovation factors)

Items	Factors		
	Process eco-innovation	Product eco-innovation	Organizational eco-innovation
Process eco-innovation (PC)			
The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	1.015		
The manufacturing process of the company reduces the use of raw materials.	0.891		
Use of cleaner technology to generate savings and prevent pollution (such as energy, water and waste).	0.737		
Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	0.725		
Recycle, reuse and remanufacture material.	0.592		
Product eco-innovation (PD)			
The company uses the smallest amount of materials to comprise the product for conducting the product development or design.		0.930	
The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design.		**0.839**	
The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.		0.711	
The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	0.287	**0.379**	
The company is using less or non-polluting/toxic materials (i.e., using environmentally friendly material).	**0.362**	0.348	

Items	Factors		
	Process eco-innovation	Product eco-innovation	Organizational eco-innovation
Organizational eco-innovation (OR)			
Our firm management often communicates eco-innovation information with employees.			-0.991
Our firm management often actively engages in eco-innovation activities.			-0.954
Our firm management often collects information on eco-innovation trends.			-0.862
Our firm management often invests a high ratio of R&D in eco-innovation.			-0.859
Our firm management often communicates experiences among various departments involved in eco-innovation.			-0.822
Our firm management often uses novel systems to manage eco-innovation.			-0.750

N = 223
Extraction Method: Maximum Likelihood
Rotation Method: Oblimin with Kaiser Normalization (absolute factor loadings equal to or higher than 0.20 displayed)
Bartlett's test of sphericity: Chi-square = 3297.073; 120 df; sig. = 0.000
Kaiser-Meyer-Olkin measure of sample adequacy = 0.933
Variance explained = 70.513

From Table 54, we can see that two items loaded on two factors, while the item "The company is using less or non-polluting/toxic materials (i.e., using environmentally friendly material)" was more problemating; it not only loaded on two factors but also had higher loading on the wrong dimension (i.e., it loaded on the process eco-innovation factor, while it should load on the product eco-innovation factor). As mentioned, this item should pertain to the dimension of product eco-innovation, but it loaded a bit higher on the dimension of process eco-innovation. Therefore, we decided to eliminate this item. Moreover, the item "The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products" also loaded on two factors – product and process eco-innovation. However, it loaded with a higher value on product eco-innovation, and thus, because of its importance, it was retained in the further analyses.

We repeated the exploratory factor analysis again (Table 55), eliminating the item "The company is using less or non-polluting/toxic materials (i.e., using environmentally friendly material)". The extraction method remained Maximum Likelihood and the rotation Direct Oblimin, and we also determined the number of factors to be extracted as three. This time, the KMO value was 0.936, and the Bartlett's test of sphericity demonstrated significant correlations ($p < 0.05$). The number of extracted factors was three, as previously determined. In addition, the scree plot of the initial run indicated three factors as an appropriate number, explaining 71.981% of variance. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.395).

Table 55: The eco-innovation dimension's item factor loadings

Items	Factors		
	Process eco-innovation	Product eco-innovation	Organizational eco-innovation
Process eco-innovation (PC)			
The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	1.016		
The manufacturing process of the company reduces the use of raw materials.	0.902		
Use of cleaner technology to generate savings and prevent pollution (such as energy, water and waste).	0.738		
Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	0.731		
Recycle, reuse and remanufacture material.	0.598		
Product eco-innovation (PD)			
The company uses the smallest amount of materials to comprise the product for conducting the product development or design.		0.940	
The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design.		**0.847**	
The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.		0.701	

Items	Factors		
	Process eco-innovation	Product eco-innovation	Organizational eco-innovation
The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	0.293	**0.350**	
Organizational eco-innovation (OR)			
Our firm management often communicates eco-innovation information with employees.			-0.988
Our firm management often actively engages in eco-innovation activities.			-0.953
Our firm management often collects information on eco-innovation trends.			-0.862
Our firm management often invests a high ratio of R&D in eco-innovation.			-0.857
Our firm management often communicates experiences among various departments involved in eco-innovation.			-0.816
Our firm management often uses novel systems to manage eco-innovation.			-0.756

N = 223
Extraction Method: Maximum Likelihood
Rotation Method: Oblimin with Kaiser Normalization (absolute factor loadings equal or higher than 0.20 displayed)
Bartlett's test of sphericity: Chi-square = 3109.220; 105 df; sig. = 0.000
Kaiser-Meyer-Olkin measure of sample adequacy = 0.936
Variance explained = 71.981

In order to validate the findings of both solutions given by the exploratory factor analyses, pertaining to the two-factor and three-factor solutions, we conducted a confirmatory factor analysis, through which we examine the convergence of the eco-innovation dimensions. The model with two factors (product & process eco-innovation as one factor, organizational eco-innovation) showed worse goodness-of-fit indexes (NFI = 0.882; NNFI = 0.890; CFI = 0.907; SRMR = 0.050; RMSEA = 0.121) and the Cronbach's alpha was 0.952. The standardized coefficients were all positive, high (above 0.50) and statistically significant. Correlation between the two dimensions was estimated at 0.72.

In addition, we have conducted a confirmatory factor analysis to examine the convergence of the eco-innovation dimensions, with three dimensions as would be supposed and expected according to the theory.

The model with three factors gave goodness-of-fit indexes (NFI = 0.928; NNFI = 0.945; CFI = 0.954; SRMR = 0.044; RMSEA = 0.086), and the Cronbach's alpha was 0.952. The standardized coefficients were all positive, high (over 0.50) and statistically significant. Correlation between product and process eco-innovation was estimated at 0.79, correlation between product and organizational eco-innovation was 0.65, and the process and organizational eco-innovation dimensions also showed high correlation (0.68). All correlations were statistically significant. We can see that confirmatory factor analysis demonstrated better goodness-of-fit indexes for the model with three dimensions than for the model with two dimensions. Therefore, we decided to use the three-factor model solution.

Furthermore, statistical information of each eco-innovation dimension's internal consistency (Cronbach's alpha reliability) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223) is indicated in Table 56. Table 56 summarizes the statistics for all eco-innovation dimensions (product, process and organizational eco-innovation) and further illustrates, for each eco-innovation dimension, model fit indexes, range of standardized coefficients, Cronbach's alpha reliability and the number of items included. We can see that Cronbach's alpha is high in all cases – for the product, process and organizational eco-innovation dimensions separately as well as for the eco-innovation construct (over 0.80). More specifically, the dimension of product eco-innovation showed good reliability (Cronbach's alpha = 0.872) and convergence in terms of coefficients. The other two dimensions, process eco-innovation (Cronbach's alpha = 0.912) and organizational eco-innovation (Cronbach's alpha = 0.956), showed excellent reliability and convergence in terms of coefficients. Moreover, standardized coefficients are all positive, high (over 0.50) and statistically significant. The goodness-of-fit indexes are also high; only RMSEA values for process and organizational eco-innovation showed slightly worse fit. Moreover, the goodness-of-fit indexes are better when related to the entire eco-innovation construct. Lastly, the model showed goodness-of-fit indexes (NFI = 0.928; NNFI = 0.945; CFI = 0.954; SRMR = 0.044; RMSEA = 0.086). We can see that the goodness-of-fit indexes are better with a three-dimension model of eco-innovation, which is in line with our theory. However, the exploratory factor analysis gave two dimensions as solutions (joining product and process eco-innovation dimensions), probably also because of highly related dimensions; product and process eco-innovation demonstrated high correlation (r = 0.79; see Table 58). Thus, we decided on three dimensions of eco-innovation on the basis of the results of the confirmatory factor analysis.

Table 56: Eco-innovation dimension's scale convergence – summary for all three eco-innovation dimensions and eco-innovation construct

Dimension	N. of items	Cronbach's alpha reliability	Range of standardized coefficients*	Model fit indexes				
				NFI	NNFI	CFI	SRMR	RMSEA
Product eco-innovation	4	0.872	0.60 to 0.80	0.993	0.992	0.997	0.017	0.05
Process eco-innovation	5	0.912	0.72 to 0.92	0.964	0.939	0.970	0.036	0.15
Organizational eco-innovation	6	0.956	0.80 to 0.93	0.945	0.918	0.951	0.030	0.19
Eco-innovation construct	15	0.952	0.62 to 0.93	0.928	0.945	0.954	0.044	0.08

Note: *N. of items* = number of items of each eco-innovation dimension; * all standardized coefficients are positive, high and significant (sig. < 0.05).

Convergent and discriminant validity of the eco-innovation construct

The eco-innovation dimensions were tested for convergent and discriminant validity together in the eco-innovation construct structural model, where dimensions were modeled as first-order latent constructs and correlated with each other (see Figure 16). The model showed good fit (NFI = 0.928; NNFI = 0.945; CFI = 0.954 – over the threshold of 0.90; SRMR = 0.044; RMSEA = 0.086 – below the threshold of 0.10). Moreover, all coefficients were found to be positive, high and significant. Also, the reliability coefficients (Cronbach's alpha = 0.952; RHO = 0.968, were high – above the threshold of 0.70).

Figure 16 illustrates the standardized solution for the eco-innovation construct, composed of the three dimensions of product, process and organizational eco-innovation. The 15 items of these three dimensions measure the entire eco-innovation construct. Table 57 offers results pertaining to the standardized coefficients and their squares for all items of the eco-innovation construct.

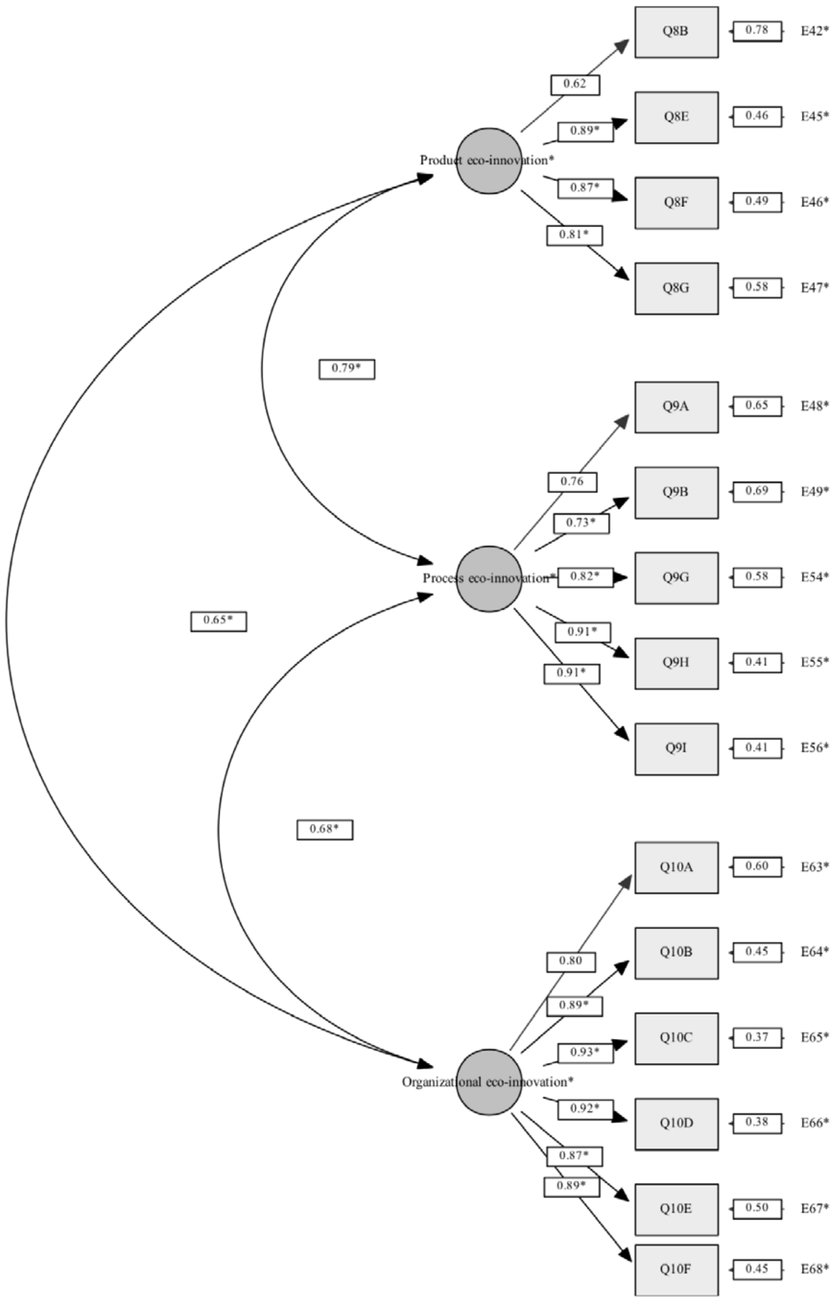

Figure 16: Eco-innovation construct (with the standardized solution)

Note pertaining to Figure 16: Measurement items: Q8B = The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products; Q8E = The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design; Q8F = The company uses the smallest amount of materials to comprise the product for conducting the product development or design; Q8G = The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design; Q9A = Low energy consumption such as water, electricity, gas, and petrol during production/use/disposal; Q9B = Recycle, reuse, and remanufacture material; Q9G = Use of cleaner technology to generate savings and prevent pollution (such as energy, water, and waste); Q9H = The manufacturing process of the company effectively reduces the emission of hazardous substances or waste; Q9I = The manufacturing process of the company reduces the use of raw materials; Q10A = Our firm management often uses novel systems to manage eco-innovation; Q10B = Our firm management often collects information on eco-innovation trends; Q10C = Our firm management often actively engages in eco-innovation activities; Q10D = Our firm management often communicates eco-innovation information with employees; Q10E = Our firm management often invests a high ratio of R&D in eco-innovation; Q10F = Our firm management often communicates experiences among various departments involved in eco-innovation; Chi-square = 228.463; p = 0.00; Goodness-of-fit indexes: NFI = 0.928; NNFI = 0.945; CFI = 0.954; SRMR = 0.044; RMSEA = 0.086; Reliability coefficients: Cronbach's alpha = 0.952; RHO = 0.968.

Table 57: Standardized coefficients and their squares (eco-innovation construct)

	Standard. coeff.	R-square
The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	0.62	0.38
The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design.	0.89	0.79
The company uses the smallest amount of materials to comprise the product for conducting the product development or design.	0.87	0.76
The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.	0.81	0.66
Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	0.76	0.58
Recycle, reuse and remanufacture material.	0.73	0.53
Use of cleaner technology to make savings and prevent pollution (such as energy, water and waste).	0.82	0.67
The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	0.91	0.83
The manufacturing process of the company reduces the use of raw materials.	0.91	0.83
Our firm management often uses novel systems to manage eco-innovation.	0.80	0.64
Our firm management often collects information on eco-innovation trends.	0.89	0.79
Our firm management often actively engages in eco-innovation activities.	0.93	0.87

	Standard. coeff.	R-square
Our firm management often communicates eco-innovation information with employees.	0.92	0.85
Our firm management often invests a high ratio of R&D in eco-innovation.	0.87	0.76
Our firm management often communicates experiences among various departments involved in eco-innovation.	0.89	0.79

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Lastly, the model reliability, variance statistics and inter-dimensional correlations are indicated in Table 58. All dimensions demonstrated good composite reliability (over the threshold of 0.70). The average variance extracted was also good, over the threshold of 0.50. Correlations among dimensions ranged from 0.65 to 0.79, implying convergence. We can see that the correlations are high among all three dimensions. The lowest correlation was estimated at 0.65 between product eco-innovation and organizational eco-innovation, while process eco-innovation and organizational eco-innovation correlated a bit higher (0.68). The highest correlation (0.79) is between product eco-innovation and process eco-innovation.

Table 58: Eco-innovation construct convergent and discriminant validity

	Overall model*		Correlations		
	CR	AVE	Product eco-innovation	Process eco-innovation	Organizational eco-innovation
Product eco-innovation	0.878	0.65	1	0.79*	0.65*
Process eco-innovation	0.916	0.69	0.79*	1	0.68*
Organizational eco-innovation	0.956	0.78	0.65*	0.68*	1

Note: CR = composite reliability; AVE = average variance extracted; * Goodness of fit indexes: NFI = 0.928; NNFI = 0.945; CFI = 0.954; SRMR = 0.044; RMSEA = 0.086.

Multidimensionality of the eco-innovation construct was also tested by comparing the relative contributions of the two models. The first model includes only one common eco-innovation first-order factor (the one common factor model) and is based on the assumption of the unidimensionality of the eco-innovation construct. The second model (eco-innovation dimensions-only model) is based on the assumption of the non-unidimensionality of the eco-innovation concept. These two models are nested in the model with both the dimensions and the common factor, a method that allows for model comparisons (Antončič 2002; Ruzzier 2005). These comparisons are shown in Table 59.

Table 59: The dimensions-only vs. the one common factor model

	Chi-square	df	NFI	NNFI	CFI	SRMR	RMSEA
M1: One common factor model	920.656 ***	89	0.712	0.682	0.731	0.109	0.205
M2: Dimensions-only model (three dimensions)	228.463 ***	87	0.928	0.945	0.954	0.044	0.086
M3: Model with both the dimensions and the common factor	142.048 ***	68	0.956	0.963	0.976	0.033	0.070
M1-M3	778.608 ***	21	0.846				
M2-M3	86.415 ***	19	0.378				

Note: Chi-square: * significant at $p < 0.05$; ** significant at $p < 0.01$; *** significant at $p < 0.0001$.

The one common factor model indicated an overall poor fit relative to the dimensions-only model in all goodness-of-fit indexes. Model fit indexes of the dimensions-only model and the model with both the dimensions and the common factor are very high. The model with both the dimensions and the common factor has somewhat lower residuals (SRMS) and errors (RMSEA) and higher NFI, NNFI and CFI indexes.

The contributions of the two models are shown in the last two rows of Table 59. Both Chi-square differences are significant ($p < 0.0001$), indicating that both models may contribute to explanatory power. However, the NFI for the two model differences, computed with the formula from Bentler (1990) by including models 1 and 3 respectively, demonstrates that the contribution of the dimensions seems to be quite substantial (NFI = 0.846), while the contribution of the overall-factor model seems to be relatively minimal (NFI = 0.378). Overall, the one common factor model seems to be inferior to the dimensions-only model. This can be considered a strong indication of the eco-innovation constructs' multidimensionality.

Eco-innovation outcomes

In this section, we present the analyses for constructs, which in the following sections will be tested in relation to eco-innovations as their consequences. As in the previous sections, we will present the descriptive statistics and check for the normality of distribution of various constructs. Exploratory factor analysis conducted in SPSS will follow, and the section will conclude with confirmatory factor analysis for each construct. We will focus on the following consequences of eco-innovation: competitive benefits (Section 7.4.1), economic benefits (Section 7.4.2), company performance (Section 7.4.3) and internationalization (Section 7.4.4).

Competitive benefits

Results (see Table 60) show which competitive benefits most analyzed companies reported as consequences of eco-innovation implementation. We asked respondents to indicate the extent to which the company's environmental practices have led to any of the listed competitive benefits (on a seven-point Likert scale: 1 = no contribution to 7 = very large contribution). We can see that, overall, improved company reputation or goodwill is reported most frequently (mean value 4.78 on a seven-point Likert scale) as a competitive benefit of eco-innovation implementation. Meanwhile, improved product innovations (M = 3.59) seem to be the least frequently reported benefit.

Table 60: Descriptive statistics for Competitive benefits

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Reduction in material costs	223	4.03	1.801	-0.120	0.163	-0.938	0.324
Reduction in process/production costs	223	3.97	1.772	-0.104	0.163	-0.925	0.324
Reduction in costs of regulatory compliance	223	3.73	1.750	-0.065	0.163	-1.019	0.324
Increased process/production efficiency	223	3.77	1.745	-0.053	0.163	-0.950	0.324
Increased productivity	223	3.79	1.728	-0.053	0.163	-0.954	0.324

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Increased knowledge about effective ways of managing operations	223	4.00	1.707	-0.117	0.163	-0.830	0.324
Improved process innovations	223	3.82	1.686	-0.113	0.163	-0.896	0.324
Improved product quality	223	4.10	1.786	-0.198	0.163	-0.955	0.324
Improved product innovations	223	3.59	1.679	0.000	0.163	-0.877	0.324
Better relationships with stakeholders such as local communities, regulators, and environmental groups	223	4.22	1.799	-0.287	0.163	-0.896	0.324
Improved employee morale	223	4.19	1.586	-0.327	0.163	-0.657	0.324
Overall improved company reputation or goodwill	223	4.78	1.619	-0.628	0.163	-0.325	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

Further, we conducted an exploratory factor analysis (Maximum Likelihood Method of extraction and Direct Oblimin rotation). All measurement items were checked for normality of distribution (see Table 60). The appropriateness of factor analysis was determined by examining the correlation matrix of competitive benefits items. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations ($p < 0.05$), and the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.917, which indicates an excellent sample adequacy. After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.511).

Table 61: KMO and Bartlett's test of sphericity (Competitive benefits)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.917
Bartlett's test of sphericity	Approx. chi-square	2697.222
	df	66
	Sig.	0.000

The number of factors to be extracted was determined a priori based on previous research works that used this scale. The number of extracted factors should be one. The scree plot of the initial run indicated that two factors might be an appropriate number, and the latent root (eigenvalue) criterion also indicated two factors, which in total explain 71.406% of variance. The two factors that were extracted as a result of the exploratory factor analysis are presented in Table 62, together with the 12 related items and their factor loadings. The new competitive benefits dimension was split into two factors, one pertaining to the various improvements (Improvement factor) and the other to the various reductions (Reduction factor).

Table 62: Competitive benefits dimension's item factor loadings

Items	Factors	
	Factor 1 (Improvement factor)	Factor 2 (Reduction factor)
Better relationships with stakeholders such as local communities, regulators, and environmental groups	0.872	
Improved process innovations	0.820	
Improved employee morale	0.820	
Increased knowledge about effective ways of managing operations	0.801	
Improved product innovations	0.753	
Overall improved company reputation or goodwill	0.753	
Improved product quality	0.724	
Increased productivity	**0.607**	-0.344
Increased process/production efficiency	**0.505**	-0.445
Reduction in process/production costs		-0.992
Reduction in material costs		-0.898
Reduction in costs of regulatory compliance	0.251	**-0.520**

N = 223
Extraction Method: Maximum Likelihood
Rotation Method: Oblimin with Kaiser Normalization (absolute factor loadings equal or higher than 0.20 displayed)
Bartlett's test of sphericity: Chi-square = 2697222; 66 df; sig. = 0.000
Kaiser-Meyer-Olkin measure of sample adequacy = 0.917
Variance explained = 71.406

A confirmatory factor analysis was conducted to validate the findings of the exploratory factor analysis, which resulted in two factors, an Improvement factor composed of nine items and a Reduction factor composed of three items. This scale originally was assumed to be composed of one factor, and previous researchers also used it as one factor (Sharma and Vredenburg 1998; Sharma 2001). Therefore, we first conducted confirmatory factor analysis in the sense that we put together all 12 items to measure competitive benefits; second, we conducted a confirmatory factor analysis in order to validate a two-factor solution.

Table 63 illustrates the main results of the confirmatory factor analyses, related to the model goodness-of-fit indexes and reliability coefficient (Cronbach's alpha). In Table 63, we can see that two-factor solution is not much better than the one-factor solution. Therefore, we decided to retain the one-factor solution composed of 12 items to measure competitive benefits. The Chi-Square and RMSEA had slightly better (lower) values in the two-factor solution, other model goodness-of-fit indexes, such as NFI, NNFI and CFI, were slightly higher in the two-factor solution, while the SRMR value was better (lower) in the one-factor solution. However, the differences were too low to decide on the two-factor solution, while the chi-square difference between the two models was statistically significant. Moreover, SRMR had better value in the one-factor solution than in the two-factor solutions, while Cronbach's alpha for the scale was high (0.954). Finally, further in our analysis we tested competitive benefits as a one-dimensional construct, comprising 12 items.

Table 63: Model good-fit and reliability indexes for 1-factor and 2-factor solution of construct Competitive benefits

	1 factor	2 factors
Chi-square (df)	613.583 (54)	542.818 (52)
RMSEA	0.216	0.206
SRMR	0.080	0.227
NFI	0.777	0.803
NNFI	0.746	0.769
CFI	0.792	0.818
Cronbach's alpha	0.954	0.954

Note: df = degrees of freedom; * the difference between models is statistically significant (Chi-square = 70.765; df = 2; p< 0.0001).

