

# Adoption of green innovations by SMEs: an investigation about the influence of stakeholders

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## Abstract

**Purpose** – Pursuing sustainable development has become a necessity for all types of businesses, owing to the increasing sensitivity of stakeholders towards pollution and environmental degradation related to economic activities. To sustain this approach, investments supporting green innovations (GIs) are required. The paper investigates how stakeholders affect the choices of companies to pursue sustainable development objectives through the use of GIs.

**Design/methodology/approach** – A sample of 222 innovative Italian SMEs was collected and analysed using the partial least squares structural equation modelling technique and the importance performance map analysis.

**Findings** – The authors found that the stakeholders with not-contractual ties with SMEs affect GIs. Among stakeholders with not-contractual ties only workforce represents a strong stimulus to eco-innovate. Anyway, contrary to expectations, public administrations exert a negative influence; that is, they appear to hinder SMEs approach towards GIs.

**Practical implications** – This paper contributes to filling the knowledge gaps about the factors stimulating innovative SMEs' investments in GIs. Specifically, by analysing the stakeholders' influences, many policy indications emerge, such as extending facilities and regulations, encouraging partnerships and networking and attracting private and institutional investors.

**Originality/value** – Until now, the prominent interest of researchers and policymakers has been focused almost exclusively on large manufacturing corporations because of their higher ecological footprints and the belief that SMEs are supposed to be mainly followers rather than first adopters of innovations. But in many international areas, the role of SMEs is widely predominant, and these SMEs chiefly operate in the service sectors.

**Keywords** Green innovations, Stakeholders, SMEs, Sustainable development, Partial least squares, Importance performance map analysis

**Paper type** Research paper

## 1. Introduction

The growing and widespread awareness of the risks related to pollution and environmental degradation deriving from economic activities has made stakeholders increasingly interested in knowing the cost of goods and services produced from the environmental and social



perspective and to urge companies to carry out their operational management within a sustainable development framework. In turn, companies increasingly advertise the actions actually taken to pursue sustainable development in order to improve consensus and legitimacy among their stakeholders.

Pursuing sustainable development implies the implementation of innovative, environmentally friendly production methods and processes that reduce the impact of firms' activity on the external context. These objectives are reached primarily through investments supporting green innovations (henceforth GIs), here meant as the introduction of any new or significantly improved product, process, organisational change or marketing solution that reduces the use of natural resources, decreases the release of harmful substances across the whole life cycle and improves the working conditions of employees.

Creating GIs does not guarantee a positive economic balance between costs incurred and the benefits obtained by the company, at least in the short term; later, advantages of an intangible type could occur. Even so, as stated by the *Business Roundtable* of the CEOs of 181 American multinationals (BR, 2019), more and more enterprises are declaring their willingness to give up a profit share in order to pursue sustainable development. In the business context, sustainable development is normally framed within the principles of *corporate social responsibility* (CSR).

This paper aims to investigate how the sensitivity of stakeholders towards environmental and social issues affects the investment decisions of companies to pursue sustainable development through GIs, in so doing contributing directly to achieving a significant number of Sustainable Development Goals (SDGs) of the United Nations, such as 7, 8 and 9 [1]. To achieve this aim, a survey involving a probabilistic sample of innovative small and medium enterprises (SMEs) was carried out.

This choice of SMEs is linked to the circumstance that within the scientific literature about GIs and the implementation of sustainable development and CSR in general, until now, the prominent interest of researchers and policymakers has been focused almost exclusively on large manufacturing corporations, owing to their higher ecological footprints and the belief that SMEs are supposedly mainly followers, rather than first adopters of innovations (e.g. Klewitz *et al.*, 2012; Oxborrow and Brindley, 2013; Jun *et al.*, 2019). But in many areas, such as Italy and other Mediterranean countries, SMEs are numerically predominant (up to 99% of total firms), and the majority operate in service sectors with a lower environmental impact, not in manufacturing ones. Moreover, the relationship between the decisions of managers and owners and the solicitations by stakeholders has been less analysed in SMEs (Vos and Achterkamp, 2006; Troshani and Doolin, 2007; Hyatt and Berente, 2017).