In addition, all the coefficients of the construct of competitive benefits were found to be positive, high and significant. These are presented in Table 64 and Figure 17.

Table 64: Standardized coefficients and their squares (Competitive benefits)

	Standard. coeff.	R-square
Reduction in material costs	0.77	0.59
Reduction in process/production costs	0.76	0.58
Reduction in costs of regulatory compliance	0.68	0.46
Increased process/production efficiency	0.87	0.76
Increased in productivity	0.89	0.79
Increased knowledge about effective ways of managing operations	0.89	0.79
Improved process innovations	0.91	0.83
Improved product quality	0.82	0.67
Improved product innovations	0.83	0.69
Better relationships with stakeholders such as local communities, regulators, and environmental groups	0.71	0.50
Improved employee morale	0.71	0.50
Overall improved company reputation or goodwill	0.68	0.46

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Statistical information of the construct competitive benefits, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is presented in Figure 17. The construct competitive benefits showed good reliability (Cronbach's alpha = 0.954). In addition, the goodness-of-fit indexes are showed in Figure 17 (NFI = 0.78; NNFI = 0.75; CFI = 0.79; SRMR = 0.080; RMSEA = 0.216).

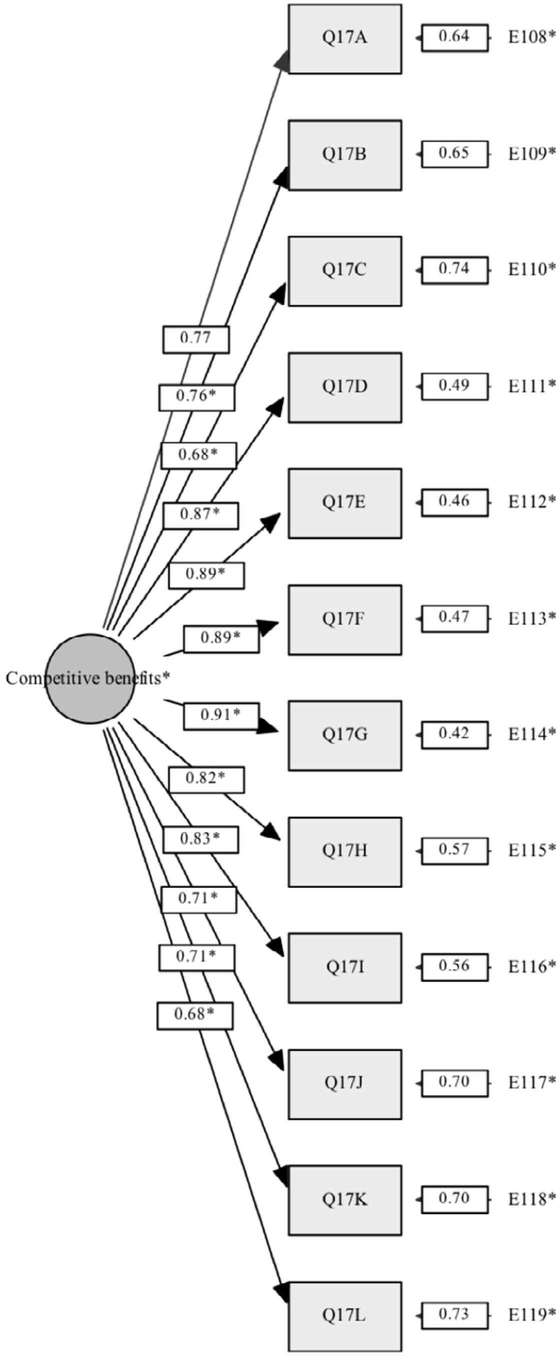

Figure 17: Diagram of construct Competitive benefits with the standardized solution

Note: Measurement items: Q17A = Reduction in material costs; Q17B = Reduction in process/production costs; Q17C = Reduction in costs of regulatory compliance; Q17D = Increased process/production efficiency; Q17E = Increased productivity; Q17F = Increased knowledge about effective ways of managing operations; Q17G = Improved process innovations; Q17H = Improved product quality; Q17I = Improved product innovations; Q17J = Better relationships with stakeholders such as local communities, regulators, and environmental groups; Q17K = Improved employee morale; Q17L = Overall improved company reputation or goodwill; Chi-square = 613.583; p = 0.000; Goodness-of-fit indexes: NFI = 0.78; NNFI = 0.75; CFI = 0.79; SRMR = 0.080; RMSEA = 0.216; Reliability coefficients: Cronbach's alpha = 0.954; RHO = 0.954; Internal consistency reliability = 0.963.

In the next step, we tried to improve the goodness-of-fit indexes by conducting another exploratory factor analysis, followed by a confirmatory factor analysis. Reduction of items was done step by step; in each step, we first eliminated the items that showed lower communalities and had lower correlations with other items (exploratory factor analysis). First, we eliminated items that had extracted communalities lower than 0.60 and correlations with other items below 0.60. After this step, we again conducted a confirmatory factor analysis to determine whether the goodness-of-fit indexes had improved, and then we eliminated the items that had lower standardized coefficients.

Finally, after conducting several exploratory and confirmatory factor analyses, we came to the best and most parsimonious solution. We have reduced the number of items from 12 to four. We report further on all the values from the exploratory and confirmatory factors analyses.

We conducted an exploratory factor analysis by using the overall sample. The method of extraction in the exploratory analysis was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation, which assumes that different factors are related.

The appropriateness of factor analysis was determined by examining the correlation matrix of competitive benefits items. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was examined and indicated similar results; specifically, the KMO value was 0.810 (KMO value with 12 items was 0.917), which indicates an excellent sample adequacy.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.749, while in the first version with 12 items the lowest communality was 0.511). As noted above, in order to improve the goodness-of-fit we removed all the items that showed lower communalities (approximately 0.60).

Table 65: KMO and Bartlett's test of sphericity (Competitive benefits)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.810
Bartlett's test of sphericity	Approx. chi-square	897.029
	df	6
	Sig.	0.000

The number of factors to be extracted was determined a priori based on previous research works that used this scale. The number of extracted factors should be one, while in the previous version with 12 items, two factors were extracted, which in total explained 71.406% of variance. This time we had four items, and only one factor was extracted, which is in line with expectations. Moreover, this one factor explains 81.419% of variance.

Therefore, we conducted a confirmatory factor analysis in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of four items. Figure 18 illustrates the main results of the confirmatory factor analysis, related to the model goodness-of-fit indexes and reliability coefficient (Cronbach's alpha). In addition, all the coefficients of the construct competitive benefits were found to be positive, high and significant. These are presented in Table 66 and Figure 18.

Table 66: Standardized coefficients and their squares (Competitive benefits)

	Standard. coeff.	R-square
Increased process/production efficiency.	0.87	0.76
Increased productivity	0.91	0.83
Increased knowledge about effective ways of managing operations	0.92	0.85
Improved process innovations	0.92	0.85

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Statistical information of the construct competitive benefits, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in the Figure 18. The construct competitive benefits showed good reliability (Cronbach's alpha = 0.946). In addition, the goodness-of-fit indexes are shown in Figure 18 (NFI = 0.943; NNFI = 0.835; CFI = 0.945; SRMR = 0.029; RMSEA = 0.334).

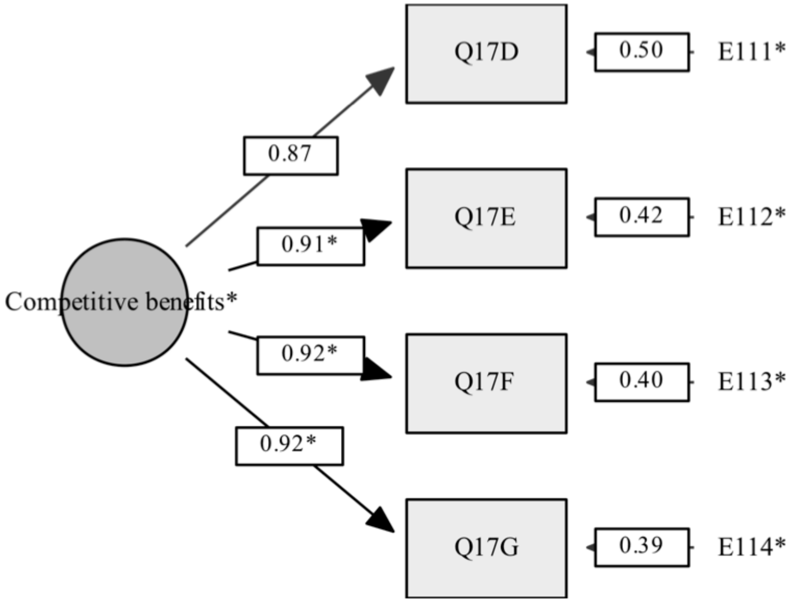

Figure 18: Diagram of construct Competitive benefits with the standardized solution
Note: Measurement items: Q17D = Increased process/production efficiency; Q17E = Increased productivity; Q17F = Increased knowledge about effective ways of managing operations; Q17G = Improved process innovations; Chi-square = 51.555; p = 0.000; Goodness-of--fit indexes: NFI = 0.94; NNFI = 0.83; CFI = 0.94; SRMR = 0.029; RMSEA = 0.334; Reliability coefficients: Cronbach's alpha = 0.946; RHO = 0.946; Internal consistency reliability = 0.948.

Economic benefits

Furthermore, we asked companies to specify the effects of their environmental activities on the listed economic benefits (on a seven-point Likert scale; 1 = very negative to 7 = very positive). Results (see Table 67) reveal that eco-innovations on average had the most positive effect on corporate image (M = 5.14), while the most negative effect was reported for short-term profits (M= 3.82). This is in line with the theory and also with practice, which indicate that eco-innovations, like innovations in general, demand high investments (this indeed depends on the type of eco-innovation that we aim to adopt, implement or develop) and pay off after a longer period of time. However, eco-innovations also exert positive effect on companies' image and reputation, and many other beneficial effects of eco-innovation can be seen in Table 67.

Table 67: Descriptive statistics for Economic benefits

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Sales	223	4.33	1.410	0.153	0.163	-0.346	0.324
Market share	223	4.02	1.349	0.067	0.163	-0.015	0.324
New market opportunities	223	4.32	1.431	-0.053	0.163	-0.414	0.324
Corporate image	223	5.14	1.367	-0.553	0.163	-0.028	0.324
Management satisfaction	223	4.78	1.531	-0.438	0.163	-0.317	0.324
Employee satisfaction	223	4.52	1.423	-0.329	0.163	-0.132	0.324
Short-term profits	223	3.82	1.419	0.111	0.163	-0.261	0.324
Cost savings	223	4.17	1.505	-0.094	0.163	-0.428	0.324
Productivity	223	4.00	1.430	-0.168	0.163	0.170	0.324

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

Further, we conducted an exploratory factor analysis by using the overall sample (the method of extraction was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation). Before the analysis, all measurement items were checked for normality of distribution (see Table 67).

The appropriateness of factor analysis was determined by examining the correlation matrix of economic benefits items. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.885, which indicates an excellent sample adequacy.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.459). The number of expected factors was one, and the extracted factor was one. In addition, the scree plot of the initial run indicated one factor as an appropriate number. Further, one factor explains 65.087% of variance.

Table 68: KMO and Bartlett's test of sphericity (Economic benefits)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.885
Bartlett's test of sphericity	Approx. chi-square	1926.122
	df	36
	Sig.	0.000

Further, a confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of nine items. This has also been confirmed by the confirmatory factor analysis. The construct of economic benefits comprises nine items. All the coefficients were found to be positive, high and significant, and these are indicated in Table 69 and Figure 19.

Table 69: Standardized coefficients and their squares (Economic benefits)

	Standard. coeff.	R-square
Sales	0.84	0.71
Market share	0.89	0.79
New market opportunities	0.85	0.72
Corporate image	0.78	0.61
Management satisfaction	0.81	0.66
Employee satisfaction	0.88	0.77
Short-term profits	0.74	0.55
Cost savings	0.68	0.46
Productivity	0.78	0.61

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Statistical information of the construct Economic benefits, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in the Figure 19. The construct economic benefits showed good reliability (Cronbach's alpha = 0.943). In addition, the goodness-of-fit indexes are shown in Figure 19 (NFI = 0.778; NNFI = 0.717; CFI = 0.788; SRMR = 0.083; RMSEA = 0.261).

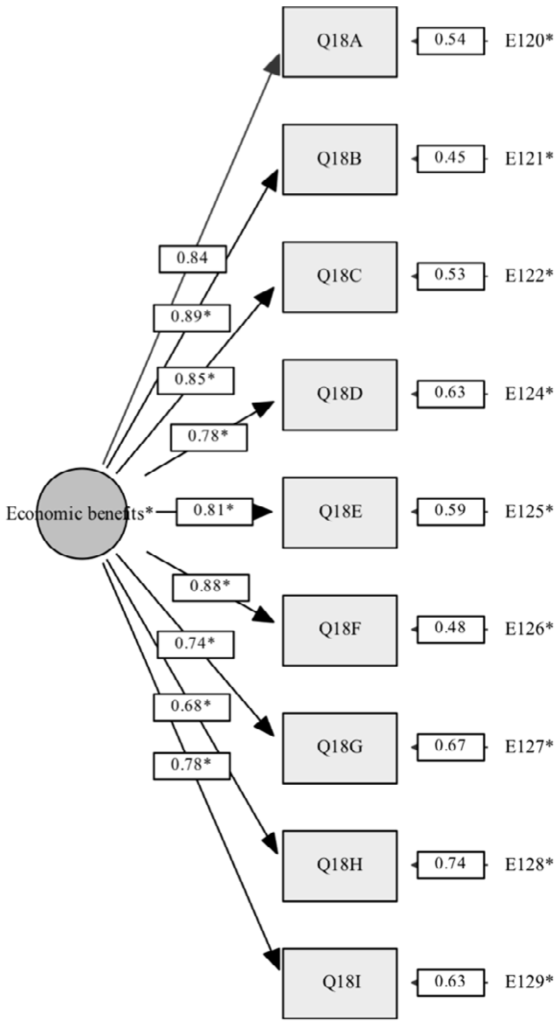

Figure 19: Diagram of construct Economic benefits with the standardized solution
Note: Measurement items: Q18A = Sales; Q18B = Market share; Q18C = New market opportunities; Q18D = Corporate image; Q18E = Management satisfaction; Q18F = Employee satisfaction; Q18G = Short-term profits; Q18H = Cost savings; Q18I = Productivity; Chi-square = 435.32; p = 0.00; Goodness-of-fit indexes: NFI = 0.778; NNFI = 0.717; CFI = 0.788; SRMR = 0.083; RMSEA = 0.261; Reliability coefficients: Cronbach's alpha = 0.943; RHO = 0.943; Internal consistency reliability = 0.951.

We have encountered a similar problem here as we did previously when dealing with the constuct of competitive benefits. Here, all nine items were extracted to one factor, and the goodness-of-fit indexes are again poor. Therefore, we tried to improve these results while maintaining the parsimony of the construct. We first eliminated the items that had lower extracted communalities and were correlated to a lower extent with other items, then again conducted exploratory factor analysis. If we appeared to be on the right track, we continued with confirmatory factor analysis and examined the goodness-of-fit indexes as well as the standardized coefficients. We repeated this procedure several times to find the best solution.

We now present the results of the best solution. We conducted an exploratory factor analysis (the method of extraction was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation). The appropriateness of factor analysis was determined by examining the correlation matrix of economic benefits items. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.846 (with nine items, the KMO value was 0.885), which means an excellent sample adequacy.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.631, while with all nine items the lowest one was 0.459). In the process of analysis, researchers usually delete or exclude the items that have low communalities after extraction – below the threshold of 0.20. Here, we have deleted all the items with communality less than 0.60.

The number of expected factors was one, and the extracted factor was one. In addition, the scree plot of the initial run indicated one factor as an appropriate number. Further, one factor explains 77.242% of variance (with all nine items, the share of explained variance was 65.087%).

Table 70: KMO and Bartlett's test of sphericity (Economic benefits)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.846
Bartlett's test of sphericity	Approx. chi-square	753.649
	df	6
	Sig.	0.000

Further, a confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of four items. This has also been confirmed by the confirmatory factor analysis. The construct Economic benefits comprises four items. All the coefficients were found to be positive, high and significant, and are indicated in Table 71 and Figure 20.

Table 71: Standardized coefficients and their squares (Economic benefits)

	Standard. coeff.	R-square
Sales	0.86	0.74
Market share	0.95	0.90
New market opportunities	0.90	0.81
Employee satisfaction	0.79	0.62

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination.

Statistical information of the construct Economic benefits, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in Figure 20. The construct Economic benefits showed good reliability (Cronbach's alpha = 0.930). In addition, the goodness-of-fit indexes are shown in Figure 20 (NFI = 0.997; NNFI = 1.000; CFI = 1.000; SRMR = 0.008; RMSEA = 0.000).

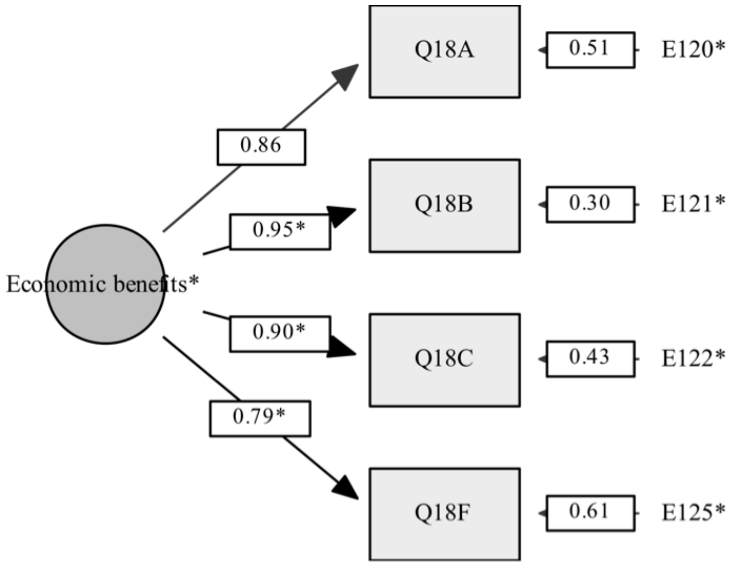

Figure 20: Diagram of construct Economic benefits with the standardized solution

Note: Measurement items: Q18A = Sales; Q18B = Market share; Q18C = New market opportunities; Q18F = Employee satisfaction; Chi-square = 1.907; p = 0.385; Goodness-of-fit indexes: NFI = 0.997; NNFI = 1.000; CFI = 1.000; SRMR = 0.008; RMSEA = 0.000; Reliability coefficients: Cronbach's alpha = 0.930; RHO = 0.930; Internal consistency reliability = 0.950.

Company performance

One of the last consequences that we measured in order to test them how do they relate to different eco-innovation types, is company performance. All the indexes presented in Table 72 were acquired and gathered for each company from the GVIN database, which contains business indicators for Slovenian companies. We have further divided companies into six classes/categories with regard to the financial and non-financial indicators (1 = less than 0%; 2 = 0-24%; 3 = 25-49%; 4 = 50-74%; 5 = 75-99%; 6 = more than 100%). Therefore, we can see that growth of employees and growth of net sales through two business years in the analyzed companies were, on average, between 0 to 24%. Financial indicators, such as ROA, ROE and ROS, were also between 0 and 24%.

Table 72: Descriptive statistics for Company performance

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Number of employees – growth through two business years	201	1.5920	0.79545	2.253	0.172	8.671	0.341
Net sales – growth through two business years	222	1.6622	0.92639	2.032	0.163	5.799	0.325
ROA (return on assets)	220	1.8682	0.41202	-0.514	0.164	4.278	0.327
ROE (return on equity)	212	2.0896	0.85791	2.645	0.167	9.706	0.333
ROS (return on sales)	220	1.8182	0.38657	-1.661	0.164	0.767	0.327

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis. Furthermore, when we acquired the data for each company, for each type indicator, six different levels were proposed that were coded from 1–6: level 1 (less than 0%), level 2 (between 0-24%), level 3 (between 25-49%), level 4 (between 50-74%), level 5 (between 75-99%) and level 6 (more than 100%). The 'mean value' presented in the table actually means the average 'level' of specific indicator; e.g., the mean of 2.08 for 'ROE – return on equity' actually means that companies on average had between 0-24% of return on equity.

In more detail, we present in Table 73 all the aforementioned indicators by frequency and percentage for the analyzed companies. The results show that the majority of companies (106 or 47.5%) reported negative growth of number of employees through two business years, while 80 companies (35.9%) reported growth related to the number of employees through two business years between 0-24%. Moreover, 10 companies (4.5%) reported growth between 25-49%, followed by three companies (1.3%) that had growth between 50-74%, while only two companies had more than 100% of growth related to the number of employees through two business years.

Regarding growth of net sales through two business years, 120 companies (53.8%) had less than 0%, while 72 companies (32.3%) had between 0-24% and 22 companies (9.9%) had between 25-49%. Continuing, four companies (1.8%) had between 50-74% of net sales growth through two business years, followed by one company (0.4%) with between 75-99% and 3 companies (1.3%) whose net sales growth through two business years was more than 100%.

Table 73 also depicts other financial indicators, such as ROA (return on assets), ROE (return on equity) and ROS (return on sales). The results show that the majority of companies (182 or 81.6%) had ROA between 0-24%, followed by 34 companies (15.2%) with less than 0%, while three companies (1.3%) had between 25-49% and only one company (0.4%) had between 50-74%. Concerning the values of ROE, the results demonstrate that the majority of companies (158 or 70.9%) had ROE between 0-24%, followed by 29 companies (13%) that had less than 0% and 14 companies (6.4%) that had between 25-49%. Continuing, five companies (2.2%) had ROE more than 100%, followed by four companies (1.8%) that had between 50-74% and two companies (0.9%) that had between 75-99%. Finally, we also checked for ROS, and the results show that the majority of companies (180 companies or 80.7%) had between 0 and 24%, followed by 40 companies (17.9%) that had less than 0%.

Table 73: Company performance – frequency and percentage of different financial and non--financial indicators

	Frequency	Percent	Sample
Number of employees – growth through two business years			
Less than 0%	106	47.5%	Total = 201 (90.1%) Missing = 22 (9.9%)
Between 0-24%	80	35.9%	
Between 25-49%	10	4.5%	
Between 50-74%	3	1.3%	
Between 75-99%	0	0	
More than 100%	2	0.9%	
Net sales – growth through two business years			
Less than 0%	120	53.8%	Total = 222 (99.6%) Missing = 1 (0.4%)
Between 0-24%	72	32.3%	
Between 25-49%	22	9.9%	
Between 50-74%	4	1.8%	
Between 75-99%	1	0.4%	
More than 100%	3	1.3%	
ROA (return on assets)			
Less than 0%	34	15.2%	Total = 220 (98.7%) Missing = 3 (1.3%)
Between 0-24%	182	81.6%	
Between 25-49%	3	1.3%	
Between 50-74%	1	0.4%	
Between 75-99%	0	0	
More than 100%	0	0	
ROE (return on equity)			
Less than 0%	29	13%	Total = 212 (95.1%) Missing = 11 (4.9%)
Between 0-24%	158	70.9%	
Between 25-49%	14	6.3%	
Between 50-74%	4	1.8%	
Between 75-99%	2	0.9%	
More than 100%	5	2.2%	
ROS (return on sales)			

	Frequency	Percent	Sample
Less than 0%	40	17.9%	Total = 220 (98.7%) Missing = 3 (1.3%)
Between 0-24%	180	80.7%	
Between 25-49%	0	0	
Between 50-74%	0	0	
Between 75-99%	0	0	
More than 100%	0	0	

Note: When we acquired the data for each company, for each type indicator, six different levels were proposed that were coded from 1–6: level 1 (less than 0%), level 2 (between 0-24%), level 3 (between 25-49%), level 4 (between 50-74%), level 5 (between 75-99%) and level 6 (more than 100%).

Further, we conducted an exploratory factor analysis (the method of extraction was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation). Before the analysis, all measurement items were checked for normality of distribution (see Table 72). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution.

The appropriateness of factor analysis was determined by examining the correlation matrix of company performance items. The Bartlett's test of sphericity, which statistically tests for the presence of correlations among the underlying variables, showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.596, which indicates a sufficient sample adequacy.

Table 74: KMO and Bartlett's test of sphericity (Company performance)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.596
Bartlett's test of sphericity	Approx. chi-square	243.333
	df	10
	Sig.	0.000

After consideration of each item's communality index and its contribution, we retained all the items. In our case, one item – "Number of net sales – growth through two business years" –had a low communality after extraction (0.11; which is below the threshold of 0.20). However, because of its importance, we retained it in the further analyses.

The number of extracted factors should be two, one pertaining to the company growth and the other to the company profitability. As expected, the scree plot of the initial run indicated that two factors might be an appropriate number, and the latent root (eigenvalue) criterion also indicated two factors, which in total explain 53.722% of variance. The two factors that were extracted as a result of the exploratory factor analysis are presented in Table 75, together with the five related items and their factor loadings. The solution with two factors was retained. Therefore, the company performance construct was split into two individual factors, one pertaining to the company profitability (including three items) and the other to the company growth (including two items).

Table 75: Company performance dimension's item factor loadings

Items	Factors	
	Factor 1 (Company profitability)	Factor 2 (Company growth)
Return on assets (ROA)	1.016	
Return on equity (ROE)	**0.610**	0.304
Return on sales (ROS)	0.564	
Number of employees – growth through two business years		0.861
Net sales – growth through two business years		0.269

N = 223
Extraction Method: Maximum Likelihood
Rotation Method: Oblimin with Kaiser Normalization (absolute factor loadings equal to or higher than 0.20 displayed)
Bartlett's test of sphericity: Chi-square = 243.333; 10 df; sig. = 0.000
Kaiser-Meyer-Olkin measure of sample adequacy = 0.596
Variance explained = 53.722

From Table 75, we can see that item "Return on equity (ROE)" loaded on two factors – company growth (the wrong factor) and company profitability (the factor on which it should load). It had a higher loading on the right factor; nonetheless, we decided that company performance will be divided into two separate constructs – company profitability and company growth. Therefore, factors will not be covered under one second-order latent factor.

Next, exploratory factor analysis was conducted only for items pertaining to the construct company profitability. The method of extraction was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation. The appropriateness of factor analysis was determined by examining the correlation matrix of company profitability items. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.596, which indicates a sufficient sample adequacy. After consideration of each item's communality index and its contribution, we retained all the items. All items had values above the threshold of 0.20 (the lowest communality was 0.276). As expected, the scree plot of the initial run indicated that one factor might be an appropriate number, and the latent root (eigenvalue) criterion also indicated one factor, which in total explains 58.904% of variance.

A confirmatory factor analysis was conducted to validate the findings of the exploratory factor analysis, which showed that the construct company profitability is composed of three items: ROA (return on assets), ROE (return on equity) and ROS (return on sales). This has been confirmed by the confirmatory factor analysis. All the coefficients were found to be positive, high and significant, and they are indicated in Table 76 and Figure 21.

Table 76: Standardized coefficients and their squares (Company profitability)

	Standard. coeff.	R-square
Return on assets (ROA)	0.95	0.90
Return on equity (ROE)	0.87	0.76
Return on sales (ROS)	0.63	0.39

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination; since this construct has been measured by only three items, an additional constraint (factor fixed to one and item ROE fixed to one) has been imposed in order to estimate the goodness-of-fit indexes.

Statistical information of the dimension company profitability, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample ($N = 223$), is indicated in Figure 21. The dimension company profitability showed good reliability (Cronbach's alpha = 0.681). In addition, the goodness-of-fit indexes are shown in Figure 21 (NFI = 0.820; NNFI = 0.468; CFI = 0.823; SRMR

= 0.522; RMSEA = 0.418). We can see that all goodness-of-fit indexes showed a poor fit.

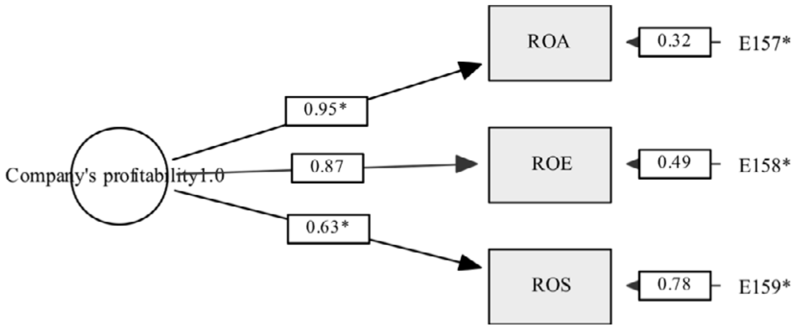

Figure 21: Diagram of company performance dimension – construct Company profitability with the standardized solution
Note: Measurement items: ROA = Return on assets; ROE = Return on equity; ROS = Return on sales; Chi-square = 37.225; p = 0.00; Goodness-of-fit indexes: NFI = 0.820; NNFI = 0.468; CFI = 0.823; SRMR = 0.522; RMSEA = 0.418; Reliability coefficients: Cronbach's alpha = 0.681; RHO = 0.870; Internal consistency reliability = 0.927.

Moreover, the second construct related to company performance, company growth, is composed of only two items: number of employees (growth through two business years) and net sales (growth through two business years). Therefore, for the construct company growth, confirmatory factor analysis has not been conducted. Instead, we have calculated only correlation between those two items. Correlation was estimated at 0.249, which is quite low but showed to be positive and statistically significant at the 0.01 level. This construct has been retained for further analyses because of its importance.

Internationalization

In our survey, 151 companies out of 223 total are engaged in international activities (i.e., are active on foreign markets). This means that the majority of analyzed companies, which accounts for 67.7% of the total sample, are internationalized. In our study, we measured internationalization with three variables: operation modes, number of foreign markets (in which the company operates) and, lastly, company's share of sales on foreign markets in the year 2013. Regarding company age when starting to operate on foreign markets, the results demonstrate that companies on average started to internationalize at between one year and three years. In more detail, among the internationalized companies, 34 companies (22.5%) identified themselves as born global (immediately starting to operate on foreign markets), followed by 30 companies (19.9%) that started their internationalization process at between 1-3 years. The majority of companies – 39 companies (25.8%) – started operating on foreign markets at 21 years or more, followed by 18 companies (11.9%) that started with international operations at between 7-10 years old. Moreover, 16 companies (10.6%) started operating on foreign markets at between 4-6 years old and 13 companies (8.6%) started operating on foreign markets at between 11-20 years. Lastly, one company answered that they have not yet started the internationalization process.

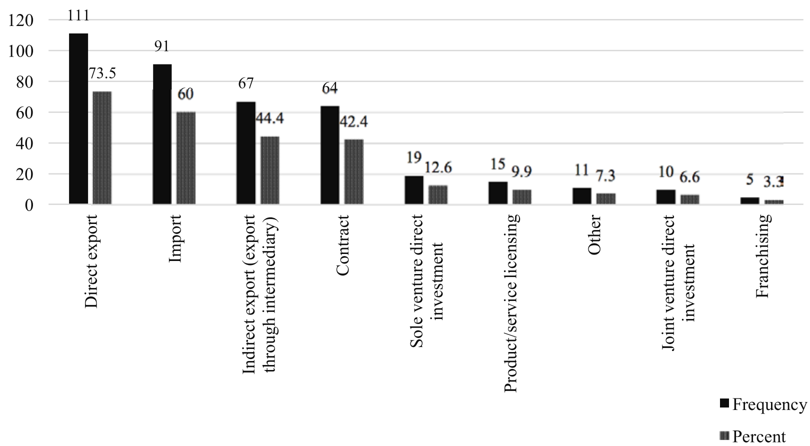

Figure 22: Frequency and percentage of use of operation modes (types) by the analyzed companies

First, we present briefly descriptive statistics of the variable called operation modes for the internationalized companies in our sample (Figure 22). Operation modes in our survey were classified into nine groups: 1) import; 2) direct export; 3) indirect export (export through intermediary); 4) sole venture direct investment; 5) joint venture direct investment; 6) contract; 7) product/service licensing; 8) franchising or 9) other. Figure 22 illustrates that the most frequently used operation mode for all analyzed companies was direct export, used by 111 companies (73.5%), followed by import (91 companies; 60.3%), indirect export (67 companies, 44.4%) and contract (64 companies; 42.4%). More rarely used by Slovenian companies were the following operation modes: sole venture direct investment (19 companies; 12.6%), followed by product/service licensing (15 companies; 9.9%) and other (11 companies; 7.3%). A less used operation mode by the analyzed companies is joint venture direct investment (10 companies; 6.6%) and the least frequently used is franchising (5 companies; 3.3%).

Furthermore, Table 77 illustrates the mean values of operation modes. We can see that direct export was the most frequently used mode of entry in international markets by analyzed companies, followed by indirect export and contract entry modes. Franchising and joint venture direct investment were found to be very rarely used by the analyzed companies.

Table 77: Descriptive statistics for internationalization variable – operation modes

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Import	151	0.60	0.491	-0.424	0.197	-1.845	0.392
Direct export	151	0.74	0.443	-1.076	0.197	-0.853	0.392
Indirect export	151	0.44	0.498	0.229	0.197	-1.974	0.392
Sole venture direct investment	151	0.13	0.333	2.279	0.197	3.237	0.392
Joint venture direct investment	151	0.07	0.250	3.524	0.197	10.557	0.392
Contract	151	0.42	0.496	0.311	0.197	-1.929	0.392
Product/service licensing	151	0.10	0.300	2.706	0.197	5.393	0.392
Franchising	151	0.03	0.180	5.271	0.197	26.131	0.392
Other	151	0.07	0.261	3.320	0.197	9.145	0.392

Note: N = number of observations; Mean = mean value on the Likert scale, which ranges from 1 to 7 (1 = strongly disagree, 7 = strongly agree); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis; indirect export (export through intermediary).

In addition, the total number of operation modes that a single company currently uses is also shown (see Figure 23). This indicator can further show the complexity of analyzed internationalized companies concerning international operations. Every single operation mode has its specifics, while we can conclude that companies that use more operation modes are more experienced in international operations than companies that use only one or two operation modes (Ruzzier 2005). We can see that among the internationalized companies, the majority of companies (47 companies; 31.1%) use only one operation mode, followed by 38 companies (25.2%), that use three operation modes and 33 companies (21.8%) use two operation modes. Moreover, 12 companies (7.9%) use four operation modes, 12 companies (7.9%) use five operation modes, six companies

(3.9%) use six operation modes and two companies (1.3%) use seven operation modes. Lastly, only one company (0.7%) reported the use of eight operation modes.

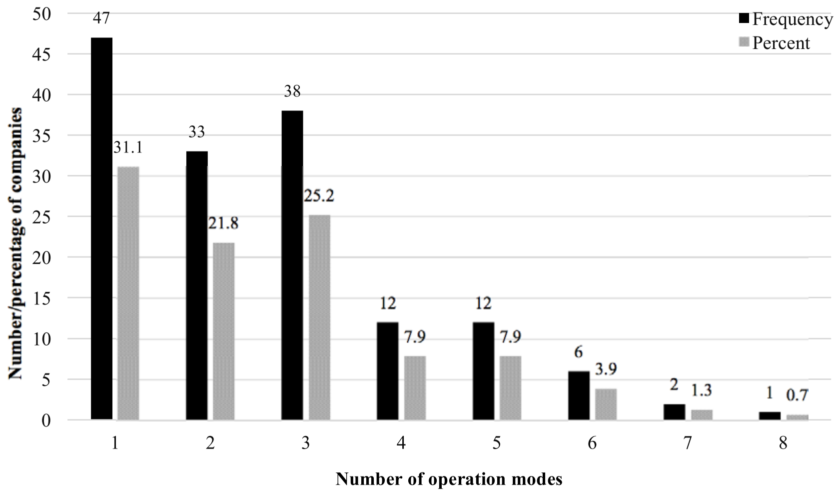

Figure 23: Frequency and percentage of use of operation modes (number) by the analyzed companies

The second internationalization variable is the number of foreign countries to which companies currently sell their products or services. Further, internationalization also concerns the market in which companies operate. A higher number of markets indicates greater complexity of companies' operations and a wider range of knowledge that companies must possess in order to be successful (Ruzzier et al. 2014a). Figure 24 illustrates the total number of countries in which a single company operates. Based on companies included in the survey, we can see that the majority of companies (37 companies; 24.5%) sell their products/services to two or three countries, followed by 29 companies (19.2%) that sell their products/services in 6 to 10 countries, while 28 companies (18.5%) sell them in 21 and more countries and 26 companies (17.2%) sell their products/services to four or five countries. Moreover, we can see hat 13 companies (8.6%) sell their products/services in 11 to 15 countries, eight companies (5.3%) sell only in one country, and seven companies (4.6%) sell them in 16 to 20 countries. Lastly, of the surveyed companies, three companies (2%) do not sell their products/services in foreign countries.

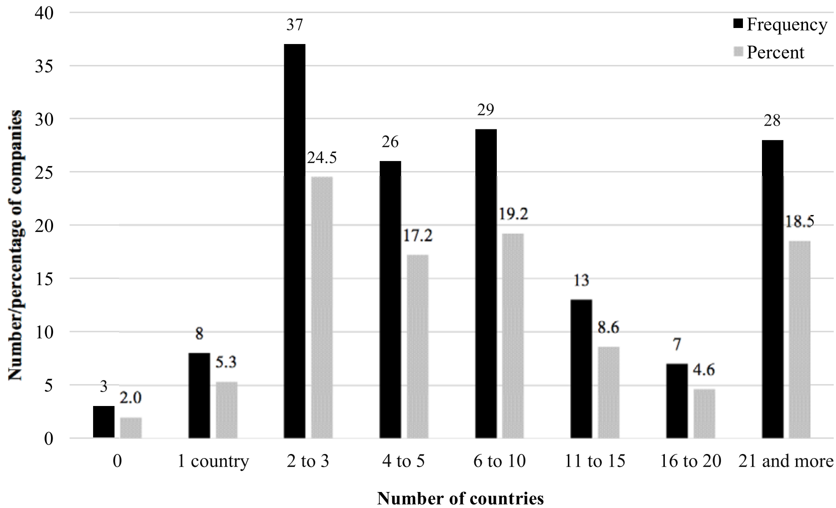

Figure 24: Frequency and percentage of the total number of countries where analyzed companies sell their products/services

The third internationalization variable pertains to the company's share of sales abroad in year 2013 (see Table 78). The most frequent measure for internationalization performance is the percentage share of foreign sales. In Table 78, we can see that the analyzed companies, on average, make between 31-50% of their sales from international operations. In more detail, 28 companies (18.5%) reported between 51-70% of their sales on foreign markets, followed by 24 companies (15.9%) that estimated the share of sales on foreign markets in 2013 at 1-10% and 23 companies (15.2%) between 91-100%. This is followed by 22 companies (14.6%) whose share of sales on foreign markets is between 71-90%, followed by 17 companies (11.3%) that estimated the share of foreign sales between 11-20%, 16 companies (10.6%) between 21-30% and 15 companies (9.9%) between 31-50%. Finally, only six of the internationalized companies (4%) reported no share of international sales in 2013.

Table 78: Share of sales in foreign market in 2013

Share of foreign sales in year 2013	N	Mean	St. Dev.	St. Err.	Min	Max
	151	4.97	2.189	0.178	1	8
Share of foreign sales in year 2013	**N**		**Frequency**		**Percent**	
0%	151		6		4.0%	
1-10%	151		24		15.9%	
11-20%	151		17		11.3%	
21-30%	151		16		10.6%	
31-50%	151		15		9.9%	
51-70%	151		28		18.5%	
71-90%	151		22		14.6%	
91-100%	151		23		15.2%	

Note: N = number of observations; Mean = mean value (variable Share of sales abroad in 2013 was measured by the extent of sales on foreign markets, ranging from 0 to 100% (level 1 = 0%; level 2 = 1-10%; level 3 = 11-20 %; level 4 = 21-30%; level 5 = 31-50%; level 6 = 51-70%; level 7 = 71-90%; level 8 = 91-100%); St. Dev. = standard deviation; St. Err. = standard error of Mean; Min = minimum; Max = maximum.

Table 79 illustrates descriptive statistics for the construct internationalization, which was measured by three items: number of foreign markets, share of sales on foreign markets in 2013 and number of operation modes. We can see that analyzed companies, on average, operate on 6 to 10 foreign markets; they had between 31-50% of sales on foreign markets in 2013 and use two operation modes for international activities (Table 79).

Table 79: Descriptive statistics for internationalization

	N	Mean	St. Dev.	Skew	St. Err. Skew	Kurt	St. Err. Kurt
Number of foreign markets	151	4.83	1.971	0.340	0.197	-0.953	0.392
Share of sales abroad in 2013	151	4.97	2.189	-0.185	0.197	-1.258	0.392
Number of operation modes	151	2.60	1.567	0.988	0.197	0.571	0.392

Note: N = number of observations; Mean = mean value (variable Number of foreign markets has been coded as follows: level 1 = zero countries; level 2 = 1 country; level 3 = between 2-3 countries; level 4 = between 4-5 countries; level 5 = between 6-10 countries; level 6 = between 11-15 countries; level 7 = between 16-20 countries; level 8 = more than 21 countries; the performance dimension of internationalization (Share of sales abroad in 2013) was measured by the extent of sales on foreign markets, ranging from 0 to 100% (level 1 = 0%; level 2 = 1-10%; level 3 = 11-20%; level 4 = 21-30%; level 5 = 31-50%; level 6 = 51-70%; level 7 = 71-90%; level 8 = 91-100%); variable Number of operation modes was constructed by summing all operation modes); St. Dev. = standard deviation; Skew = skewness; St. Err. of Skew = standard error of skewness; Kurt = kurtosis; St. Err. Kurt = standard error of kurtosis.

Further, we conducted an exploratory factor analysis (the method of extraction was the Maximum Likelihood Method, while the selected rotation was Direct Oblimin rotation). Before the analysis, all measurement items were checked for normality of distribution (see Table 79). Results have shown that the ratio of standard errors of kurtosis and skewness range between values of -2 and 2, which implies normality of distribution.

The appropriateness of factor analysis was determined by examining the correlation matrix of economic benefit items. The Bartlett's test of sphericity showed that the correlation matrix has significant correlations ($p < 0.05$). Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.514, which indicates a sufficient sample adequacy.

After consideration of each item's communality index and its contribution, we retained all the items (the lowest communality after extraction was 0.124). In the process of analysis, researchers usually delete or exclude the items that have low communalities after extraction (below the threshold of 0.20). However, we retained the item "Total number of operation modes" in further analyses despite the low communality after extraction, because of its relevance. The number of expected factors was one, and the extracted factor was one, explaining 50.377% of variance.

Table 80: KMO and Bartlett's test of sphericity (Internationalization)

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.514
Bartlett's test of sphericity	Approx. chi-square	93.843
	df	3
	Sig.	0.000

A confirmatory factor analysis was conducted in order to validate the findings of the exploratory factor analysis, which resulted in one factor composed of three items. This has also been confirmed by the confirmatory factor analysis. The construct internationalization comprises three items. All the coefficients were found to be positive, high and significant, and are indicated in Table 81 and Figure 25.

Table 81: Standardized coefficients and their squares (Internationalization)

	Standard. coeff.	R-square
Number of foreign markets	1	1
Share of sales on foreign markets in 2013	0.85	0.72
Number of operation modes	0.62	0.38

Note: Standard. coeff. = Standardized coefficients; R-square = Coefficient of Determination; since this construct has been measured by only three items, an additional constraint (factor fixed to one) has been imposed in order to estimate the goodness-of-fit indexes.

Statistical information of the construct internationalization, pertaining to reliability (reliability coefficients) and convergence (goodness-of-fit model indexes) based on the overall sample (N = 223), is indicated in Figure 25. The construct internationalization showed good reliability (Cronbach's alpha = 0.875). In addition, the goodness-of-fit indexes are shown in Figure 25 (NFI = 0.986; NNFI = 0.964; CFI = 0.988; SRMR = 0.132; RMSEA = 0.157).

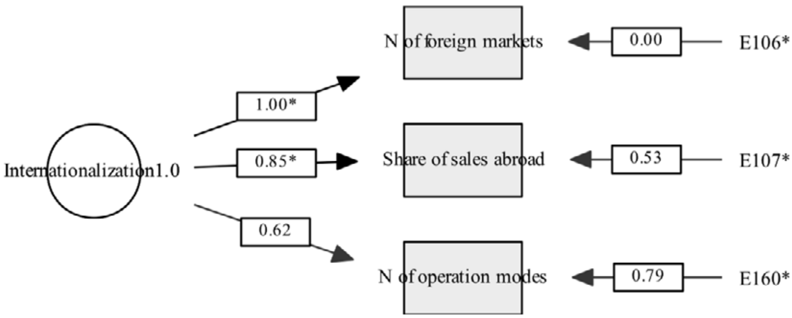

Figure 25: Diagram of construct Internationalization with the standardized solution
Note: Measurement items: Number of foreign markets, Share of sales abroad and Number of operation modes; Chi-square = 6.373; p = 0.01; Goodness-of-fit indexes: NFI = 0.986; NNFI = 0.964; CFI = 0.988; SRMR = 0.132; RMSEA = 0.157; Reliability coefficients: Cronbach's alpha = 0.875; RHO = 0.904; Internal consistency reliability = 1.000.

Eco-innovation models

The findings of the main effects among eco-innovations, its determinants (managerial environmental concern, expected benefits, the command-and-control instrument, the economic incentive instrument, customer demand and competitive pressure) and consequences (competitive benefits, economic benefits, company growth, company profitability and internationalization) will be discussed in this chapter. First, we present the findings that pertain to testing the hypotheses for the product eco-innovation (Section 8.1); second, we test the hypotheses for the process eco-innovation (Section 8.2); and third, for the organizational eco-innovation (Section 8.3). Lastly, we examine the expanded eco-innovation construct model (section 8.4), where all three dimensions of eco-innovation are covered under a second-order latent factor.

Product eco-innovation model

In the product eco-innovation model, the influence of various determinants on product eco-innovation was tested, and the influence of product eco-innovation on its outcomes was analyzed. Eco-innovation determinants were measured by six elements: the command-and-control instrument, the economic incentive instrument, managerial environmental concern, customer demand, expected benefits and competitive pressure. Eco-innovation outcomes were measured by five elements: company growth and company profitability, economic benefits, competitive benefits and internationalization. Two elements related to eco-innovation outcomes – company growth and company profitability – are objective measures, obtained from the GVIN database, which includes different companies' parameters related to the profitability indicator ratios, company growth, and so on for most Slovenian companies.

Construct validity of product eco-innovation model

All measurement items and Cronbach's alpha values are reported in Table 82. Content validity for the survey instrument is supported by the literature, in-depth interviews with environmental managers and a pilot test. A confirmatory factor analysis (CFA) using EQS 6.1 is estimated to assess the construct validity of the product eco-innovation model. In the model, each item is linked to its corresponding construct with freely estimated covariance. The model fit indexes are as follows: Chi-square = 1421.120; df = 836; NFI = 0.817; NNFI = 0.903; CFI = 0.914; RMSEA = 0.061; SRMR = 0.064. These results suggest that the measurement model is acceptable. In addition, the Cronbach's alpha is 0.938, while the reliability coefficient RHO is 0.977.

From Table 82, we can see that all factor loadings are greater than 0.50, and the p-values are significant at the 0.05 level, except for the item pertaining to the construct company growth ("Number of employees – growth through 2 business years"); therefore, convergent validity (pertaining to reliability) is ensured (Fornell and Larcker 1981). In addition, the composite reliability of all constructs (except for the construct company growth) is greater than 0.70, indicating acceptable reliability (Hair et al. 2009). Additionally, the square root of average variance extracted (AVE) for each construct is greater than 0.50, except for the construct company growth, for which has not been calculated (instead, the correlation between the two items pertaining to the construct company growth is given).