Specifically, SMEs of innovative nature are investigated. Leading scholars (van Stel *et al.*, 2007; Acs *et al.*, 2009; Storey and Greene, 2010) maintain that innovative SMEs, frequently operating in advanced or cutting-edge service sectors, are the companies with the highest probability of expanding rapidly, creating net employment, favouring the change in productive specialisation in their countries and supporting access to that quaternary sector of the economy more compatible with sustainable development principles. Hence, the above-mentioned research gaps risk slowing down the process of adoption of GIs by those SMEs with the highest potential.

Aspiring to shed light on SMEs' investments in GIs encouraged by stakeholders, the paper provides a rationale supporting policies in favour of innovation and sustainable development that today are almost absent in relation to SMEs. In addition, the paper provides decisional elements for executives.

After this introduction, Section 2 presents the theoretical framework and the hypotheses, Section 3 describes the method, Section 4 reports the findings and Section 5 discusses the policy implications and concludes the paper.

## 2. The framework

A growing number of scholars argue that in order to overcome the current systemic crisis that since some years ago has gripped many Western countries, the relationship between the economy and the environment should be rethought consistently with the recovery of strong ethical values (e.g. [Carroll and Shabana, 2010](#); [Freeman and Dmytriiev, 2017](#)). This perspective explicitly reaffirms the basic conception of companies as organisations aiming at ensuring the economic, civil and social progress of a community and whose ultimate goal is to provide human, financial and technological resources for improving the quality of life (e.g. [Coronella et al., 2018](#)). Environmental and worker protection are pillars of this view.

The need to pursue sustainable development has emerged since the 70s, as recognised by the pioneers of CSR ([Freeman, 1984](#); [Carroll, 1991](#)). Originally, sustainable development was defined as a set of internal choices of organisations aimed at self-regulation of their operating methods to make them consistent with respect for the external environment. Over time, the core of this approach has changed, becoming one that affects economics and ethics as well as other scientific disciplines such as marketing, operations management, organisational behaviour, sociology, political science, history and even law ([Lee and Carroll, 2011](#); [Ferramosca and Verona, 2019](#)). All of them together are centred on the necessity to assure a company's development that does not alter the environment irreversibly, and does not consume non-renewable natural resources, does not worsen the living conditions of workers and citizens.

In its continuous evolution, today sustainable development has adopted a governance orientation that includes the ethical and environmental implications of business choices within a strategic vision, according to a global approach that goes beyond the mandatory behaviours imposed by legislation to assuming unique, distinctive features ([Carroll and Shabana, 2010](#)). In other words, sustainable development is no longer just the result of deliberate decisions at a managerial level ([Marangos and Warren, 2017](#)), or of mandatory regulations to be adopted at local, national and transnational levels, but a managerial philosophy that permeates the entire company, distinguishing and characterising the company from competitors with respect to the external context ([Coronella et al., 2018](#); [Ferramosca and Verona, 2019](#)). The reason for this change is twofold, as companies can decide to engage in a sustainable development pathway for economic and/or ethical purposes.

From the economic side, the main objective is to increase corporate profitability and competitiveness. This goal can be achieved in a direct way, reducing the consumption of raw materials and natural resources, or in an indirect way by reaching intangible objectives, such as increasing legitimacy and consensus among internal stakeholders (i.e. employees, managers or owners) and external stakeholders (i.e. consumers, community, partners). As the community is expected to purchase a higher number of environmentally friendly products in the near future, this consensus is expected to be translated into sustainable competitive advantages, such as improvements in the company's image, reputation, customer retention and employee motivation ([Vos and Achterkamp, 2006](#); [Hyatt and Berente, 2017](#)).