Table 82: Measurement model of latent variables and Cronbach's alpha for latent variables

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha
Managerial environmental concern (MC)					
1a Eco-innovation is an important component of the company's environmental management strategy.	0.61		0.858	0.60	0.836
1b Most eco-innovations are worthwhile.	0.82	*			
1c Eco-innovation is necessary to achieve high levels of environmental performance.	0.83	*			
1d Eco-innovation is an effective environmental management strategy.	0.83	*			
Expected benefits (EB)					
2b To improve profitability.	0.77		0.923	0.67	0.914
2c To increase productivity.	0.79	*			
2d To increase market share.	0.89	*			
2e To enter new markets.	0.83	*			
2g To strengthen the brand.	0.76	*			
2h Competitive advantage.	0.85	*			
Command-and-control instrument (CCI)					
3a Our products should meet the requirements of national environmental regulations.	0.88		0.942	0.80	0.946
3b Our products should meet the requirements of international and/or EU environmental regulations.	0.92	*			
3c Our production processes should meet the requirements of national environmental regulations.	0.89	*			
3d Our production processes should meet the requirements of international and/or EU environmental regulations.	0.89	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha
Economic incentive instrument (EII)					
3e The government provides preferential subsidy on environmental innovation.	0.85		0.847	0.66	0.838
3f The government provides preferential tax policy on environmental innovation.	0.95	*			
3h The government promotes environmental protection.	0.59	*			
Customer demand (CD)					
4a Environment is a critical issue for our important customers.	0.91		0.949	0.82	0.940
4b Our important customers often bring up environmental issues.	0.93	*			
4c Customer demands motive us in our environmental efforts.	0.88	*			
4d Our customers have clear demands regarding environmental issues.	0.91	*			
Competitive pressure (CP)					
6a We establish the company's environmental image compared to competitors through green concepts.	0.90		0.933	0.83	0.933
6b We increase the company's market share through green concepts.	0.89	*			
6c We improve the company's competitive advantage over competitors through green concepts.	0.95	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha
Product eco-innovation (PD)					
8b The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	0.61		0.879	0.64	0.885
8e The company chooses materials for the product that consume the least amount of energy and resources for conducting the product development or design.	0.91	*			
8f The company uses the smallest possible amount of materials to comprise the product for conducting the product development or design.	0.88	*			
8g The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.	0.79	*			
Competitive benefits (CB)					
17d Increased process/production efficiency.	0.87		0.949	0.82	0.946
17e Increase in productivity.	0.92	*			
17f Increased knowledge about effective ways of managing operations.	0.92	*			
17g Improved process innovations.	0.92	*			
Economic benefits (ECB)					
18a Sales.	0.89		0.936	0.79	0.930
18b Market share.	0.95	*			
18c New market opportunities.	0.91	*			
18f Employee satisfaction.	0.79	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha
Company performance – growth (GR)					
Number of employees - growth through 2 business years	0.30		n.a.	n.a.	0.249**
Net sales - growth through 2 business years	0.80	*			
Company performance – profitability (PF)					
ROA	0.99		0.807	0.59	0.681
ROE	0.71	*			
ROS	0.55	*			
Internationalization (INT)					
Number of foreign countries where company currently sells its products/services	0.99		0.894	0.74	0.875
Share of sales on foreign markets in 2013	0.87	*			
Total number of operation modes	0.70	*			

Note: * p-values are significant at 0.05 level; ** correlation between the two items pertaining to the construct company growth is significant at the 0.01 level; n.a. = not applicable, because the construct company growth is composed of only two items.

Moreover, Table 83 depicts correlations between latent variables, where we can observe that all correlations are statistically significant.

Table 83: Results of correlations between latent variables

	MC	EB	CCI	EII	CD	CP	PD	CB	ECB	GR	PF	INT
MC	1											
EB	0.56*	1										
CCI	0.26*	0.22*	1									
EII	0.24*	0.30*	0.21*	1								
CD	0.37*	0.40*	0.54*	0.19*	1							
CP	0.45*	0.47*	0.37*	0.30*	0.49*	1						
PD	0.36*	0.40*	0.41*	0.30*	0.51*	0.59*	1					
CB	0.27*	0.29*	0.36*	0.18*	0.45*	0.49*	0.41*	1				
ECB	0.38*	0.47*	0.30*	0.23*	0.49*	0.57*	0.47*	0.68*	1			
GR	0.07*	0.10*	-0.18*	0.03*	-0.05*	-0.08*	-0.22*	-0.04*	0.02*	1		
PF	0.05*	0.07*	-0.12*	0.05*	-0.03*	-0.04*	0.00*	-0.04*	0.02*	0.27*	1	
INT	0.08*	0.13*	0.29*	-0.00*	0.37*	0.04*	0.25*	0.20*	0.27*	0.00*	-0.02*	1

Note: MC = managerial environmental concern; EB = expected benefits; CCI = the command-and-control instrument; EII = the economic incentive instrument; CD = customer demand; CP = competitive pressure; PD = product eco-innovation; CB = competitive benefits; ECB = economic benefits; GR = growth (company performance); PF = profitability (company performance); INT = internationalization.

Statistical analysis and results (path analysis)

All construct dimensions were assessed using exploratory and confirmatory factor analyses in previous sections. We also present construct validity for the product eco-innovation model with its determinants and consequences (see Section 8.1.1). Reliability statistics for all construct dimensions were good (over 0.70), as were the goodness-of-fit measures, which indicated an acceptable model fit for all constructs (except for company growth, which showed worse goodness-of-fit measures). In this section, we use structural equation modeling to test all relationships between the latent variables and the observed variables as well as the relationships among multiple latent variables simultaneously. The resulting product eco-innovation model with estimated relationships (standardized solution) is depicted in Figure 26. The model shows a moderate fit to the data (NFI = 0.763; NNFI = 0.848; CFI = 0.859; SRMR = 0.212; RMSEA = 0.077).

Figure 26: Product eco-innovation model (standardized solution)
Note: Chi-square = 1842.735 (879 df); p = 0.00; Goodness-of-fit indexes: NFI = 0.763; NNFI = 0.848; CFI = 0.859; SRMR = 0.212; RMSEA = 0.077; Reliability coefficients: Cronbach's alpha = 0.939; RHO = 0.947.

The results of testing the proposed hypotheses are depicted in Figure 26. We will focus first on the parts of the hypotheses pertaining to the determinants of product eco-innovation and then on the parts related to the consequences of product eco-innovation.

Hypotheses 1a and 1b examined the relationship between the command-and-control instrument, the economic incentive instrument and product eco-innovation, which for both types of environmental policy instruments was predicted to be positive and significant. The standardized coefficients for both relationships were in the expected direction (positive), quite substantial (the standardized coefficient was 0.15 for the command-and-control instrument and 0.12 for the economic incentive instrument) and significant. Therefore, the findings revealed that Hypotheses 1a and 1b are both supported.

Strong support was found for Hypothesis 2, which postulated a positive and significant relationship between customer demand and product eco-innovation. The standardized coefficient was high (0.29) and significant.

The relationship between managerial environmental concern and product eco-innovation was found to be positive and significant, while the standardized coefficient was small (0.01). Thus, Hypothesis 3 is supported.

Hypothesis 4 postulated a positive and significant relationship between expected benefits and product eco-innovation. The association between expected benefits and product eco-innovation was found to be positive and significant (standardized coefficient 0.12).

Hypothesis 5a (the relationship between competitive intensity and product eco-innovation) was not tested, since the factor competitive intensity explains only 36.733% of variance and was therefore excluded from further analyses. However, Hypothesis 5b examined the relationship between competitive pressure and product eco-innovation, which was expected to be positive and significant. The standardized coefficient for this relationship is highly positive, significant and substantial (0.44), indicating strong support for Hypothesis 5b.

When testing our hypotheses, as indicated in Figure 26, and focusing on consequences of product eco-innovation, we have to add that Hypothesis 6 was tested separately, as it was divided into two dimensions – company growth and company profitability – in order to obtain greater insight regarding how product eco-innovation affects company growth and company profitability. Hypothesis 6 predicted a positive and significant association between product eco-innovation and company performance. In more detail, Hypothesis 6a postulates a positive and significant relationship between product eco-innovation and company growth, while Hypothesis 6b posits a positive and significant association between product eco-innovation and company profitability. When testing the relationships between product eco-innovation and indicators of company performance (company growth and company profitability), statistically significant influences were detected, but the direction was the opposite of the predicted direction. We can see (Figure 26) that product eco-innovation was found to be quite substantially (standardized coefficient -0.14) related to company growth, but again in the opposite direction (i.e., negatively). Therefore, Hypothesis 6a is not supported. Similarly, the standardized coefficient measuring the influence of eco-innovation on company profitability was significant, negative, and close to zero (standardized coefficient -0.00). The relationship was expected to be positive and significant, but, as aforementioned, we can see that the standardized coefficient estimating the relationship between product eco-innovation and company profitability is low (approximately zero) and statistically significant; thus, these findings indicate that Hypothesis 6b is not supported.

In our model, we also used soft measures to measure economic performance of eco-innovation. Hypothesis 7 predicted a positive and significant relationship between product eco-innovation and economic benefits. In addition, the results further indicate that product eco-innovation was found to be highly, positively and significantly related to economic benefits (standardized coefficient 0.49). Therefore, Hypothesis 7 is supported.

Moreover, the relationship between product eco-innovation and competitive benefits was found to be highly positive and significant (standardized coefficient 0.43), offering support for the Hypothesis 8, which is confirmed.

Finally, Hypothesis 9 examined the relationship between product eco-innovation and internationalization and postulated that product eco-innovation has a positive impact on internationalization. The standardized coefficient for this relationship is high, positive and significant (0.24), indicating support for Hypothesis 9. This means that more eco-innovative companies (in the sense of introducing more product eco-innovations) are also more internationalized (in terms of scale and scope).

Process eco-innovation model

In the process eco-innovation model, the influence of various determinants on process eco-innovation was tested, and the influence of process eco-innovation on its outcomes was also analyzed. Eco-innovation determinants were measured by six elements: the command-and-control instrument, the economic incentive instrument, managerial environmental concern, customer demand, expected benefits and competitive pressure. Eco-innovation outcomes were measured by five elements: company growth and company profitability (objective measures obtained from the GVIN database), economic benefits, competitive benefits and internationalization.

Construct validity of process eco-innovation model

All measurement items and values of Cronbach's alpha are reported in Table 84. Content validity for the survey instrument is supported by the literature, in-depth interviews with environmental managers and a pilot test. A Confirmatory Factor Analysis (CFA) model using EQS 6.1 is estimated to assess the construct validity. In the model, each item is linked to its corresponding construct with freely estimated covariance. The model fit indexes are as follows: Chi-square = 1475.364; df = 879; NFI = 0.818; NNFI = 0.906; CFI = 0.916; RMSEA = 0.060; SRMR = 0.060, which suggests that the measurement model is acceptable. In addition, the Cronbach's alpha is 0.939, while the reliability coefficient RHO is 0.978.

Table 84: Measurement model of latent variables and Cronbach's alpha for latent variables

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Managerial environmental concern (MC)					
1a Eco-innovation is an important component of the company's environmental management strategy.	0.63		0.856	0.60	0.836
1b Most eco-innovations are worthwhile.	0.83	*			
1c Eco-innovation is necessary to achieve high levels of environmental performance.	0.81	*			
1d Eco-innovation is an effective environmental management strategy.	0.81	*			
Expected benefits (EB)					
2b To improve profitability.	0.77		0.923	0.67	0.914
2c To increase productivity.	0.79	*			
2d To increase market share.	0.89	*			
2e To enter new markets.	0.83	*			
2g To strengthen the brand.	0.76	*			
2h Competitive advantage.	0.85	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Command-and-control instrument (CCI)					
3a Our products should meet the requirements of national environmental regulations.	0.87		0.942	0.80	0.946
3b Our products should meet the requirements of international and/or EU environmental regulations.	0.91	*			
3c Our production processes should meet the requirements of national environmental regulations.	0.90	*			
3d Our production processes should meet the requirements of international and/or EU environmental regulations.	0.90	*			
Economic incentive instrument (EII)					
3e The government provides preferential subsidy on environmental innovation.	0.84		0.848	0.66	0.838
3f The government provides preferential tax policy on environmental innovation.	0.96	*			
3h The government promotes environmental protection.	0.59	*			
Customer demand (CD)					
4a Environment is a critical issue for our important customers.	0.91		0.949	0.82	0.940
4b Our important customers often bring up environmental issues.	0.93	*			
4c Customer demands motivate us in our environmental efforts.	0.88	*			
4d Our customers have clear demands regarding environmental issues.	0.91	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Competitive pressure (CP)					
6a We establish a company's environmental image compared to competitors through green concepts.	0.90				
6b We increase the company's market share through green concepts.	0.89	*	0.933	0.83	0.933
6c We improve the company's competitive advantage over competitors through green concepts.	0.95	*			
Process eco-innovation (PC)					
9a Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	0.79				
9b Recycle, reuse and remanufacture material.	0.73	*			
9g Use of cleaner technology to generate savings and prevent pollution (such as energy, water and waste).	0.83	*	0.922	0.70	0.912
9h The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	0.92	*			
9i The manufacturing process of the company reduces the use of raw materials.	0.91	*			
Competitive benefits (CB)					
17d Increased process/production efficiency.	0.87				
17e Increase in productivity.	0.92	*			
17f Increased knowledge about effective ways of managing operations.	0.92	*	0.949	0.82	0.946
17g Improved process innovations.	0.92	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Economic benefits (ECB)					
18a Sales.	0.89		0.935	0.78	0.930
18b Market share.	0.95	*			
18c New market opportunities.	0.91	*			
18f Employee satisfaction.	0.79	*			
Company performance – growth (GR)					
Number of employees - growth through 2 business years	0.57		n.a.	n.a.	0.249**
Net sales - growth through 2 business years	0.43	*			
Company performance – profitability (PF)					
ROA	0.95		0.804	0.59	0.681
ROE	0.74	*			
ROS	0.56	*			
Internationalization (INT)					
Number of foreign countries where company currently sells its products/ services	0.99		0.889	0.73	0.875
Share of sales on foreign markets in 2013	0.86	*			
Total number of operation modes	0.69	*			

Note: * p-values are significant at 0.05 level; ** correlation between two items pertaining to the construct company growth is significant at the 0.01 level; n.a. = not applicable, because the construct company growth is composed of only two items.

From Table 84, we can see that all factor loadings are greater than 0.50 and that the p-values are significant at 0.05 level, except for the item pertaining to the construct company growth ("Net sales – growth through 2 business years"); therefore, the convergent validity is ensured (Fornell and Larcker 1981). In addition, the composite reliability of all constructs (except for the construct company growth) is greater than 0.70, indicating acceptable reliability (Hair et al. 2009). Additionally, the square root of average variance extracted (AVE) for each construct is greater than 0.50, except for the construct company growth, for which has not been calculated (instead, the correlation between the two items related to the construct is given).

Table 85 depicts correlations between latent variables, where we can observe that all correlations are statistically significant.

Table 85: Results of Correlations between latent variables

	MC	EB	CCI	EII	CD	CP	PC	CB	ECB	GR	PF	INT
MC	1											
EB	0.56*	1										
CCI	0.26*	0.22*	1									
EII	0.23*	0.29*	0.21*	1								
CD	0.38*	0.40*	0.54*	0.19*	1							
CP	0.46*	0.47*	0.37*	0.30*	0.49*	1						
PC	0.44*	0.22*	0.47*	0.22*	0.51*	0.55*	1					
CB	0.28*	0.29*	0.36*	0.18*	0.45*	0.49*	0.49*	1				
ECB	0.39*	0.47*	0.30*	0.23*	0.49*	0.56*	0.48*	0.68*	1			
GR	0.07*	0.03*	-0.38*	-0.10*	-0.12*	-0.07*	-0.15*	-0.07*	0.01*	1		
PF	0.06*	0.07*	-0.13*	0.05*	-0.00*	-0.00*	0.06*	-0.04*	0.28*	0.38*	1	
INT	0.08*	0.12*	0.29*	-0.00*	0.36*	0.04*	0.16*	0.20*	0.26*	-0.10*	-0.01*	1

Note: MC = managerial environmental concern; EB = expected benefits; CCI = the command-and-control instrument; EII = the economic incentive instrument; CD = customer demand; CP = competitive pressure; PC = process eco-innovation; CB = competitive benefits; ECB = economic benefits; GR = growth (company performance); PF = profitability (company performance); INT = internationalization.

Statistical analysis and results (path analysis)

All construct dimensions were assessed using exploratory and confirmatory factor analyses in previous sections. We also present construct validity for the process eco-innovation model with its determinants and consequences (see Section 8.2.1). Reliability statistics for all construct dimensions were good (over 0.70), as were the goodness-of-fit measures, which indicated an acceptable model fit for all constructs (except for company growth, which showed worse goodness-of-fit measures). In this section, we use structural equation modeling to test all relationships between latent variables and observed variables and the relationships among multiple latent variables simultaneously.

The resulting process eco-innovation model with estimated relationships (standardized solution) is depicted in Figure 27. The model shows a moderate fit to the data (NFI = 0.766; NNFI = 0.852; CFI = 0.863; SRMR = 0.213; RMSEA = 0.075).

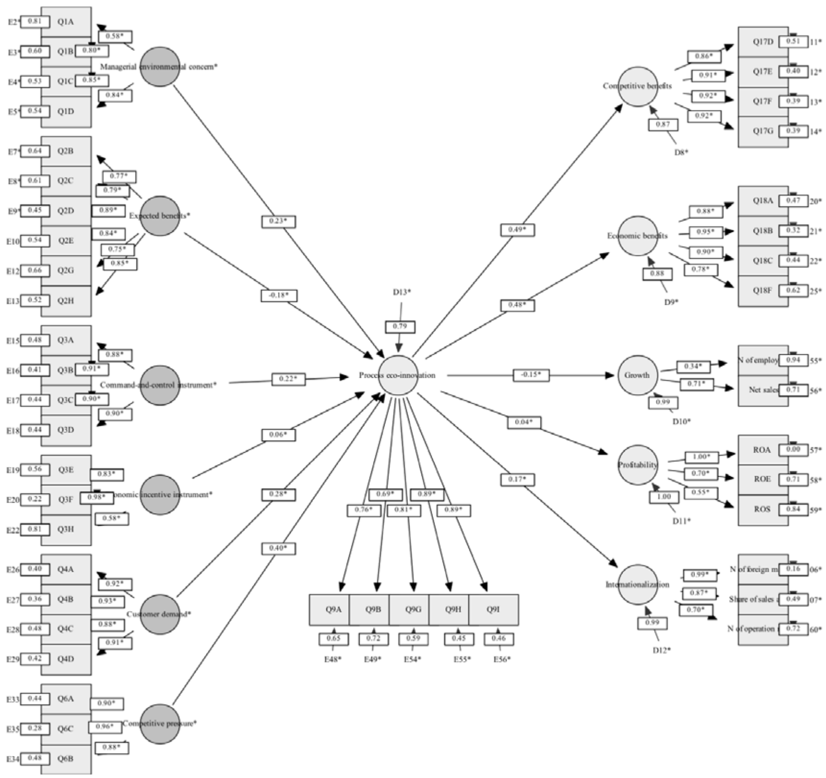

Figure 27: Process eco-innovation model (standardized solution)
Note: Chi-square = 1902.195 (922 df); p = 0.00; Goodness-of-fit indexes: NFI = 0.766; NNFI = 0.852; CFI = 0.863; SRMR = 0.213; RMSEA = 0.075; Reliability coefficients: Cronbach's alpha = 0.939; RHO = 0.948.

We also tested hypotheses concerning determinants and consequences for process eco-innovation. The results of testing our hypotheses are depicted in Figure 27. We will first focus on the hypotheses pertaining to the determinants of process eco-innovation and then on the hypotheses that pertain to the consequences of process eco-innovation.

Hypotheses 1a and 1b examined the relationship between environmental policy instruments (the command-and-control instrument, the economic incentive instrument) and process eco-innovation, which for both environmental policy instruments was predicted to be positive and significant. The standardized coefficients for the relationship between the command-and-control instrument and process eco-innovation were in the expected direction (positive), quite high (the standardized coefficient of the command-and-control instrument was 0.22) and significant. Support was also found for Hypothesis 1b, which posited a positive and significant relationship between the economic incentive instrument and process eco-innovation (the standardized coefficient was 0.06). Therefore, the findings revealed that Hypotheses 1a and 1b are both supported, while the command-and-control instrument seems to play a more important role in spurring process eco-innovation than the economic incentive instrument.

Strong support was found for Hypothesis 2, which postulated a positive and significant relationship between customer demand and process eco-innovation. The standardized coefficient was high (0.28) and significant.

The relationship between managerial environmental concern and process eco-innovation was found to be positive, high and significant (the standardized coefficient was 0.23). Hypothesis 3 is therefore supported.

Hypothesis 4 postulated a positive relationship between expected benefits and process eco-innovation. The association between expected benefits and process eco-innovation was found to be negative and significant (standardized coefficient -0.18), which is the opposite of what we expected. We can thus see that expected benefits do not drive companies toward implementation of process eco-innovations. It is probable that companies expect higher investments in process eco-innovation and tradeoff, which can be seen after several years' lag. Thus, Hypothesis 4 is not supported.

Hypothesis 5a (the relationship between competitive intensity and process eco-innovation) was not tested, since the factor competitive intensity explains only 36.733% of variance and was therefore excluded from further analyses. Hypothesis 5b examined the relationship between competitive pressure and process eco-innovation, which was expected to be positive and significant. The standardized coefficient for this relationship is highly positive, significant and substantial (0.40), indicating strong support for Hypothesis 5b.

When testing our hypotheses, as indicated in Figure 27 and focusing on consequences of process eco-innovation, we have to add that Hypothesis 6 was tested separately, as it was divided into two dimensions – company growth and company profitability – in order to obtain greater insights regarding how process eco-innovation affects company growth and company profitability. However, Hypothesis 6 predicted a positive and significant association between process eco-innovation and company performance. In more detail, Hypothesis 6a posits a positive and significant relationship between process eco-innovation and company growth, while Hypothesis 6b posits a positive and significant association between process eco-innovation and company profitability. When testing the relationships between process eco-innovation and indicators of company performance (company growth and company profitability), significant influences were detected. We can see (Figure 27) that process eco-innovation was found to be quite substantially (standardized coefficient -0.15) related to company growth, but in a negative direction, which is the opposite of what we predicted. Therefore, Hypothesis 6a is not supported. Meanwhile, the standardized coefficient measuring the influence of process eco-innovation on company profitability was significant and positive, although that the association was weak (standardized coefficient 0.04). The relationship was expected to be positive and significant; thus, these findings indicate that Hypothesis 6b is supported.

In our model, we also used soft measures to measure economic performance of eco-innovation. Hypothesis 7 predicted a positive and significant relationship between process eco-innovation and economic benefits. In addition, the results further indicate that process eco-innovation was found to be highly, positively and significantly related to economic benefits (standardized coefficient 0.48). Therefore, Hypothesis 7 is supported.

Moreover, the relationship between process eco-innovation and competitive benefits was found to be highly positive and significant (standardized coefficient 0.49), offering support for Hypothesis 8.

Finally, Hypothesis 9 examined the relationship between process eco-innovation and internationalization and postulated that process eco-innovation has a positive impact on internationalization. The standardized coefficient for this relationship is quite substantial, positive and significant (0.17), indicating support for Hypothesis 9. This means that more eco-innovative companies (in the sense of introducing more process eco-innovations) are also more internationalized (in terms of scale and scope).

Organizational eco-innovation

In the organizational eco-innovation model, the influence of various determinants on organizational eco-innovation and the influence of organizational eco-innovation on its outcomes were analyzed. Eco-innovation determinants were measured by six elements: the command-and-control instrument, the economic incentive instrument, managerial environmental concern, customer demand, expected benefits and competitive pressure. Eco-innovation outcomes were measured by five elements: company growth and company profitability (objective measures obtained from the GVIN database), economic benefits, competitive benefits and internationalization.

Construct validity of organizational eco-innovation model

All measurement items and Cronbach's alpha values are reported in Table 86. Content validity for the survey instrument is supported by the literature, in-depth interviews with environmental managers and a pilot test. A Confirmatory Factor Analysis (CFA) model is estimated to assess the construct validity. In the model, each item is linked to its corresponding construct with freely estimated covariance. The model fit indexes are as follows: Chi-square = 1600.916; df = 923; NFI = 0.819; NNFI = 0.902; CFI = 0.913; RMSEA = 0.063; SRMR = 0.060, suggesting that the measurement model is acceptable. In addition, the Cronbach's alpha is 0.946, while the reliability coefficient RHO is 0.981.

From Table 86, we can see that all factor loadings are greater than 0.50 and the p-values are significant at the 0.05 level, except for the item pertaining to the company growth ("Net sales - growth through 2 business years"), and convergent validity is ensured (Fornell and Larcker 1981). In addition, the composite reliability of all constructs (except for the construct company growth) is greater than 0.70, indicating acceptable reliability (Hair et al. 2009). Additionally, the square root of average variance extracted (AVE) for each construct is greater than 0.50, except for the construct company growth, for which has not been calculated (instead, the correlation between the two items pertaining to the construct is given).

Table 86: Measurement model of latent variables and Cronbach's alpha for latent variables

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Managerial environmental concern (MC)					
1a Eco-innovation is an important component of the company's environmental management strategy.	0.62				
1b Most eco-innovations are worthwhile.	0.83	*			
1c Eco-innovation is necessary to achieve high levels of environmental performance.	0.82	*	0.858	0.60	0.836
1d Eco-innovation is an effective environmental management strategy.	0.82	*			
Expected benefits (EB)					
2b To improve profitability.	0.77				
2c To increase productivity.	0.79	*			
2d To increase market share.	0.89	*			
2e To enter new markets.	0.83	*	0.923	0.67	0.914
2g To strengthen the brand.	0.76	*			
2h Competitive advantage.	0.85	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Command-and-control instrument (CCI)					
3a Our products should meet the requirements of national environmental regulations.	0.87		0.942	0.80	0.946
3b Our products should meet the requirements of international and/or EU environmental regulations.	0.91	*			
3c Our production processes should meet the requirements of national environmental regulations.	0.90	*			
3d Our production processes should meet the requirements of international and/or EU environmental regulations.	0.90	*			
Economic incentive instrument (EII)					
3e The government provides preferential subsidy on environmental innovation.	0.85		0.835	0.66	0.838
3f The government provides preferential tax policy on environmental innovation.	0.96	*			
3h The government promotes environmental protection.	0.59	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Customer demand (CD)					
4a Environment is a critical issue for our important customers.	0.91				
4b Our important customers often bring up environmental issues.	0.93	*	0.949	0.82	0.940
4c Customer demands motivate us in our environmental efforts.	0.88	*			
4d Our customers have clear demands regarding environmental issues.	0.91	*			
Competitive pressure (CP)					
6a We establish the company's environmental image compared to competitors through green concepts.	0.90				
6b We increase the company's market share through green concepts.	0.89	*	0.933	0.83	0.933
6c We improve the company's competitive advantage over competitors through green concepts.	0.95	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Organizational eco-innovation (OR)					
10a Our firm management often uses novel systems to manage eco-innovation.	0.81		0.958	0.79	0.956
10b Our firm management often collects information on eco-innovation trends.	0.91	*			
10c Our firm management often actively engages in eco-innovation activities.	0.93	*			
10d Our firm management often communicates eco-innovation information with employees.	0.92	*			
10e Our firm management often invests a high ratio of R&D in eco-innovation.	0.86	*			
10f Our firm management often communicates experiences among various departments involved in eco-innovation.	0.90	*			
Competitive benefits (CB)					
17d Increased process/production efficiency.	0.87		0.949	0.82	0.946
17e Increase in productivity.	0.92	*			
17f Increased knowledge about effective ways of managing operations.	0.92	*			
17g Improved process innovations.	0.92	*			

Measurement items	Completely standardized loading	p	Composite reliability	AVE	Cronbach's alpha (for construct Growth is given correlation)
Economic benefits (ECB)					
18a Sales.	0.88		0.935	0.78	0.930
18b Market share.	0.95	*			
18c New market opportunities.	0.91	*			
18f Employee satisfaction.	0.79	*			
Company performance – growth (GR)					
Number of employees - growth through 2 business years	0.61		n.a.	n.a.	0.249**
Net sales - growth through 2 business years	0.40	*			
Company performance – profitability (PF)					
ROA	0.96		0.808	0.59	0.681
ROE	0.74	*			
ROS	0.56	*			
Internationalization (INT)					
Number of foreign countries where company currently sells its products/services	0.99		0.894	0.74	0.875
Share of sales on foreign markets in 2013	0.87	*			
Total number of operation modes	0.70	*			

Note: * p-values are significant at 0.05 level; ** correlation between two items pertaining to the construct company growth is significant at the 0.01 level; n.a. = not applicable, because the construct company growth is composed of only two items.

Table 87 depicts correlations between latent variables, where we can observe that all correlations are statistically significant.

Table 87: Results of correlations between latent variables

	MC	EB	CCI	EII	CD	CP	OR	CB	ECB	GR	PF	INT
MC	1											
EB	0.56*	1										
CCI	0.25*	0.22*	1									
EII	0.23*	0.30*	0.21*	1								
CD	0.37*	0.40*	0.54*	0.19*	1							
CP	0.46*	0.47*	0.37*	0.30*	0.49*	1						
OR	0.44*	0.42*	0.39*	0.31*	0.47*	0.73*	1					
CB	0.27*	0.29*	0.36*	0.18*	0.45*	0.49*	0.56*	1				
ECB	0.38*	0.47*	0.30*	0.23*	0.49*	0.56*	0.65*	0.68*	1			
GR	0.06*	0.02*	-0.37*	-0.11*	-0.12*	-0.06*	-0.06*	-0.07*	0.06*	1		
PF	0.06*	0.07*	-0.12*	0.05*	-0.00*	-0.00*	0.06*	-0.04*	0.03*	0.36*	1	
INT	0.08*	0.12*	0.29*	-0.00*	0.37*	0.04*	0.18*	0.20*	0.26*	-0.11*	-0.01*	1

Note: MC = managerial environmental concern; EB = expected benefits; CCI = the command-and-control instrument; EII = the economic incentive instrument; CD = customer demand; CP = competitive pressure; OR = organizational eco-innovation; CB = competitive benefits; ECB = economic benefits; GR = growth (company performance); PF = profitability (company performance); INT = internationalization.

Statistical analysis and results (path analysis)

All construct dimensions were assessed using exploratory and confirmatory factor analyses in previous sections. We also present construct validity for the organizational eco-innovation model with its determinants and consequences (see Section 8.3.1). Reliability statistics for all construct dimensions were good (over 0.70), as were the goodness-of-fit measures, which indicated an acceptable model fit for all constructs (except for company growth). In this section, we use structural equation modeling to test all relationships between latent variables and observed variables as well as the relationships among multiple latent variables simultaneously.

The resulting organizational eco-innovation model with estimated relationships (standardized solution) is depicted in Figure 28. The model shows a moderate fit to the data (NFI = 0.775; NNFI = 0.860; CFI = 0.869; SRMR = 0.214; RMSEA = 0.075).

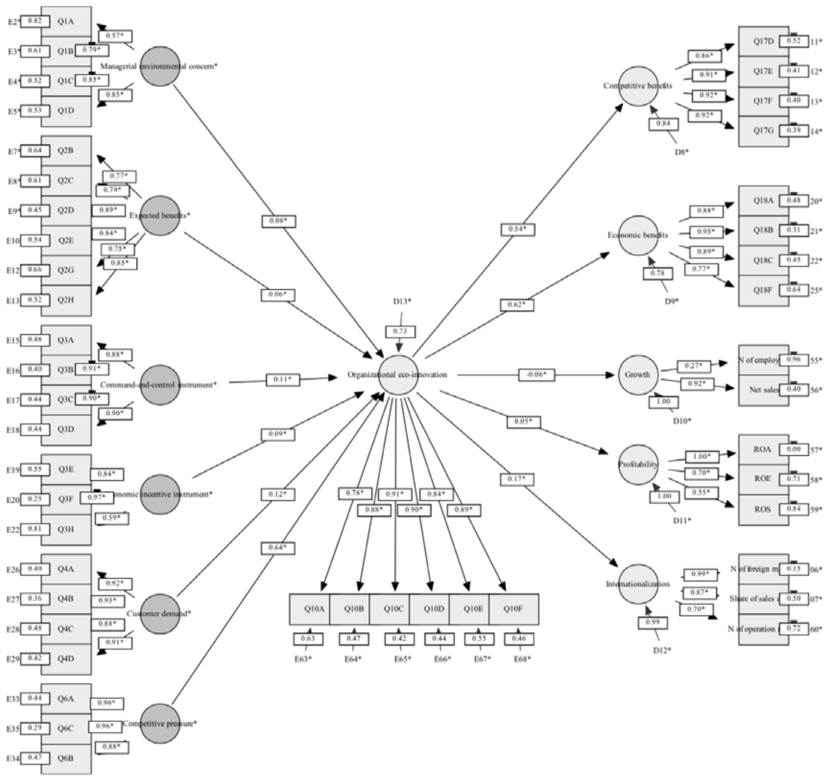

Figure 28: Organizational eco-innovation model (standardized solution)
Note: Chi-square = 1982.385 (966 df); p = 0.00; Goodness-of-fit indexes: NFI = 0.755; NNFI = 0.860; CFI = 0.869; SRMR = 0.214; RMSEA = 0.075; Reliability coefficients: Cronbach's alpha = 0.946; RHO = 0.958.

The results of testing hypotheses related to the organizational eco-innovation model are depicted in Figure 28. As before, we will first focus on the hypotheses pertaining to the determinants of organizational eco-innovation and then on the hypotheses that pertain to the consequences of organizational eco-innovation.

Hypotheses 1a and 1b examined the relationships between environmental policy instruments (the command-and-control instrument, the economic incentive instrument) and organizational eco-innovation, which for both types of environmental policy instruments was predicted to be positive and significant. The standardized coefficients for both relationships were positive (standardized coefficient was 0.11 for the command-and-control instrument and 0.09 for the economic incentive instrument) and significant. Therefore, the findings revealed that Hypotheses 1a and 1b are both supported.

Support was also found for Hypothesis 2, which postulated a positive and significant relationship between customer demand and organizational eco-innovation. The standardized coefficient was positive (0.12) and significant.

The relationship between managerial environmental concern and organizational eco-innovation was found to be positive and significant (the standardized coefficient was slightly lower, estimated at 0.08). Thus, Hypothesis 3 is supported.

Hypothesis 4 postulated a positive relationship between expected benefits and organizational eco-innovation. The association between expected benefits and organizational eco-innovation was found to be positive and significant (standardized coefficient 0.06), indicating support for Hypothesis 4.

Hypothesis 5a (the relationship between competitive intensity and organizational eco-innovation) was not tested, since the factor competitive intensity explains only 36.733% of variance and was therefore excluded from further analyses. Hypothesis 5b examined the relationship between competitive pressure and organizational eco-innovation, which was expected to be positive and significant. The standardized coefficient for this relationship is highly positive, significant and substantial (0.64), offering strong support for Hypothesis 5b.

When testing our hypotheses, as indicated in Figure 28 and focusing on consequences of organizational eco-innovation, we have to add that Hypothesis 6 was tested separately, as it was divided into two dimensions – company growth and company profitability – in order to obtain greater insights regarding how organizational eco-innovation affects company growth and company profitability. However, Hypothesis 6 predicted a positive and significant association between organizational eco-innovation and company performance. In more detail, Hypothesis 6a postulates a positive and significant relationship between organizational eco-innovation and company growth, while Hypothesis 6b posits a positive and significant association between organizational eco-innovation and company profitability. When testing the relationships between organizational eco-innovation and indicators of company performance (company growth and company profitability), significant influences were detected. We can see (Figure 28) that organizational eco-innovation was found to be negatively related to company growth (standardized coefficient -0.06), which is the opposite of what we expected. Therefore, Hypothesis 6a is not supported. Meanwhile, the standardized coefficient measuring the influence of organizational eco-innovation on company profitability was significant and positive, although the association was weak (standardized coefficient 0.05). The relationship was expected to be positive and significant; therefore, these findings indicate that Hypothesis 6b is supported.

In our model, we also used soft measures to measure economic performance of eco-innovation. Hypothesis 7 predicted a positive and significant relationship between organizational eco-innovation and economic benefits. In addition, the results further indicate that organizational eco-innovation was found to be highly, positively and significantly related to economic benefits (standardized coefficient 0.62). Therefore, Hypothesis 7 is supported.

Moreover, the relationship between organizational eco-innovation and competitive benefits was found to be highly positive and significant (standardized coefficient 0.54), offering support for Hypothesis 8, which is confirmed.

Finally, Hypothesis 9 examined the relationship between organizational eco-innovation and internationalization and postulated that organizational eco-innovation has a positive impact on internationalization. The standardized coefficient for this relationship is quite substantial, positive and significant (0.17), therefore indicating support for Hypothesis 9. This means that more eco-innovative companies (in the sense of introducing more organizational eco-innovations) are also more internationalized (in terms of scale and scope).

The expanded construct-level model of eco-innovation

In the expanded construct-level model of eco-innovation, we have analyzed the influence of eco-innovation determinants on eco-innovation implementation and the influence of eco-innovation implementation on its outcomes. Eco-innovation determinants were measured by six elements: the command-and-control instrument, the economic incentive instrument, managerial environmental concern, customer demand, expected benefits and competitive pressure. The eco-innovation construct was measured as a second-order latent factor composed of three dimensions: product, process and organizational eco-innovation. Eco-innovation outcomes were measured by five elements: company growth, company profitability, economic benefits, competitive benefits and internationalization. Two elements related to eco-innovation outcomes – company growth and company profitability – are objective measures, obtained from the GVIN database.

Construct validity for the expanded construct-level model of eco-innovation

All measurement items and the values of Cronbach's alpha are reported in Tables 88 and 89. Content validity for the survey instrument is supported by the literature, in-depth interviews with environmental managers and a pilot test. A Confirmatory Factor Analysis (CFA) model is estimated to assess the construct validity. In the model, each item is linked to its corresponding construct with freely estimated covariance. The model fit indexes are as follows: Chi-square = 2230.569; df = 1339; NFI = 0.795; NNFI = 0.895; CFI = 0.905; RMSEA = 0.060; SRMR = 0.062, suggesting that the measurement model is acceptable. In addition, the Cronbach's alpha is 0.958, while the reliability coefficient RHO is 0.984. Table 88 depicts Cronbach's alpha values for all measurement items. It indicates that all constructs (with the exception of the construct company growth) demonstrate good reliability (over the threshold of 0.70).

Table 88: Measurement items and Cronbach's alpha for latent variables

Measurement items	Cronbach's alpha (for construct Growth is given correlation)
Managerial environmental concern	
1a Eco-innovation is an important component of the company's environmental management strategy. 1b Most eco-innovations are worthwhile. 1c Eco-innovation is necessary to achieve high levels of environmental performance. 1d Eco-innovation is an effective environmental management strategy.	0.836
Expected benefits	
2b To improve profitability. 2c To increase productivity. 2d To increase market share. 2e To enter new markets. 2g To strengthen the brand. 2h Competitive advantage.	0.914

Measurement items	Cronbach's alpha (for construct Growth is given correlation)
Command-and-control instrument	
3a Our products should meet the requirements of national environmental regulations. 3b Our products should meet the requirements of international and/or EU environmental regulations. 3c Our production processes should meet the requirements of national environmental regulations. 3d Our production processes should meet the requirements of international and/or EU environmental regulations.	0.946
Economic incentive instrument	
3e The government provides preferential subsidies for environmental innovation. 3f The government provides preferential tax policies on environmental innovation. 3h The government promotes environmental protection.	0.838
Customer demand	
4a Environment is a critical issue for our important customers. 4b Our important customers often bring up environmental issues. 4c Customer demands motivate us in our environmental efforts. 4d Our customers have clear demands regarding environmental issues.	0.940
Competitive pressure	
6a We establish the company's environmental image compared to competitors through green concepts. 6b We increase the company's market share through green concepts. 6c We improve the company's competitive advantage over competitors through green concepts.	0.933
Product eco-innovation	
8b The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products. 8e The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design. 8f The company uses the smallest possible amount of materials to comprise the product for conducting the product development or design. 8g The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.	0.872

Measurement items	Cronbach's alpha (for construct Growth is given correlation)
Process eco-innovation	
9a Low energy consumption such as water, electricity, gas and petrol during production/use/disposal. 9b Recycle, reuse and remanufacture material. 9g Use of cleaner technology to generate savings and prevent pollution (e.g., energy, water and waste). 9h The manufacturing process of the company effectively reduces the emission of hazardous substances or waste. 9i The manufacturing process of the company reduces the use of raw materials.	0.912
Organizational eco-innovation	
10a Our firm management often uses novel systems to manage eco-innovation. 10b Our firm management often collects information on eco-innovation trends. 10c Our firm management often actively engages in eco-innovation activities. 10d Our firm management often communicates eco-innovation information with employees. 10e Our firm management often invests a high ratio of R&D in eco-innovation. 10f Our firm management often communicates experiences among various departments involved in eco-innovation.	0.956
Competitive benefits	
17d Increased process/production efficiency. 17e Increase in productivity. 17f Increased knowledge about effective ways of managing operations. 17g Improved process innovations.	0.946
Economic benefits	
18a Sales. 18b Market share. 18c New market opportunities. 18f Employee satisfaction.	0.930
Company performance – growth	
Number of employees - growth through 2 business years Net sales - growth through 2 business years	0.249**
Company performance – profitability	
ROA ROE ROS	0.681

Measurement items	Cronbach's alpha (for construct Growth is given correlation)
Internationalization	
Number of foreign countries where company currently sells its products/services Share of sales on foreign markets in 2013 Total number of operation modes	0.875

Note: ** correlation between two items pertaining to the construct company growth is significant at the 0.01 level.

From Table 89, we can see that all factor loadings are greater than 0.50 and the p-values are significant at the 0.05 level, except for the item pertaining to company growth ("Net sales - growth through 2 business years"); therefore, the convergent validity is ensured (Fornell and Larcker 1981). In addition, the composite reliability of all constructs (except for the construct company growth) is greater than 0.70, indicating acceptable reliability (Hair et al. 2009). Additionally, the square root of average variance extracted (AVE) for each construct is greater than 0.50, except for the construct growth, for which has not been calculated (instead, the correlation between the two items pertaining to the construct is given).

Table 89: Measurement model of latent variables

Measurement items	Completely standardized loading	p	Composite reliability	AVE
Managerial environmental concern (MC)				
1a Eco-innovation is an important component of the company's environmental management strategy.	0.63		0.858	0.60
1b Most eco-innovations are worthwhile.	0.84	*		
1c Eco-innovation is necessary to achieve high levels of environmental performance.	0.81	*		
1d Eco-innovation is an effective environmental management strategy.	0.81	*		

Measurement items	Completely standardized loading	p	Composite reliability	AVE
Expected benefits (EB)				
2b To improve profitability.	0.77		0.923	0.67
2c To increase productivity.	0.79	*		
2d To increase market share.	0.89	*		
2e To enter new markets.	0.83	*		
2g To strengthen the brand.	0.76	*		
2h Competitive advantage.	0.85	*		
Command-and-control instrument (CCI)				
3a Our products should meet the requirements of national environmental regulations.	0.88		0.943	0.80
3b Our products should meet the requirements of international and/or EU environmental regulations.	0.91	*		
3c Our production processes should meet the requirements of national environmental regulations.	0.90	*		
3d Our production processes should meet the requirements of international and/or EU environmental regulations.	0.90	*		
Economic incentive instrument (EII)				
3e The government provides preferential subsidies for environmental innovation.	0.85		0.847	0.66
3f The government provides preferential tax policies on environmental innovation.	0.95	*		
3h The government promotes environmental protection.	0.59	*		

Measurement items	Completely standardized loading	p	Composite reliability	AVE
Customer demand (CD)				
4a Environment is a critical issue for our important customers.	0.91		0.949	0.82
4b Our important customers often bring up environmental issues.	0.93	*		
4c Customer demands motivate us in our environmental efforts.	0.88	*		
4d Our customers have clear demands regarding environmental issues.	0.91	*		
Competitive pressure (CP)				
6a We establish the company's environmental image compared to competitors through green concepts.	0.90		0.933	0.83
6b We increase the company's market share through green concepts.	0.89	*		
6c We improve a company's competitive advantage over competitors through green concepts.	0.95	*		
Product eco-innovation (PD)				
8b The company is improving and designing environmentally friendly packaging (e.g., using less paper and plastic materials) for existing and new products.	0.63		0.880	0.65
8e The company chooses materials of the product that consume the least amount of energy and resources for conducting the product development or design.	0.89	*		
8f The company uses the smallest possible amount of materials to comprise the product for conducting the product development or design.	0.88	*		
8g The company deliberately evaluates whether the product is easy to recycle, reuse and decompose for conducting the product development or design.	0.80	*		

Measurement items	Completely standardized loading	p	Composite reliability	AVE
Process eco-innovation (PC)				
9a Low energy consumption such as water, electricity, gas and petrol during production/use/disposal.	0.79		0.922	0.70
9b Recycle, reuse and remanufacture material.	0.73	*		
9g Use of cleaner technology to generate savings and prevent pollution (e.g., energy, water and waste).	0.84	*		
9h The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.	0.92	*		
9i The manufacturing process of the company reduces the use of raw materials.	0.90	*		
Organizational eco-innovation (OR)				
10a Our firm management often uses novel systems to manage eco-innovation.	0.81		0.958	0.79
10b Our firm management often collects information on eco-innovation trends.	0.91	*		
10c Our firm management often actively engages in eco-innovation activities.	0.93	*		
10d Our firm management often communicates eco-innovation information with employees.	0.92	*		
10e Our firm management often invests a high ratio of R&D in eco-innovation.	0.86	*		
10f Our firm management often communicates experiences among various departments involved in eco-innovation.	0.91	*		

Measurement items	Completely standardized loading	p	Composite reliability	AVE
Competitive benefits (CB)				
17d Increased process/production efficiency.	0.87		0.949	0.82
17e Increased productivity.	0.92	*		
17f Increased knowledge about effective ways of managing operations.	0.92	*		
17g Improved process innovations.	0.92	*		
Economic benefits (ECB)				
18a Sales.	0.88		0.935	0.78
18b Market share.	0.95	*		
18c New market opportunities.	0.91	*		
18f Employee satisfaction.	0.79	*		
Company performance – growth (GR)				
Number of employees - growth through 2 business years	0.48		n.a.	n.a.
Net sales - growth through 2 business years	0.51	*		
Company performance – profitability (PF)				
ROA	0.97		0.805	0.59
ROE	0.72	*		
ROS	0.56	*		
Internationalization (INT)				
Number of foreign countries where company currently sells its products/services	0.99		0.894	0.74
Share of sales on foreign markets in 2013	0.87	*		
Total number of operation modes	0.70	*		

Note: * p-values are significant at 0.05 level; n.a. = not applicable, because the construct company growth is composed of only two items.

Moreover, Table 90 depicts correlations between latent variables, where we can observe that all correlations are statistically significant.

Table 90: Results of Correlations between latent variables

	MC	EB	CCI	EII	CD	CP	PD	PC	OR	CB	ECB	GR	PF	INT
MC	1													
EB	0.56*	1												
CCI	0.26*	0.22*	1											
EII	0.24*	0.30*	0.21*	1										
CD	0.38*	0.40*	0.54*	0.19*	1									
CP	0.46*	0.47*	0.38*	0.30*	0.49*	1								
PD	0.37*	0.40*	0.41*	0.31*	0.51*	0.59*	1							
PC	0.44*	0.22*	0.47*	0.22*	0.51*	0.55*	0.79*	1						
OR	0.45*	0.42*	0.39*	0.31*	0.47*	0.73*	0.66*	0.69*	1					
CB	0.28*	0.29*	0.36*	0.18*	0.45*	0.49*	0.41*	0.49*	0.56*	1				
ECB	0.39*	0.47*	0.30*	0.23*	0.49*	0.57*	0.47*	0.48*	0.65*	0.68*	1			
GR	0.08*	0.06*	-0.36*	-0.06*	-0.11*	-0.08*	-0.21*	-0.17*	-0.08*	-0.07*	0.13*	1		
PF	0.06*	0.07*	-0.12*	0.05*	-0.02*	-0.02*	0.01*	0.05*	0.06*	-0.04*	0.26*	0.38*	1	
INT	0.08*	0.13*	0.29*	-0.04*	0.37*	0.04*	0.25*	0.16*	0.18*	0.20*	0.26*	-0.08*	-0.17*	1

Note: MC = managerial environmental concern; EB = expected benefits; CCI = the command-and-control instrument; EII = the economic incentive instrument; CD = customer demand; CP = competitive pressure; PD = product eco-innovation; PC = process eco-innovation; OR = organizational eco-innovation; CB = competitive benefits; ECB = economic benefits; GR = growth (company performance); PF = profitability (company performance); INT = internationalization.