From an ethical point of view, companies are encouraged to follow a pathway towards sustainable development primarily in response to the individual sensitivity of their managers/owners ([Carroll, 1991](#); [Lee and Carroll, 2011](#); [Marangos and Warren, 2017](#)). The adoption of business ethics and environmental principles becomes a way to meet personal needs of responsibility and concern towards an external context that is increasingly suffering in terms of pollution and people's standards of living. In these circumstances, strategic considerations are ancillary; that is, advantages in terms of revenues and/or reputation become possible consequences of behaviour based on ethical principles, but not goals in themselves ([Coronella et al., 2018](#); [Ferramosca and Verona, 2019](#)). Of course, the pursuit of sustainable development can be the answer of executives to stakeholders' expectations and

pressures regarding environmental and social issues (Troshani and Doolin, 2007; Hyatt and Berente, 2017; Wright and Nyberg, 2017).

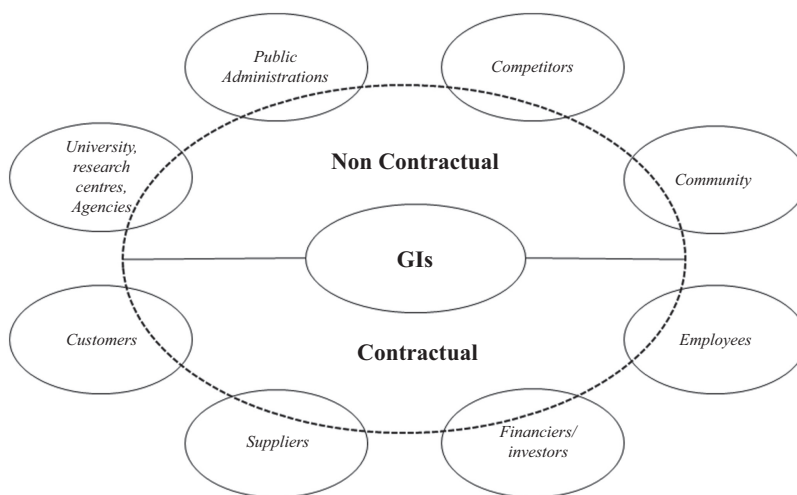
Thus, many motives for approaching sustainable development exist, involving both large corporate and small businesses. But they also presuppose the adoption of specific GIs by companies (Dangelico and Pujari, 2011; De Medeiros *et al.*, 2014). For at least 15 years, a thriving multidisciplinary debate to identify the factors encouraging the adoption of GIs has arisen. A basic distinction concerns drivers of internal and external origin (Mazzanti and Zoboli, 2009; Heimonen, 2012; Hojnik and Ruzzier, 2016). While the former basically concern the role played by the possession of adequate resources by companies (human, financial, material, skills, etc.), the latter concern the influence exercised by various categories of stakeholders.

This paper focuses on the second driver – taking into account the most influential stakeholders – that is consistent with the basilar classification taken by Clarke (1998), who distinguished among contractual (customers, suppliers, financiers/investors, employees) and non-contractual stakeholders (competitors, public administrations, research centres/universities/other public agencies, the community as whole) (Figure 1).

With specific reference to the stakeholders soliciting SMEs to adopt GIs, it is possible that companies are somehow obliged to adapt to the requests of contractual stakeholders by virtue of the existence of legal constraints, or in order to maintain the relationship with them. Regarding non-contractual stakeholders, it is probable that the companies act proactively to improve their reputation and image.

### 2.1 The hypotheses

*Customers'* expectations in terms of sustainable development are traditionally considered as a powerful incentive to sustain GIs for all types of firms (Cai and Li, 2018). Both customers (B2B) and end-consumers (B2C) are believed to be among the most influential stakeholders asking for environmentally friendly products for which they are willing to pay higher prices. Normally, B2C are considered more persuasive than B2B. For B2B, the intensity of pressure on business partners to realise GIs tends to be related to the repetitiveness and strength of the



**Note(s):** Clarke, 1998

**Figure 1.**  
The classification of stakeholders

business relationship (Bjerregaard, 2009; Cristo-Andrade and Franco, 2019). Hence, the first hypothesis to test is:

*H1.* In innovative SMEs, customers affect the decisions regarding GIs.