The expanded construct-level model of eco-innovation (path analysis)

In order to analyze the hypothesized relationships between determinants and outomes of eco-innovation construct, a new, expanded construct-level model of eco-innovation was designed. In this model, eco-innovation was presented as a second-order latent factor, defined by the underlying dimensions, which are product, process and organizational eco-innovation.

All construct dimensions were assessed using exploratory and confirmatory factor analyses in previous sections. We also present a construct validity for the expanded eco-innovation model with its determinants and consequences (see Section 8.4.1). Reliability statistics for all construct dimensions were good (over 0.70), as were the goodness-of-fit measures, which indicated an acceptable model fit for all constructs (except for company growth). In this section, we use structural equation modeling to test all relationships between latent variables and observed variables as well as the relationships among multiple latent variables simultaneously.

The resulting eco-innovation model with estimated relationships (standardized solution) is depicted in Figure 29. The model shows a moderate fit to the data (NFI = 0.755; NNFI = 0.857; CFI = 0.865; SRMR = 0.202; RMSEA = 0.070); specifically, NFI and SRMR show poor fit, while NNFI and CFI show acceptable fit and RMSEA shows good fit.

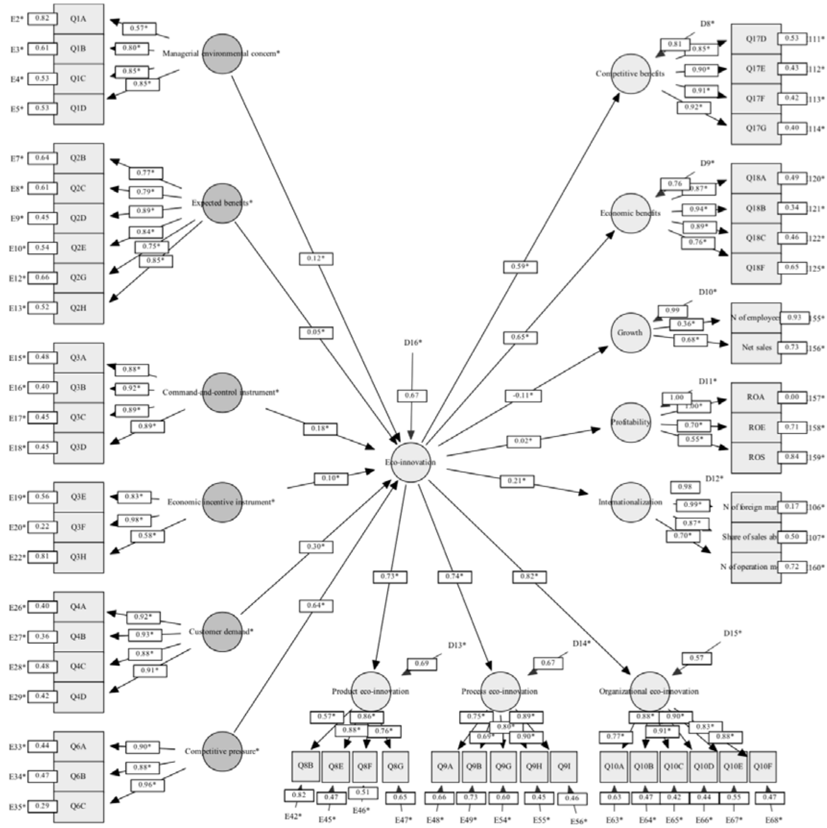

Figure 29: The expanded construct-level model of eco-innovation (standardized solution)
Note: Chi-square = 2671.593 (1401 df); p = 0.00; Goodness-of-fit indexes: NFI = 0.755; NNFI = 0.857; CFI = 0.865; SRMR = 0.202; RMSEA = 0.070; Reliability coefficients: Cronbach's alpha = 0.958; RHO = 0.967.

In the expanded construct-level model of eco-innovation, we tested hypotheses related to determinants and consequences of eco-innovation (testing eco-innovation as a second-order latent construct, including the following three dimensions: product, process and organizational eco-innovation). The results related to the hypotheses testing are depicted in Figure 29. As before, we will focus first on the hypotheses pertaining to determinants of eco-innovation and then on hypotheses pertaining to the consequences of eco-innovation.

Hypotheses 1a and 1b examined the relationships between environmental policy instruments (the command-and-control instrument, the economic incentive instrument) and eco-innovation, which were predicted to be positive and significant. The standardized coefficients for both relationships were positive, quite substantial and significant (standardized coefficient was 0.18 for the command-and-control instrument and 0.10 for the economic incentive instrument). The findings revealed that Hypotheses 1a and 1b can be both supported.

Hypothesis 2, postulated a positive and significant relationship between customer demand and eco-innovation. The standardized coefficient was positive, high and significant (standardized coefficient 0.30), and the results indicate strong support for Hypothesis 2.

The relationship between managerial environmental concern and eco-innovation was found to be positive and significant (the standardized coefficient was 0.12). Thus, Hypothesis 3 is be supported.

Hypothesis 4 predicted a positive relationship between expected benefits and eco-innovation. The association between expected benefits and eco-innovation was found to be positive and significant (standardized coefficient was 0.05), indicating support for Hypothesis 4.

Hypothesis 5a (the relationship between competitive intensity and eco-innovation) was not tested, since the factor competitive intensity explains only 36.733% of variance and was therefore excluded from further analyses. Meanwhile, strong support was found for Hypothesis 5b, which examined the relationship between competitive pressure and eco-innovation, which was expected to be positive and significant. The standardized coefficient for this relationship is highly positive and significant (0.64), indicating strong support for Hypothesis 5b.

When testing the relationships between eco-innovation and indicators of company performance (company growth and profitability), significant influences were detected. Hypothesis 6a postulates a positive and significant relationship between eco-innovation and company growth. The standardized coefficient was negative and significant (-0.11), indicating that Hypothesis 6a cannot be supported. Hypothesis 6b posits a positive and significant association between eco-innovation and company profitability. Eco-innovation was found to be weakly, positively and significantly related to company profitability (standardized coefficient 0.02), indicating support for Hypothesis 6b.

In our model, we also used soft measures to measure economic performance of eco-innovation. Hypothesis 7 predicted a positive and significant relationship between eco-innovation and economic benefits. The results indicate that eco-innovation was highly, positively and significantly related to economic benefits (standardized coefficient 0.65). Therefore, Hypothesis 7 is supported.

Moreover, the relationship between eco-innovation and competitive benefits was found to be highly positive and significant (standardized coefficient 0.59), offering support for Hypothesis 8, which is also confirmed.

Finally, Hypothesis 9 examined the relationship between eco-innovation and internationalization and posited that eco-innovation has a positive impact on internationalization. The standardized coefficient for this relationship is quite substantial, positive and significant (0.21), thus offering support for Hypothesis 9. In conclusion, it appears that companies that introduce more eco-innovations are also more internationalized (in terms of scale and scope).

Summary of findings and discussion

In this section, we briefly summarize the main findings of this study. First, we summarize the findings that pertain to the eco-innovation construct, which is composed of three dimensions (measured as a second-order latent factor) and which was developed and further tested in our study. We also present the findings of different eco-innovation models (product, process and organizational eco-innovation), for which we separately explored/tested drivers and outcomes. Therefore, the hypotheses developed and tested in this study can be divided into four groups. We have tested all hypotheses concerning eco-innovation determinants and outcomes separately for product, process and organizational eco-innovation. Lastly, the hypotheses were also tested for the construct-level model of eco-innovation. All the hypotheses were tested using structural equation modeling (SEM).

The eco-innovation construct in our study was proposed to include three dimensions: product eco-innovation, process eco-innovation and organizational eco-innovation. As a result of the empirical analyses that were conducted in our study, we found that a three-dimensional structure was best to describe the phenomenon under investigation. The eco-innovation construct developed in this study (including the dimensions of product, process and organizational eco-innovation), demonstrated good convergent validity (NFI = 0.928; NNFI = 0.945; CFI = 0.954; SRMR = 0.044; RMSEA = 0.086; Cronbach's alpha = 0.952) and moderate discriminant validity (correlations between product and organizational eco-innovation and between process and organizational eco-innovation were below 0.70, while the correlation between product and process eco-innovation was estimated at 0.79). When the eco-innovation construct was linked in the model with its determinants (drivers) and outcomes (consequences), the nomological validity of the eco-innovation construct was also shown.

Second, we present findings pertaining to the product eco-innovation model. On the one hand, the findings of our study revealed that all the predicted determinants of eco-innovation (the command-and-control instrument, the economic incentive instrument, managerial environmental concern, customer demand, expected benefits and competitive pressure) exerted positive and significant effects ($p < 0.05$) on product eco-innovation. Among the tested determinants of eco-innovation, we found that competitive pressure works as the most effective driver of eco-innovation – its effect on product eco-innovation was the greatest among the tested determinants of eco-innovation, followed by customer demand, which also exerted a large, positive and significant effect on product eco-innovation. A moderate (but still positive and significant) influence on product eco-innovation was also shown by other eco-innovation determinants, which are, in descending order with regard to the size of standardized coefficients, as follows: the command-and-control instrument, the economic incentive instrument and expected benefits (the last two had the same value of standardized coefficients, meaning that they both exert equal influence). The least effective determinant of product eco-innovation was found to be managerial environmental concern, which exerted the weakest influence on product eco-innovation; nevertheless, its influence was still positive and significant ($p < 0.05$). On the other hand, regarding eco-innovation outcomes, we found empirical evidence to support the hypotheses that predicted a positive and significant relationship between product eco-innovation and economic benefits, competitive benefits and internationalization (in descending order of the size of the standardized coefficients; $p < 0.05$). We have not found empirical evidence to support the hypotheses related to the objective measures of company performance – company growth and company profitability. The hypotheses can be partially supported in the sense that the relationship between product eco-innovation and both company growth and company profitability was direct and significant ($p < 0.05$); however, it was found to be negative, which is the opposite of what we expected. In the case of product eco-innovation's effect on company profitability, the standardized coefficient is approximately zero and statistically significant, but it is also negative and thus not consistent with the hypothesis. In sum, companies reported the gain of competitive benefits and positive economic benefits to be related to product eco-innovation implementation, but the objective measures (company growth and company profitability) do not reflect this. This was expected to occur, because eco-innovation's return on investment or payoff may take several years, and in our study we have not controlled the time since investment in product eco-innovation. Therefore, even when companies may already observe and reap some benefits from eco-innovation implementation, their positive effect on the "hard" measures pertaining to the company's profitability indicator ratios cannot yet be seen. Moreover, those indicators related to company profitability and growth are derived from the period of the recent economic crisis; thus, we can infer that product eco-innovations contributed to companies' survival and their existence during the crisis.

Third, concerning the process eco-innovation model, we found that the following determinants (in descending order of importance by the sizes of standardized coefficients) exerted positive and significant effects ($p < 0.05$) on process eco-innovation: competitive pressure, customer demand, managerial environmental concern, the command-and-control instrument and the economic incentive instrument. The only hypothesis pertaining to the determinants of eco-innovation for which we have not found empirical support was related to the expected benefits. We predicted a positive and significant relationship between expected benefits and process eco-innovation, while the association found between them was negative and significant ($p < 0.05$). It seems that when companies start to implement process eco-innovations, they do not consider them to be beneficial for the company; that is, they do not expect any benefits from their implementation in advance, or at least any such benefits are not the triggering factors that would steer them toward eco-innovation implementation. With regard to the eco-innovation outcomes, we found support for all eco-innovation outcomes except company growth, for which the association was significant and negative ($p < 0.05$), instead of the expected positive and significant association. Our findings indicate that process eco-innovation exerts a great positive and significant influence on competitive benefits, followed by economic benefits ($p < 0.05$).Meanwhile, the association between process eco-innovation and internationalization was moderately high, significant ($p < 0.05$) and positive. Lastly, we also found a weak but significant ($p < 0.05$) and positive association between process eco-innovation and company profitability.

When examining the determinants and consequences of organizational eco-innovation, the findings of our study indicate that all the tested determinants exerted positive and significant effects ($p < 0.05$) on organizational eco-innovation, further, organizational eco-innovation also exerted significant influences ($p < 0.05$) on all examined consequences of eco-innovation. More specifically, the results reveal that organizational eco-innovation is driven to the greatest extent by competitive pressure. Other determinants exerted moderate, positive and significant effects on organizational eco-innovation as follows (in descending order by the size of standardized coefficients): customer demand, the command-and-control instrument, the economic incentive instrument, managerial environmental concern and expected benefits. Among the consequences of eco-innovation, the results indicate that organizational eco-innovation is associated to the greatest extent with economic benefits, followed by competitive benefits. Organizational eco-innovation also has a positive, moderately high and significant influence on internationalization and a weaker but still positive and significant association with company profitability. In the organizational eco-innovation model, only one hypothesis has not been supported – the one that pertains to the relationship between organizational eco-innovation and company growth. The relationship between organizational eco-innovation and company growth was expected to be positive and significant, but it turned out to be significant and negative ($p < 0.05$).

When we tested the construct-level model of eco-innovation, eco-innovation was measured as a second-order latent factor, including three dimensions (product, process and organizational eco-innovation). We found that all the tested determinants exerted positive and significant influences ($p < 0.05$) on the eco-innovation construct. Concerning the size of standardized coefficients, we can summarize that the empirical evidence gave the strongest support to the determinant competitive pressure, followed by customer demand. A moderate, positive and significant effect was also demonstrated by the following three determinants: the command-and-control instrument, managerial environmental concern and the economic incentive instrument. A weaker effect on the eco-innovation construct was exerted by the determinant expected benefits; however, it was still positive and significant. Concerning the eco-innovation outcomes, all the hypotheses, except the hypothesis pertaining to the company growth, were supported. The eco-innovation construct had the greatest influence on economic benefits, followed by competitive benefits. We also found a high, positive and significant association between the eco-innovation construct and internationalization, while the relationship between the eco-innovation construct and company profitability was significant and positive but weak. The only hypothesis that is partially rejected is the hypothesis about company growth. The relationship between the eco-innovation construct and company growth is significant and direct (as predicted in hypothesis 6a), but it is negative rather than positive and thus does not support the hypothesis.

Table 91: Summary of hypotheses-related findings (structural equation modeling)

Hypotheses with description		Results – main findings			
		Product EI	Process EI	Organizational EI	EI construct
H1a	There is a positive and significant relationship between the ***command-and-control instrument*** and companies' implementation of eco-innovation.	*Supported.*	*Supported.*	*Supported.*	*Supported.*
H1b	There is a positive and significant relationship between the ***economic incentive instrument*** and companies' implementation of eco-innovation.	*Supported.*	*Supported.*	*Supported.*	*Supported.*
H2	There is a positive and significant relationship between ***customer demand*** and companies' implementation of eco-innovation.	*Supported.*	*Supported.*	*Supported.*	*Supported.*
H3	There is a positive and significant relationship between ***managerial environmental concern*** and companies' implementation of eco-innovation.	*Supported.*	*Supported.*	*Supported.*	*Supported.*

Hypotheses with description		Results – main findings			
		Product EI	Process EI	Organizational EI	EI construct
H4	There is a positive and significant relationship between ***expected benefits*** and companies' implementation of eco-innovation.	*Supported.*	Not supported.	*Supported.*	*Supported.*
H5a	There is a positive and significant relationship between ***competitive intensity*** and companies' implementation of eco-innovation.	Not tested.	Not tested.	Not tested.	Not tested.
H5b	There is a positive and significant relationship between ***competitive pressure*** and companies' implementation of eco-innovation.	*Supported.*	*Supported.*	*Supported.*	*Supported.*
H6a	The relationship between eco-innovation's performance and ***company growth*** is direct and positive.	Partially supported (direct but negative).	Partially supported (direct but negative).	Partially supported (direct but negative).	Partially supported (direct but negative).
H6b	The relationship between eco-innovation's performance and ***company profitability*** is direct and positive.	Partially supported (direct but close to zero).	*Supported.*	*Supported.*	*Supported.*
H7	The relationship between eco-innovation's performance and ***economic benefits*** is direct and positive.	*Supported.*	*Supported.*	*Supported.*	*Supported.*
H8	The relationship between eco-innovation's performance and ***competitive benefits*** is direct and positive.	*Supported.*	*Supported.*	*Supported.*	*Supported.*

Hypotheses with description		Results – main findings			
		Product EI	Process EI	Organizational EI	EI construct
H9	The relationship between eco-innovation's performance and *internationalization* is direct and positive.	Supported.	Supported.	Supported.	Supported.

Summarizing (see Table 91), we can conclude that several factors – the command-and-control instrument, the economic incentive instrument, customer demand, managerial environmental concern and competitive pressure – all drive implementation of the following eco-innovation types: product, process, organizational eco-innovation, and eco-innovation construct. The results revealed that expected benefits work as a driver of product eco-innovation, organizational eco-innovation and the eco-innovation construct, while expected benefits do not work as a driver of process eco-innovation. Finally, pertaining to the outcomes of eco-innovation, the results indicate that implementation of product, process and organizational eco-innovation and the eco-innovation construct leads to a higher level of internationalization (in terms of scope – number of operation modes and number of foreign markets – and scale) and also leads to greater competitive and economic benefits. Moreover, implementation of process eco-innovation, organizational eco-innovation and the eco-innovation construct is positively associated with company profitability (in terms of ROA, ROE and ROS), while this is not the case for product eco-innovation. We assume that this last finding pertaining to the effect of product eco-innovation on company profitability (where the standardized coefficient was close to zero, negative and statistically significant) relates to the longer process of product development, and thus the results pertaining to company profitability are also lagged in time. However, implementation of eco-innovation does not lead to company growth but rather shows a significant negative influence on it (in terms of employees and sales). This finding should be interpreted with care, however, because growth in number of employees and growth in sales can also be affected by other factors.

Below, we summarize all the findings related to each hypothesis. We have tested four eco-innovation models (of which the main findings were briefly summarized above): we tested determinants and consequences of product, process and organizational eco-innovation and, lastly, the eco-innovation construct.

Hypothesis 1a, which postulates a significant and positive effect of the command-and-control instrument on eco-innovations, has been supported for product, process and organizational eco-innovation and also for the eco-innovation construct, which measured eco-innovation as a second-order latent factor composed of product, process and organizational eco-innovation. Our findings are in line with prior research works (Noci and Verganti 1999; Triebswetter and Wackerbauer 2008; Kammerer 2009; Lin et al. 2013b; Triguero et al. 2013), which found regulations to be a driver of product eco-innovation. Furthermore, numerous studies also found support for the claim that regulations motivate companies to adopt process eco-innovation (Cleff and Rennings 1999; Wagner 2009; Agan et al. 2013; Lin et al. 2013b) and spur organizational eco-innovation adoption (Triguero et al. 2013). Moreover, our results are in line with many research works that have found regulations to incite eco-innovation adoption/implementation (Cleff and Rennings 1999; Hall 2000; Blum-Kusterer and Salman Hussain 2001; Mazzanti and Zoboli 2006; Horbach 2008; Chappin et al. 2009; Lewis and Cassells 2010; Qi et al. 2010; Belin et al. 2011; Popp et al. 2011; Weng and Lin 2011; Yalabik and Fairchild 2011; Blind 2012; Doran and Ryan 2012; Dong et al. 2013; Bocken et al. 2014; Cai and Zhou 2014; Chassagnon and Haned 2014; Doran and Ryan 2014; Ford et al. 2014; Li 2014). An interesting finding from our results is that the standardized coefficient was greatest for the causal relationship between the command-and-control instrument and process eco-innovation, while it was lowest for the association between the command-and-control instrument and organizational eco-innovation. Based on our results, we can conclude that the command-and-control instrument drives process eco-innovation to the greatest extent (standardized coefficient 0.22), followed by the eco-innovation construct (standardized coefficient 0.18), product eco-innovation (standardized coefficient 0.15) and, lastly, organizational eco-innovation (standardized coefficient 0.11). It seems that the command-and-control instrument incites the most process eco-innovation, while it exerts a smaller effect on the other eco-innovation types (remaining high, positive and significant). In sum, the command-and-control instrument is an effective driver of all eco-innovation types, but only its relative strength varies depending on the eco-innovation type.

Hypothesis 1b, which relates to the relationship between the economic incentive instrument and different types of eco-innovations, also turned out to be supported for all three eco-innovation types (product, process and organizational eco-innovation) and the eco-innovation construct. The economic incentive instrument exerted a positive, significant and moderate influence on product eco-innovation (standardized coefficient 0.12), on the eco-innovation construct (standardized coefficient 0.10), and on organizational eco-innovation (standardized coefficient 0.09), while it exerted the weakest influence (but still positive and significant) on process eco-innovation (standardized coefficient 0.06). We can conclude that our findings are consistent with those of prior research works, which found support for the role of the economic incentive instrument on eco-innovation implementation (Chappin et al. 2009; Oltra and Saint Jean 2009). Many researchers also found a positive and significant effect of government subsidies and grants (which are part of the economic incentive instrument) on different eco-innovation types (Yalabik and Fairchild 2011; Zeng et al. 2011; De Marchi 2012; Doran and Ryan 2012).

Related to the environmental policy instruments, which we have tested as two individual components – the command-and-control instrument and the economic incentive instrument – we can conclude that the results of our study do not offer empirical support for the superiority of the economic incentive instrument over the command-and-control instrument (Rennings et al. 2006). Rather, both instruments have shown a positive and significant association with all eco-innovation types (product, process and organizational eco-innovation as well as the eco-innovation construct). The empirical evidence indicates the slight superiority of the command-and-control instrument over the economic incentive instrument in all four tested models of eco-innovation.

Concerning Hypothesis 2, which posits a positive and significant relationship between customer demand and eco-innovations, we found strong support for the construct-level eco-innovation model (standardized coefficient 0.30), which is consistent with numerous research works (Ziegler and Rennings 2004; Le et al. 2006; Kivimaa 2007; Horbach 2008; Lewis and Cassells 2010; Popp et al. 2011; Weng and Lin 2011; Zeng et al. 2011; Doran and Ryan 2012; Oxborrow and Brindley 2013; Bocken et al. 2014; Cai and Zhou 2014; Chassagnon and Haned 2014; Doran and Ryan 2014; Li 2014; Triguero et al. 2014). Furthermore, our results offer strong empirical evidence for the relationship between customer demand and product eco-innovation (standardized coefficient 0.29), in line with prior research (Ziegler and Rennings 2004; Rehfeld et al. 2007; Triebswetter and Wackerbauer 2008; Horbach et al. 2012; Lin et al. 2013a; Lin et al. 2013b; Triguero et al. 2013). Based on the results of our study, we can conclude that customer demand also drives process eco-innovation (standardized coefficient 0.28), in line with other research works (Ziegler and Rennings 2004; Agan et al. 2013). Moreover, we found support for the association between customer demand and organizational eco-innovation (standardized coefficient 0.12). The influence of customer demand on different types of eco-innovation was found to be positive and significant for all four models of eco-innovation; therefore, customer demand has been demonstrated to drive the implementation of different eco-innovation types in the analyzed companies. We can also observe that the causal relationships between customer demand and several eco-innovations – the eco-innovation construct, product eco-innovation, and process eco-innovation – have received stronger support than the causal relationship between customer demand and organizational eco-innovation. This can be also expected because, generally, customers impose pressure on companies to operate in a more environmentally friendly way, and thus emphasize the role of process eco-innovation adoption and in such way steer companies toward environmentally friendly way of manufacturing or demand from companies' ecological products as an outcome. Therefore, it is more likely that customers incite companies to meet their needs by introducing product eco-innovations, which may lead to certain benefits for the customer (e.g., energy savings) or will satisfy customers' desire for ecological responsibility, awareness and environmental consciousness.

Next, consistent with previous research, we found that managerial environmental concern (Hypothesis 3) exerts a positive and significant influence on process eco-innovation (standardized coefficient 0.23), on the eco-innovation construct (standardized coefficient 0.12), on organizational eco-innovation (standardized coefficient 0.08) and on product eco-innovation (standardized coefficient 0.01). This is in line with past research, which found support for the effect of managerial environmental concern on process eco-innovation (Agan et al. 2013), on eco-innovation in general (Qi et al. 2010; Bocken et al. 2014) and on product eco-innovation (Chang 2014). The influence of the determinant managerial environmental concern was positive and significant for all four models, while its effect was greatest on process eco-innovation and weakest on product eco-innovation, which is in line with past research. Thus, managerial environmental concern seems to affect mostly implementation of process eco-innovations in the analyzed companies.

Hypothesis 4, with regard to expected benefits as a driver of eco-innovation, received mixed support when analyzing its effect on different eco-innovation types. We predicted a positive and significant influence on all eco-innovation models. In our study, we found the greatest empirical support for the causal relationship between expected benefits and product eco-innovation (standardized coefficient 0.12), followed by organizational eco-innovation (standardized coefficient 0.06); finally, we found a weaker, but still positive and significant, relationship between expected benefits and the eco-innovation construct (standardized coefficient 0.05). The relationships of the previously mentioned effects were all positive and significant. However, we have not found support for a positive effect of expected benefits on process eco-innovation; instead the association between them was negative, moderately high and significant (-0.18). It seems that companies do not engage in process eco-innovation because they expect benefits or positive outcomes from it. It is likely that, in the initial phase, companies expect only high investment costs and expenses related to process eco-innovation implementation, although in the long term they provide several benefits for companies, especially cost savings. It is generally known that eco-innovations pay off after several years' lag due to high initial investments (especially in the case of integrated cleaner technology). Moreover, process eco-innovation can be roughly divided into end-of-pipeline technology and cleaner technology; the first leads only to costs and does not deliver benefits to the company, because it works only on externality reduction, while the latter demands higher investments but can also be beneficial for the company (in terms of cost savings, e.g., energy, material and resource). However, the results of our study revealed that expected benefits do not drive implementation of process eco-innovations in the analyzed companies. On the other hand, our findings concerning product eco-innovation, organizational eco-innovation and the eco-innovation construct are in line with past findings that companies are motivated by expected benefits to adopt eco-innovation. Researchers found that companies expect primarily cost savings from eco-innovation implementation (Lewis and Cassells 2010; York and Venkataraman 2010; Belin et al. 2011; Pereira and Vence 2012; Oxborrow and Brindley 2013; Chassagnon and Haned 2014; Mondéjar-Jiménez et al. 2014), followed by other benefits like new market creation/increase of market share (Lewis and Cassells 2010; Triguero et al 2013; Mondéjar-Jiménez et al. 2014), improvement of firm reputation/image (Lewis and Cassells 2010; van den Bergh et al. 2011; van den Bergh 2013; Bocken et al. 2014), expected increase of product quality (Lewis and Cassells 2010; Mondéjar-Jiménez et al. 2014), improved firm efficiency/productivity (Lewiss and Cassells 2010), potential revenue (York and Venkataraman 2010; Bocken et al. 2014) and gain of competitive advantage/differentiation (Triebswetter and Wackerbauer 2008; Lewis and Cassells 2010; York and Venkataraman 2010; Cuerva et al. 2013).

We have not tested Hypothesis 5a related to competitive intensity, because the variance that this construct explained was too low. Instead, we examined the Hypothesis 5b, which predicts a significant and positive influence of competitive pressure on eco-innovation. This hypothesis received strong support in all four models (product eco-innovation, process eco-innovation, organizational eco-innovation and the eco-innovation construct). In more detail, competitive pressure exerted the greatest impact on the eco-innovation construct and organizational eco-innovation (both had standardized coefficients estimated at 0.64), followed by product eco-innovation (standardized coefficient 0.44) and process eco-innovation (standardized coefficient 0.40). Again, all relationships were high, positive and significant, which is consistent with past research works (Le et al. 2006; Kemp and Pearson 2007; Yalabik and Fairchild 2011; Zeng et al. 2011; Bocken et al. 2014; Cai and Zhou 2014; Li 2014).

Hypothesis 6a predicted a positive and significant relationship between company growth and eco-innovations. However, our study produced no empirical evidence to support this relationship. Rather, negative and significant relationships were found for all four models of eco-innovation. These results are not surprising, because past researchers received mixed results when testing the relationship between eco-innovations and company growth. Likewise, we predicted positive and significant relationships between eco-innovations and company profitability and again found mixed support. Empirical evidence of our study gives support to causal relationships between process eco-innovation, organizational eco-innovation and the eco-innovation construct and company profitability, which is consistent with past research works (Rao and Holt 2005; Clemens 2006; Montabon et al. 2007; Eiadat et al. 2008; Molina-Azorín et al. 2009; Huang and Wu 2010; Zeng et al. 2011; Ar 2012; Cheng and Shiu 2012; Cheng et al. 2013; De Burgos-Jiménez et al. 2013; Leonidou et al. 2013a). Meanwhile, a significant and negative relationship (standardized coefficient close to zero) was found between product eco-innovation and company profitability; therefore, more research on this topic is required before making premature or ambiguous conclusions related to this relationship. The support found for causal associations between organizational eco-innovation and company profitability (standardized coefficient 0.05); process eco-innovation and company profitability (standardized coefficient 0.04), and eco-innovation construct and company profitability (standardized coefficient 0.02) was positive and significant, although the standardized coefficients were low. We can also see that only for product eco-innovation showed no support; product eco-innovation exerts a negative influence on company profitability, but this this relationship is close to zero, is negative and significant (standardized coefficient -0.00). The likely explanation for this finding is that innovations that do not improve a company's resource efficiency do not provide positive returns on profitability, while innovations that increase a company's resource efficiency (in terms of material or energy consumption per unit of output) are more likely to have a positive effect on profitability (Rexhäuser and Rammer 2013). Likewise, Ghisetti and Rennings (2014) stressed that innovations that lead to reduction in the use of energy or materials per unit of output positively affect a company's competitiveness, while externality-reducing innovations hamper a company's competitiveness.

Because we expected that eco-innovations would not exert a positive effect on company performance, when focusing on objective measures (i.e., profitability indicator ratios) related to company growth and company profitability (secondary data obtained from the GVIN database), we also measured economic benefits pertaining to the respondents' assessment of company performance. We found strong support for Hypothesis 7, which predicted positive and significant relationships between eco-innovations and economic benefits. The eco-innovation construct exerts a significant positive effect on economic benefits (standardized coefficient 0.65), as do organizational eco-innovation (standardized coefficient 0.62), product eco-innovation (standardized coefficient 0.49) and, finally, process eco-innovation (standardized coefficient 0.48).

Moreover, all eco-innovation types (product eco-innovation, process eco-innovation, organizational eco-innovation and the eco-innovation construct) exerted a positive and significant influence on competitive benefits. We found the strongest association when testing the causal relationship between the eco-innovation construct and competitive benefits (standardized coefficient 0.59), followed by organizational eco-innovation (standardized coefficient 0.54), process eco-innovation (standardized coefficient 0.49), and product eco-innovation (standardized coefficient 0.43). All the relationships were strong, positive and significant, thus offering strong support to Hypothesis 8.

Lastly, we tested the relationships between eco-innovations and internationalization. Our study yields empirical evidence to support positive and significant causal relationships of these categories for all four models. We found the strongest support for the relationship between product eco-innovation and internationalization (standardized coefficient 0.24), followed by the relationship between the eco-innovation construct and internationalization (standardized coefficient 0.21). Moderately high standardized coefficients were found for the relationships between process eco-innovation and internationalization and between organizational eco-innovation and internationalization (in both relationships, the standardized coefficients were estimated at 0.17). This indicates that eco-innovations lead to higher degree of internationalization.

Conclusion

This chapter is divided into four sections: contributions (Section 10.1), implications (for theory and research, for policy makers and for entrepreneurs; Section 10.2), limitations (Section 10.3), and, finally, future research directions and opportunities (Section 10.4).

Contributions

This study makes theoretical and methodological contributions to the field of eco-innovation research. The first theoretical contribution pertains to the literature review, which offers a synthesis regarding eco-innovation definitions, the main dimensions of eco-innovation, eco-innovation features, eco-innovation drivers and eco-innovation outcomes. This is followed by a proposal of our own definition of eco-innovation, developed based on the results and findings of this study.

The second contribution of this study pertains to conceptual proposal and empirical verification of the eco-innovation construct, which is composed of three main dimensions – product, process and organizational eco-innovation – based on a sample of Slovenian companies (where such a study and validation of the eco-innovation construct has, to the best of our knowledge, not yet been conducted). The newly adapted and tested multidimensional measure of eco-innovation is comprehensive and parsimonious, reflecting good psychometric characteristics. It integrates three dimensions (product, process and organizational eco-innovation) and can be used as a reliable and validated measure of eco-innovation in future research works. Items for the measurement scales' development were adapted to the Slovenian environment based on prior research works. Some items were retained while others were eliminated due to the content validation performed by a qualitative study involving interviewing environmental managers from companies that implement eco-innovations. The quality of scales has been verified by exploratory and confirmatory analyses for each construct. The eco-innovation construct has been demonstrated to have good validity (convergent, discriminant and nomological).

The third key contribution of this study is the development and empirical testing of an integrative model of eco-innovation, which includes eco-innovation with its main dimensions (eco-innovation as a second-order latent factor, including product, process and organizational eco-innovation), its drivers and its consequences. The empirical testing of the model clarified the nature of the relationships between eco-innovation, its drivers (the command-and-control instrument, the economic incentive instrument, managerial environmental concern, expected benefits, customer demand and competitive pressure) and its consequences (economic and competitive benefits, internationalization, company growth and profitability) based on a sample of Slovenian companies. The main contribution of testing this model is that it reveals the key role of competitive pressure as a driver of the eco-innovation construct, while the other drivers' significantly positive influences are minor in comparison. This leads us to the conclusion that operating in highly competitive environments steers companies towards the adoption and development of environmentally friendly products (to satisfy customers' demands), implementation of environmentally friendly production processes and organizational eco-innovation, in order to gain a competitive advantage over their competitors. Related to the consequences of the eco-innovation construct, based on the findings of the undertaken study, we can conclude that eco-innovation exerts significantly positive influences on companies' economic and competitive benefits and contributes to higher degrees of internationalization and higher company profitability, whereas it is significantly negatively associated with company growth. This last finding should be interpreted with caution, however, because the values of standardized coefficients are very low; thus, this should be revised and measured/tested again after a few years' lag (the research could be repeated next year to explore whether differences in company growth and profitability occur).

One of the greatest contributions of this study is that it tests four different models, together with the previously mentioned construct-level model of eco-innovation. In our study, we examined drivers and outcomes of different eco-innovation types separately (product, process and organizational eco-innovation), which have led us to more detailed and profound insights regarding drivers and outcomes of different eco-innovation types. As aforementioned, the construct-level model of eco-innovation (measured and tested as a second-order latent factor comprising three dimensions: product, process and organizational eco-innovation) has also been tested. In more detail, we have explored the relative strengths of each driver on different eco-innovation types; likewise, the same has been done for the eco-innovation outcomes. This leads us to conclusions regarding which eco-innovation type leads to greater competitive and economic benefits, higher company profitability or increased internationalization, as well as which drivers are more relevant and effective in triggering certain eco-innovation types. The most important insight is that all the tested drivers significantly positively affect all three eco-innovation types (with the exception of expected benefits, which demonstrated a significantly negative association with process eco-innovation). The strongest influence on product eco-innovation is exerted by competitive pressure, followed by customer demand. Meanwhile, process and organizational eco-innovation are largely driven by competitive pressure. Regarding the eco-innovation outcomes, relationships between all three eco-innovation types (product, process and organizational eco-innovation) and three of the outcomes (internationalization, competitive and economic benefits) are significantly positive, whereas all three eco-innovation types are significantly negatively associated with company growth (however, while the values of standardized coefficients were significant, they were low; thus, this finding should be interpreted with care, and the analysis should be repeated after a one-year lag). Moreover, process and organizational eco-innovation exert a significantly positive influence on company profitability, while the association between product eco-innovation and company profitability is significant but negative (again this finding should be interpreted with caution, because the standardized coefficient was close to zero despite being statistically significant).

The fifth contribution pertains to the eco-innovation drivers, as we have tested many factors (both internal and external to the company) that may influence the implementation of eco-innovation in companies. Before the quantitative research, these factors were also verified through qualitative research, to explore whether the Slovenian companies identify them as driving forces of eco-innovation implementation. Their relevance was thus identified/verified by a prior qualitative study (i.e., interviews with environmental managers of five Slovenian companies that implement eco-innovations). Moreover, in this study, we identified the drivers of different eco-innovation types (product, process and organizational eco-innovation, and the eco-innovation construct). We found that all drivers spur eco-innovations (with the exception of excepted benefits as a driver of process eco-innovation, where a negative relationship was found), while competitive pressure can be considered the strongest driver of all three eco-innovation types. Another great contribution lies in testing driver environmental policy instruments as two individual components (the command-and-control instrument and the economic incentive instrument). This approach has also been adopted in prior research (Li 2014) and has proven to be rewarding in our study, where we were able to identify the individual influences of both instruments on different eco-innovation types.

Furthermore, the contribution pertaining to the outcomes of eco-innovation is that we tested outcomes of eco-innovation at the firm level, meaning that we were interested in the consequences pertaining to the company that deploys eco-innovations. Our main aim was to explore whether eco-innovations are worthwhile for the company that adopts them, or whether they deliver benefits only to the environment. We tested the following outcomes of eco-innovation: competitive benefits, economic benefits, company growth and profitability, and internationalization as consequences of three eco-innovation types (product, process and organizational eco-innovation) and eco-innovation construct. Another important contribution in testing the consequences of eco-innovation is that we not only identified the consequences for each eco-innovation type but also used both self-reported (economic and competitive benefits, internationalization) and objective measures (company growth and profitability were obtained from the GVIN database). A combination of both types of measures enabled us to derive several insights. The literature offers rather ambiguous and mixed results pertaining to the eco-innovation outcomes. Eco-innovation by definition is more environmentally benign than relevant alternatives. The definition by itself does not emphasize any benefits for the company that either adopts or develops eco-innovation. However, it is known that some types of eco-innovation may be beneficial for the companies (e.g., cleaner production resulting in cost savings and consequently leading to higher profitability), while others (eco-innovations that tend only to reduce the negative externalities, such as end-of-pipeline technologies) are instead harmful to the company performance (competitiveness and profitability). Moreover, payoff related to eco-innovation investments requires a few years' lag (depending on the amount of resources invested). Therefore, for the majority of companies, at least for the first few years after implementation, eco-innovations were seen as a burden for the company. As previously mentioned, we tested the outcomes of eco-innovation in two ways: by asking respondents to evaluate the economic and competitive benefits and by using secondary data (such as ROA, ROE, ROS, company growth in terms of number of employees and growth in sales over two business years). Our findings indicate that companies perceive eco-innovations as beneficial, in terms of economic and competitive benefits (self-reported measures); however, in terms of the objective indicators of company performance, we found a negative association between all eco-innovation types and company growth, as well as between product eco-innovation and company profitability. While these values were statistically significant, they were low (in the case of product eco-innovation's effect on company profitability, the standardized coefficient was close to zero and thus requires further research). The finding that relations between eco-innovations and company performance are low, may be explained by the fact that eco-innovations generally pay off after several years' lag; that is, the profitability indicator ratios are initially negative if the investments made were substantial and have not yet shown returns. Therefore, more research on this topic is needed in order for the association between eco-innovations and company performance (when using the profitability indicator ratios) to be fully understood. However, by including self-reported measures, the results indicate that eco-innovations deliver competitive and economic benefits to the company that implements them. Therefore, our findings reveal that the relationships between eco-innovations (all four models) and company growth are significant and negative, whereas the relationship between eco-innovations and company profitability was found to be positive and significant, with the exception of product eco-innovation (which had a significant and negative association with company profitability). However, eco-innovations lead to the gain of economic and competitive benefits. This approach (using both types of measures to test the effects of eco-innovations on company performance) proved to be rewarding, as the distinct effects of company performance would otherwise not be recognized or could lead to flawed conclusions. In this way, the results show that eco-innovations do deliver benefits to the company that implements them. We can thus conclude that eco-innovations are worthwhile (in terms of economic and competitive benefits) for companies that implement them, even if the objective measures do not yet show the positive results.

A major contribution of this study is that identifies which drivers work as driving forces of specific eco-innovation types and further explores how different eco-innovation types affect company performance in terms of competitive and economic benefits, company growth and profitability and internationalization. These results lead to several insights and implications, which especially concern entrepreneurs and policy makers. Through the acquired knowledge and insights regarding drivers of certain eco-innovation types as well as eco-innovations' outcomes, this study can contribute to the development and further implementation of eco-innovations in the Slovenian entrepreneurial environment.

The last contribution lies in the rigor test of the data analyses. All the models were tested with structural equation modeling, and prior to testing all the constructs were validated (through exploratory and confirmatory factor analysis) and demonstrated good psychometric characteristics.

Implications

The results of this study deliver several implications. In the following subsections, we provide implications for theory and research (Section 10.2.1), policy makers (Section 10.2.2) and practice (entrepreneurs; Section 10.2.3).

Implications for theory and research

As already mentioned, many research works have explored determinants and outcomes of eco-innovation, usually focusing only on either determinants or outcomes and either focusing only on one eco-innovation type or combining all eco-innovation types under one factor (as we have done with the eco-innovation construct). Compared to the partial models that have been previously explored, we have employed a more integrative approach. We have first conducted a qualitative study by interviewing environmental managers in five Slovenian companies that implement eco-innovation in order to identify the drivers of eco-innovation that motivated them to implement eco-innovation and the outcomes of their eco-innovation implementation. Through these interviews, we were able to verify which drivers are relevant and important for the Slovenian environment with regard to implementation of eco-innovation. We then adapted the chosen drivers to the Slovenian environment (because many research works are based on Chinese companies, whose eco-innovation drivers differ from those in Slovenia), and conducted the quantitative research. In our quantitative research, we encompassed several drivers and also focused on the outcomes (in terms of company growth and profitability, internationalization, competitive and economic benefits). The integrative approach that we have adopted highlights the relative importance and relevance of several eco-innovation determinants and outcomes pertaining to eco-innovation implementation.

Concerning the drivers of eco-innovation with a focus on environmental policy instruments, researchers generally measure them as one construct. Following Li (2014), we have divided environmental policy instruments into the command-and-control instrument and the economic incentive instrument. Thus, we examined the individual effects of each instrument on eco-innovation. This approach has turned out to be rewarding in our research, giving more profound insights into their individual effects on different eco-innovation types.

Moreover, when testing outcomes of eco-innovation, we employed both objective (secondary financial data of analyzed companies gathered from the GVIN database) and self-reported measures, instead of only one or the other as in most previous research. This approach has proven to be rewarding. Eco-innovation generally pays off after several years' lag due to the investments made, and thus the objective measures can reflect a more negative situation than occurs in reality, leading to the conclusion that eco-innovation is only a cost that the company must bear. The self-reported measures, on the other hand, reflect the outcomes that cannot yet be observed using the profitability indicator ratios (as the return on investments may take several years). Therefore, the financial indicators tend to show a negative image even after companies begin to see the benefits of implementing eco-innovation. In our case, we have seen that product, process and organizational eco-innovation all exerted a significantly negative influence on company growth, while only process and organizational eco-innovation demonstrated a low but significantly positive influence on company profitability. On the other hand, our self-reported measures showed that companies recognized economic and competitive benefits derived from product, process and organizational eco-innovation implementation.

Another contribution to theory and research is our exploration of drivers and outcomes of different eco-innovation types, leading to greater insights and a deeper understanding of drivers and outcomes of different eco-innovation types (product, process and organizational eco-innovation). The integrative approach has taken into consideration a larger number of relevant variables that can work as drivers of eco-innovation, as well as a larger number of variables to gauge company performance (outcomes related to eco-innovation implementation). In contrast to partial approaches, which tend to explore few variables, the integrative approach takes into consideration a greater number of relevant variables while omitting the less important elements (checked with prior qualitative research). However, by identifying the relative importance of model elements (drivers and outcomes) for different eco-innovation types (product, process and organizational eco-innovation), we are able to draw more precise and accurate implications for entrepreneurs and policy makers, making our research interesting and beneficial for a wide range of audiences.

Lastly, we have adapted and tested the eco-innovation construct, covering product, process and organizational eco-innovation, by verifying it on the sample of Slovenian companies. The eco-innovation construct developed in this study offers a relatively complete picture and thus can be used in future exploration of eco-innovation as a research framework. The eco-innovation construct was validated in this study and can be used as an eco-innovation measure both at the overall level and at the dimensional levels.

Finally, based on the results of our study, we proposed the following definition of eco-innovations: Eco-innovations encompass environmental and economic dimensions and include a variety of new or significantly improved products, processes, organizational methods and systems that are more environmentally friendly than the existing ones. They stem mainly from competitive pressure and customer demand. The most important outcome of eco-innovations (which can be intentional or a side effect) pertains to decreased adverse effects to the environment. From the environmental point of view, eco-innovations decrease the company's environmental burden, while from the economic point of view, eco-innovations pay off because they result in competitive and economic benefits, as well as a higher degree of internationalization.

Implications for policy makers

The implications for governmental policy makers are as follows. The results of our study indicate the greatest influence of competitive pressure and customer demand on product eco-innovation; moreover, competitive pressure seems to be the strongest driving force of process and organizational eco-innovation. By comparison, both the command-and-control instrument and the economic incentive instrument exert a smaller (though still significantly positive) effect on all eco-innovation types. The command-and-control instrument and the economic incentive instrument seem to be effective in motivating eco-innovation implementation, while the economic incentive instrument plays an even smaller role than the command-and-control instrument in spurring eco-innovation implementation in Slovenian companies. Policy makers could benefit from our results, as our findings revealed that the command-and-control instrument plays the most effective role in spurring process eco-innovation, followed by product eco-innovation, while it has the least effect on organizational eco-innovation. In addition, the economic incentive instrument is most effective in spurring implementation of product eco-innovation, followed by organizational eco-innovation, and, lastly, process eco-innovation. We believe that the economic incentive instrument in the Slovenian environment is not developed enough, and therefore should be more emphasized, especially for eco-innovations that deliver higher value for the environment and economy and are related to large investments, which require more time to pay off and consequently hamper company performance in the meantime. It is likely that developing greater flexibility in the command-and-control instrument and combining it with the economic incentive instrument would deliver better results and gain more success in spurring eco-innovation. As stressed by other researchers (Rennings et al. 2006), for a long time it was assumed that the economic incentive instrument is more effective than and thus superior to the command-and-control instrument for triggering eco-innovation, whereas the findings of our study demonstrate the opposite result for all eco-innovation types. As argued by Oltra and Saint Jean (2009), we stress, based on the obtained findings, that the economic incentive instrument cannot entirely substitute for the command-and-control instrument, and by itself is not sufficient for spurring eco-innovation. Therefore, the use of different instruments may vary depending on the context and eco-innovation type, while the combination of both seems to be most effective.

However, a significant insight of this study is that the most important driver of implementation of eco-innovation is not the environmental policy instruments but rather competitive pressure, which forces companies to become more environmentally friendly, be more eco-efficient in their use of resources (e.g., material, energy, water, etc.), and provide/offer to consumers more environmentally friendly solutions. According to the results of this study, competition is the strongest driving force of all eco-innovation types tested in this study (product, process, organizational eco-innovation and eco-innovation construct). Thus, the policy makers should develop or propose instruments that would both diffuse eco-innovation adoption in companies and help companies to develop eco-innovations that lead to a gain of competitive advantage and consequently benefit the economy as well.

In addition, product eco-innovation contributes to companies' economic and competitive benefits but is negatively related to company profitability and growth. More research should be done on this topic, considering that the positive outcomes of eco-innovations can be lagged in time and thus control the time of investment in product eco-innovation. However, companies that implement product eco-innovation to a greater extent seem to enjoy a higher degree of internationalization. Policy makers should tackle this issue and dedicate more attention to the economic incentive instrument in order to overcome the investment costs related to the product eco-innovation; a possible solution would be green public procurement or tax exemptions. Incentivizing product eco-innovation can also deliver benefits to the economy, in the sense that a higher degree of internationalization leads to higher profits and also reflects a country's sustainable awareness worldwide.

Moreover, companies with more process and/or organizational eco-innovations are also more internationalized, and this relationship is stronger in the case of product eco-innovation. Product eco-innovation exerts a low but negative influence on company growth and profitability, while process and organizational eco-innovation showed a positive relationship with company profitability and a negative relationship with company growth. The results of this study reveal that all eco-innovations lead to competitive and economic benefits. Therefore, it would be meaningful to incentivize companies in terms of subsidizing hiring additional employees, which would not only contribute to company growth in terms of number of employees but also deliver new insights, knowledge and competences to companies, as well as new human resources that can be exploited for the adoption or development of eco-innovation. Moreover, bearing in mind that process and organizational eco-innovations are positively associated with company profitability, such incentives (sunk costs, subsidies, grants) may be provided only for the initial investment, in the case of certain process eco-innovations that highly contribute to the environmental welfare and demand high investments that may pay off after several years through cost savings. Other incentives that could be helpful are tax exemptions, which, again, could be applied only for a few years, covering the investment period (e.g., a company that deploys a new eco-innovative process and amortizes its investment over 10 years would acquire tax exemptions instead of other grants for the period before the investment becomes lucrative).

Based on the findings of our study, we summarize the main suggestions for the policy makers. Companies have long seen eco-innovations as sunk costs and never-ending investments due to the environmental regulations and standards with which they needed to comply. Eco-innovations were therefore seen as a burden for companies, implemented only to comply with regulations. Today, however, we can observe a change in this mindset. Companies have begun to recognize that in eco-innovation lies the potential to acquire several benefits, such as the gain of competitive advantage and business opportunities. The findings of our study indicate that companies that implement product, process and/or organizational eco-innovation can exploit several benefits from it, such as higher company profitability (with the exception of product eco-innovation, for which we found a low but negative association), economic and competitive benefits and a higher degree of internationalization. This indicates that eco-innovations are worthwhile for companies and do pay off in terms of the previously mentioned outcomes. Regarding the drivers of eco-innovation, the results of our study clearly indicate the prevailing effect of competitive pressure over other determinants for all three eco-innovation types (product, process and organizational eco-innovaton). Competitive pressure seems to be the strongest driving force of all three eco-innovation types, while noteworthy influences are also demonstrated by customer demand on product eco-innovation and customer demand and managerial environmental concern on process eco-innovation. The rest of the examined determinants, such as the command-and-control instrument, the economic incentive instrument, and expected benefits were also found to be effective in triggering eco-innovations, albeit to a lesser degree. These findings suggest an important implication for policy makers. Keeping in mind that companies are mostly motivated to eco-innovation implementation by competitive pressure, customer demand and managerial environmental concern, the environmental policy instruments (both the command-and-control instrument and the economic incentive instrument) should be adapted. For a successful enforcement of policies, the command-and-control instrument and the economic incentive instrument should be combined and made more market-oriented. Pursuing market demand and companies' needs and including them in policy development would greatly contribute to the enhanced capacity and performance level of eco-innovations in companies.

Second, environmental policy instruments should offer more assistance and support to companies through the entire lifecycle of eco-innovations. Market-oriented instruments (e.g., tradable permits and green taxes), regulations, and environmental standards are meant to hinder the operation of non-compliant companies; however, too often they also hamper companies that do comply. Moreover, tax exemptions could be applied more often, either to the company that implements eco-innovations or to the purchase of eco-products or services. For investments in process eco-innovation, which are more eco-efficient and pertain to the area of renewable energy (e.g., wind power, photovoltaic system, etc.), feed-in-tariffs have proved worldwide to be a good practice in order to spur their implementation. One of the last suggestions regarding environmental policy instruments concerns green public procurement, which is not yet applied and practiced to a desirable extent in the Slovenian environment, but which has the potential to ease companies' commercialization and sales and to support their environmental efforts. Finally, the results of our study reveal that managers play an important role in inducing eco-innovation in companies. Therefore, subsidies for education/training related to environmental topics, to either raise the level of environmental awareness among companies' managers and present them with opportunities to seize from eco-innovation or to improve their knowledge and expertise, could deliver important outcomes. Another suggestion would be providing subsidies for employment of managers with backgrounds, expertise or knowledge related to environmental issues and solutions, making them more likely to pursue sustainability and steer companies towards eco-innovation implementation. Lastly, critically needed are a higher level of knowledge transfer among researchers and practitioners, a stronger connection between research and practice and better collaboration between public authorities (universities and research institutes) and companies, all of which could greatly contribute to companies' efforts to implement or develop eco-innovations. A huge amount of hidden potential, opportunities and knowledge lies in this gap, which should be better exploited.

Implications for entrepreneurs

Lastly, our results hold several implications for entrepreneurs. The results of this study have revealed that implementation of process and/or organizational eco-innovations leads to more successful company performance in terms of company profitability, gain of competitive and economic benefits and a higher degree of internationalization. This indicates that companies should invest more in process and organizational eco-innovations, which increase their profitability and lead to several benefits, or at least successfully pay off, according to our findings. Implementation of product, process and organizational eco-innovation also leads to several competitive and economic benefits for companies and therefore delivers value not only to the environment but also to the companies that implement them.

Another important aspect to tackle from the perspective of entrepreneurs is that, based on our study's findings, eco-innovations seem to increase the degree of internationalization. Companies that implement either product, process or organizational eco-innovation are also more internationalized (operating on more foreign markets, using many operation modes when entering foreign markets, and having a higher share of sales abroad). Implementation of eco-innovation therefore contributes to success on the foreign markets (in terms of scale and scope). In sum, implementation of eco-innovations can provide a new business opportunity, offering entrance to or better performance on foreign markets.

Limitations

Our study has some limitations, which will be described in this section. Due to the complexity of the phenomenon and our effort to adopt an integrative approach (i.e., to test the drivers and outcomes of different eco-innovation types as well as the construct-level model of eco-innovation), high observations per parameter were required to test such a complex model.

With regard to the data collection, our study is based on a sample of Slovenian companies; therefore, the study and its findings are somewhat limited to the Slovenian environment. However, since the conceptual basis was developed in research on other contexts and then adapted to the Slovenian environment, we infer that the findings may be generalizable to some degree to other European countries that are similar to Slovenia. Moreover, we collected data only from companies employing at least five employees in order to avoid dormant micro companies.

Further, this study has encompassed companies from different industries that have implemented eco-innovation, whether or not they have acquired environmental certificates. Nevertheless, having been conducted on a middling large sample, our study already shows the prevailing effects of certain eco-innovation determinants on different eco-innovation types, as well as the effects of different eco-innovation types on the outcomes at firm level. A great contribution of this study is that it has not measured eco-innovation in general but rather distinguished several eco-innovation types – product, process and organizational – and further explored drivers and outcomes of different eco-innovation types.

Some limitations in the study's design can be also identified. This study used cross-sectional data. A longitudinal study would enable us to draw conclusions and causative implications regarding the effects of different eco-innovation determinants on eco-innovation practices, as well as the impact of different eco-innovation types on the outcomes at firm level. With this approach, we obtained insight into drivers and outcomes of eco-innovation pertaining to the moment at which companies completed the questionnaire. This limitation has been partially mitigated with the use of objective and self-reported measures concerning company performance. Objective measures gathered from a secondary database present a current state, while the self-reported measures add reflective and subjective evaluation of eco-innovation performance and its ongoing effect on the company's performance.

Another limitation, which is partially related to the previous one, pertains to informant bias (i.e., the data were collected from only one person from each company). Since we used a single informant from each of the companies to complete the survey, concerns of common method variance (CMV) were addressed (Podsakoff et al. 2003) using Harman's single factor test, which is the most widely used method to assess the possibility of CMV. Results indicated a low threat of common method variance.

Our study used mainly self-reported measures, which reflect its subjective nature. It may be that different informants from the same company would respond differently to some degree, because they perceive the same situation and environment differently. However, we believe that this was not a major limitation in our study, because we were interested in factors that spur companies into implementation of eco-innovation and its outcomes. Another limitation could occur if the person who completed the questionnaire was not yet employed in the company when the company began its eco-innovation implementation, as that person might not have the necessary knowledge and insights into factors that incited the company to begin eco-innovation implementation, nor of its outcomes and their effects exerted on company performance. We have partially avoided this limitation by asking respondents to respond only if they are the most knowledgeable person in the company about its eco-innovations. Moreover, we measured the outcomes of eco-innovation using objective measures; for company growth and profitability we obtained data from the available database, and therefore subjective factors provided only additional, complementary insight. By collecting the objective and subjective measures of company performance (in terms of economic benefits), we achieved equilibrium, in the sense that some types of eco-innovation become profitable after several years' lag, while respondents may already recognize and be able to report their positive results.

Moreover, in this study we endeavored to explore the determinants of different eco-innovation types based on the Slovenian sample. However, we have encompassed the most relevant determinants of eco-innovation according to the prior qualitative research we conducted. This implies that some other determinants were omitted. Due to the complexity of the phenomenon under study, only the most important drivers and outcomes of eco-innovation were selected and included in the model. We have decided to dedicate more attention to the company-related outcomes of eco-innovation than to the environmental benefits, because we feel that it is of great importance to show companies the outcomes of eco-innovation related to company performance in order to answer the question of whether such innovations are worth implementing. This is quite a salient issue, especially because the literature offers mixed findings, and companies themselves usually consider eco-innovation to be expensive and beneficial only to the environment while it is harmful to company performance. Our aim was thus to explore which eco-innovations deliver potential benefits (company growth, profitability, higher degree of internationalization, and competitive and economic benefits) to the companies that implement them.

Among the determinants of eco-innovation, we investigated only drivers of eco-innovation, while barriers to eco-innovation remains a topic for further research. It would be useful to know what barriers hinder companies from adopting eco-innovation, in order to get insights regarding why companies do not implement eco-innovation. Research on this question should focus on companies that are not engaged in any eco-innovation activity. These results would lead to important insights and suggest how to steer less motivated companies to implement eco-innovation.

Another limitation of this study concerns the fact that we have not differentiated between companies that adopt and companies that develop certain types of eco-innovation. Adoption and development of eco-innovation can differ in their driving forces and in outcomes pertaining to company performance.

Furthermore, related to the research methodology, we can analyze drivers of eco-innovation with either a qualitative or a quantitative approach. Our study is a case of quantitative research (i.e., survey analysis), which means that the relative strength of the so-called "driver" is being studied, while its decisiveness remains a topic for further analysis (Hojnik and Ruzzier 2015).

Despite the aforementioned limitations, this study's methods and design were suitable for realizing the study's goal and also delivering the important contributions discussed in the previous sections.

Future research directions and opportunities

The main goals of this study were as follows. First, we wanted to develop an eco-innovation construct with three dimensions – product, process and organizational eco-innovation – and empirically test it based on a sample of 223 Slovenian companies. Second, we wanted to develop and empirically test a construct-level model of eco-innovation, by adopting an integrative approach and exploring eco-innovation's drivers and consequences. Further, drivers and outcomes were also explored for the different eco-innovation types (product, process and organizational), thus delivering insights that are more detailed and provide a deeper understanding. We believe that our study delivers important insights and contributions and, to the best of our knowledge, presents the first integrative study in this research field in the Slovenian environment. However, many research gaps still remain open, as discussed below.

The measures of the eco-innovation construct in our study encompass three dimensions and differentiate between product, process and organizational eco-innovation. Data analyses demonstrate good psychometric characteristics, also including sufficient discriminant validity, although the product and process eco-innovation dimensions do correlate with each other to a higher level than with organizational eco-innovation dimension. Thus, these dimensions could be further refined and improved. Furthermore, the eco-innovation construct measure should also be validated on samples of foreign companies in different countries. Moreover, the distinction or division of eco-innovation dimensions could be also more specific and go into more detail, in the sense that process eco-innovation could be divided into externality-reducing innovations and resource-reducing innovations (e.g., Ghisetti and Rennings 2014), or end-of-pipeline technologies and cleaner production technologies (as is more commonly done). This distinction could bring other important insights regarding the drivers and outcomes of different process eco-innovation types.

As abovementioned, in our study we have not differentiated between the adoption/implementation and innovation/development stages of eco-innovation (as strongly emphasized in various literature reviews undertaken by several researchers, e.g., del Río 2009; Hojnik and Ruzzier 2015). Great differences can emerge when exploring drivers of eco-innovation in these two different stages. These differences might also be present in the outcomes of eco-innovation (i.e., whether a company develops or adopts eco-innovation). Thus, future research could explore which drivers work better, which are most effective in the different stages of eco-innovation (development and adoption), for different types of eco-innovation (product, process and organizational), and also how the outcomes of different eco-innovation types differ in different eco-innovation stages. Future research should address the following questions: Is it better for companies to adopt or develop eco-innovation? Which is more beneficial – contributing to better company performance, providing competitive benefits or providing possible entry or expansion on foreign markets? Do first-mover advantages really occur, and are the companies that develop eco-innovations able to seize the benefits from them?

Another future research direction pertains to the exploration of drivers and outcomes of radical and incremental innovations. Researchers (Kemp and Pearson 2008; Kemp and Pontoglio 2011) have argued that within the innovation literature, a distinction is made between incremental innovations and radical innovations. Incremental innovations are only minor modifications of already existing processes or products, while radical innovations present a technological discontinuity based on a break with existing competencies and technologies (Kemp and Pontoglio 2011). Based on a detailed literature review encompassing mixed-method studies and meta-analyses, Kemp and Pontoglio (2011) stressed that regulation is generally believed to motivate merely the diffusion of environmental technology; further, the common wisdom sees market-based instruments as superior to regulations when aiming to solicit innovative responses. However, based on their literature review, Kemp and Pontoglio (2011) conclude that there is more evidence of regulations inducing radical innovation than of market-based instruments doing so. Therefore, in future research it would be beneficial to explore which drivers trigger incremental eco-innovation and which trigger radical eco-innovation (i.e., what are the relative strengths of different drivers and which ones work best for which type), as well as the outcomes of the different types at the firm level. It would also be interesting to explore and control for the expected period of return on investment and the size of the return on investment for each eco-innovation type.

Moreover, we have adopted a cross-sectional study design, while a longitudinal design would be more appropriate for exploring cause-and-effect relationships (i.e., drivers and outcomes of eco-innovations). In future research, it would thus be meaningful to perform a longitudinal study, since eco-innovation effects on company performance are known to have a few years' lag (especially concerning company growth and profitability). A longitudinal study would explain the process of eco-innovation, especially in terms of which drivers of eco-innovation are important in the development phase and which in the adoption and diffusion phase. Knowing the drivers for all stages of eco-innovation would indeed be an important insight. Moreover, we could also obtain deeper insights, such as when a certain type of eco-innovation becomes profitable (bearing in mind that investments in cleaner technology can pay off after several years, while investment in end-of-pipe technology mainly benefits the environment rather than the company) and when different types of eco-innovation provide a return on investment. A longitudinal study would help to answer the question of whether eco-innovations over time only cover or offset the investment costs or really turn out to be lucrative for companies and offer them a first-mover advantage on the market. Pertaining to the effect of eco-innovations on company performance, we have found some statistically significant results in our study, but we were not able to support the hypotheses about company growth and profitability for all eco-innovation types. Therefore, further work and research on this topic related to companies' profitability indicators ratios (i.e., growth in number of sales and employees, ROA, ROE and ROS) is recommended in order to clarify and understand the association between eco-innovations and company performance. In future research, more information (e.g., time of investment and resources invested in eco-innovation) would help us to establish a greater degree of accuracy on this matter. In the future, we will repeat this study in order to again estimate and analyze the relationship between eco-innovations and company performance after a few years' lag, to see and control whether and how the results change over time.

In future research, it would also be interesting to control the rate of R&D investment in eco-innovations. Several researchers (Ziegler and Rennings 2004; Rennings et al. 2006) found a positive and significant effect of R&D activities on implementation of product and process eco-innovation, while others (Rehfeld et al. 2007) found a weak effect of R&D

activities on product eco-innovation. Moreover, as aforementioned, not only the rate of R&D but also the stage of eco-innovation should be controlled, in order to see and gauge what kind and amount of investment the adoption of eco-innovation or the development of a certain eco-innovation type require and when the return on investments occurs. With these insights, we could suggest to companies which eco-innovation type is best for them to adopt or implement using their limited resources, as well as what period of time is predicted for a return on their investment. In addition, the outcomes of different eco-innovation types should also be examined in more detail – that is, when, whether, and which eco-innovation types deliver benefits to the company. In sum, return on investment and estimated time of payoff related to different eco-innovation types present further research directions, which would be of great help not only for companies but also for potential investors and policy makers, in order to make it easier for them to plan the development and application of different environmental policy instruments.

Researchers (Hojnik and Ruzzier 2015, 1) have stressed that a stimulus can act as a motivation-based factor (e.g., regulatory pressure, various expected benefits to be derived from eco-innovation implementation, profiling of company as environmentally friendly, competitive pressure, customer demand) or a facilitating factor (e.g., EMS, financial resources, technological capabilities). In our study, we defined and examined the drivers of eco-innovation as motivation-based factors, and thus the role of drivers that work as facilitating factors of eco-innovation remains a topic of future research. Thus, another interesting aspect to explore would be the effect of EMS (ISO 14001 and EMAS), because several researchers have found a positive effect of EMS on different eco-innovation types. Specifically, researchers have found a positive association between EMS (ISO 14001 and EMAS accreditation) and environmental product innovation (Rehfeld et al. 2007), environmental process innovations (Wagner 2008), and increased investments in eco-innovation (Kesidou and Demirel 2012). When tested separately, ISO 14001 exerted a positive and significant influence on environmental product and process innovation (Ziegler and Rennings 2004), as well as on end-of-pipeline technologies (Demirel and Kesidou 2011). In future research, it would be interesting to test the association between various types of EMS (such as ISO 14001 and EMAS) and different eco-innovation types (e.g., product, process and organizational eco-innovation). Moreover, we could also control the time of accreditation and the effect of accreditation on eco-innovation in the stages of adoption and development.

In addition, as emphasized by Hojnik and Ruzzier (2015), past research mostly examined the proximate factors (i.e., the causes that immediately lead to the adoption or development of eco-innovation), while more attention should be devoted to the distal factors of eco-innovation adoption and development (i.e., the real reason that leads to eco-innovation adoption or development). Our study in not an exception with regard to this issue; therefore, the investigation of the distal factors of eco-innovation adoption and development remains a future research direction.

Lastly, in future research we would suggest developing this study and applying it to a wider context (i.e., other countries) to test whether and how drivers and outcomes of eco-innovation vary across countries and eco-innovation types. It would also be fruitful to use this integrative approach on different types of industries. In our study, we tested the drivers and outcomes of different eco-innovation types on a sample of companies with at least five employees, while more detailed insights focusing on different types of industries and other company's characteristics (e.g., age and size) could deepen our understanding of eco-innovation drivers and outcomes. This would lead to implications related to which eco-innovation type is the most lucrative and beneficial for companies working in a certain type of industry, age or size, and which factors trigger different types of eco-innovation in different types of industry etc.

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Recenziji

I

Avtorica Jana Hojnik v monografiji z naslovom *IN PURSUIT OF ECO-INNOVATION: Drivers and consequences of eco-innovation at firm level* jasno in obširno opredeli področje preučevanja, nudi natančen pregled literature in dosedanjih raziskav ter na podlagi le tega ustrezno razvije hipoteze raziskave. Namen raziskave je preučiti gonilne sile in posledice uvajanja eko inovacij v podjetjih. Avtorica se osredotoči oziroma v svoji raziskavi zajame širok spekter določljivk/gonilnih sil eko inovacij (to so naslednje: predpise, ekonomske instrumente, povpraševanje kupcev, managerjeva skrb za okolje, pričakovane koristi in pritisk konkurence) in pa posledic (v raziskavi zajame naslednje: rast in dobičkonosnost podjetja, ekonomske koristi, konkurenčne koristi ter internacionalizacija). Sama monografija nudi strnjen pregled definicij eko inovacij, njihovih glavnih dimenzij, lastnosti in pa tudi merjenja, medtem ko s sintezo pomembnejših lastnosti eko inovacij pripomore k razjasnitvi koncepta eko inovacij. Avtorica na podlagi rezultatov raziskave ter preučevanja literature razvije svojo definicijo eko inovacij. Kot omenjeno, avtorica na začetku natančno opredeli eko inovacije, njihove dimenzije, načine merjenja, pomembnejše lastnosti eko inovacij, nato pa sledi pregled določljivk eko inovacij in pa posledic eko inovacij na ravni podjetij. Na podlagi izčrpnega pregleda literature je predlagan konceptualni model eko inovacij, katerega avtorica na vzorcu 223 slovenskih podjetij tudi empirično preveri. Vsi konstrukti uporabljeni v raziskavi so prej ustrezno testirani/preverjeni – preverjene so njihove psihometrične značilnosti s pomočjo konfirmativne in eksplorativne faktorske analize. Nadalje avtorica predlagani konceptualni mo-

del s pomočjo modeliranja strukturnih enačb tudi empirično preveri na vzorcu 223 slovenskih podjetij vseh velikosti (v vzorec so vključena podjetja, ki imajo vsaj 5 zaposlenih). Raziskava oziroma monografija nudi celosten pregled dosedanje/aktualne literature in empiričnih del/raziskav in pa tudi zanimive ter koristne ugotovitve nanašajoč se na uvajanje in spodbujanje eko inovacij v podjetjih. Velika dodana vrednost raziskave je posamično testiranje gonilnih sil in pa posledic različnih vrst eko inovacij: izdelčnih, procesnih in pa organizacijskih eko inovacij. S tem avtorica bolj natančno testira in tudi določi katere določljivke vplivajo na uvajanje izdelčnih, procesnih in pa organizacijskih eko inovacij. Nadalje, ta pristop omogoča tudi vpogled v to katere eko inovacije se podjetjem izplačajo in katere ne ali manj. Avtorica glavne ugotovitve raziskave strne in prikaže bolj jedrnato na koncu monografije. Za zaključek pa opozori na omejitve raziskave, predstavi tudi možnosti za nadaljnje raziskovanje in poda predloge za podjetja, raziskovalce ter oblikovalce politik.
Boštjan Antončič

II

The subject of monograph is very effectively identified and described and the main research questions are clearly expressed and positioned within the current academic conversation. A thorough literature review is carried out in the first part of the monograph, showing the multitude of perspectives that overlap. Furthermore, an entire chapter is dedicated to the clarification of the possible meanings of "eco-innovation" and their positioning within the broader concept of innovation. The literature review highlights the many facets of eco-innovation, its several determinants and its multiple consequences.

The research conducted and presented in this monograph is based on a very sophisticated and complex model that includes most of the variables and dimensions covered by the rich and growing literature in the field. The hypotheses are tested through an econometric model, based on the well-known methodology of Structural Equations Modelling. The research is based on a non-randomized sample of Slovenian companies who are pursuing eco-innovation projects.

While quantitative in nature, the research is mostly based on perceptual measures of eco-innovation determinants and outcomes. Hypotheses are tested for relevance and significance.

Furthermore, the monograph drives interesting and important conclusions from the research, both at the theoretical and the managerial level. A specific section of the conclusions also addresses the potential avenues for future research. It is also highlighted the need to further refine and adjust the research methodology to drive some conclusions on the time dimensions and profiles of eco-innovation. Indeed, the current research is cross-sectional and a longitudinal study would be more appropriate to test some of these research hypotheses.

In sum, this monograph is a very well crafted research, based on solid academic ground and driving to interesting conclusions, based on significant statistical methods.

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