A second group of stakeholders is represented by *suppliers*. They can solicit their customer companies to make GIs compatible with those already adopted by them, or to purchase environmental innovations that they have generated for customers. Several studies state that the higher the degree of integration and cooperation with other companies (for instance, in a supply chain), the more the supplier pressures increase (Tumelero *et al.*, 2019). Anyway, often research regarding the relationships among suppliers and innovative SMEs is inconclusive (e.g. Mazzanti and Zoboli, 2009). The second hypothesis to test is:

*H2.* In innovative SMEs, suppliers affect the decisions concerning GIs.

Even *financiers* and *investors* are increasingly interested in funding companies that follow the principles of sustainable development and sustain GIs. This tendency represents a valid way to build a good reputation as an ethical institution in the broad sense, which is very significant for companies that lend money and have often been accused of speculative behaviours. As innovative SMEs frequently suffer from scarcity of financial resources in sustaining their investment programmes (Díaz-García *et al.*, 2015; Hojnik and Ruzzier, 2016), we expect they would be encouraged to make GIs in order to more easily access financing. Thus, we verify this hypothesis:

*H3.* In innovative SMEs, financiers/investors affect the decisions regarding GIs.

*Employees* can affect their own companies' choices from three perspectives. Firstly, employees are also customers of the firms' output, recipients of improved internal working conditions and citizens with a subjective sensitivity regarding the external environment. Secondly, to reach a higher level of motivation and productivity, companies have to pay attention to the workforce's expectations. Thirdly, employees' competencies can be a stimulus in making GIs. This influence is expected to be more evident among innovative SMEs, due to the closer linkages between staff and executives supporting innovative processes (van Stel *et al.*, 2007; Acs *et al.*, 2009; Heimonen, 2012). Therefore, the hypothesis is:

*H4.* In innovative SMEs, employees affect the decisions regarding GIs.

Scholars agree in maintaining that the influence of *public administrations* at local, national or EU level is particularly strong for all types of companies (Díaz-García *et al.*, 2015; Hojnik and Ruzzier, 2016), especially for SMEs (Klewitz *et al.*, 2012). Public administrations usually propose regulations and fiscal and/or monetary incentives designed to make the companies' behaviour consistent with SDGs. The purpose is to spread the externalities connected to investments into social and environmental dimensions (e.g. pollution emissions) and support the cross-fertilisation of knowledge. With this in mind, the hypothesis to test is:

*H5.* In innovative SMEs, public administrations affect the decisions regarding GIs.

Universities, research centres or chambers of commerce agencies, institutionally aiming to provide knowledge, technical and technological support, competencies and specialised services to companies, directly affect SMEs' choices (Bjerregaard, 2009; Olsson *et al.*, 2020). Composed of specialists and academics who, in turn, receive stimuli at the European or international level, these organisations also encourage sustainable development. Therefore, establishing linkages with these organisations represents a powerful stimulus for companies, especially for innovative SMEs usually lacking all the resources necessary to apply advanced innovations (Mohannak, 2007; Storey and Greene, 2010). Hence, we expect that:

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H6. Universities, research centres and other agencies affect the decisions of innovative SMEs' concerning GIs.

The sensitivity towards sustainable development shown by a *community* as whole, here meant as cultural or mass-media influences exerted on citizens and consumers, positively affects the implementation of GIs by companies (Marangos and Warren, 2017; Jun *et al.*, 2019). This influence tends to be lower in low-income per capita countries, as the environmental awareness of citizens is mitigated by the minor possibility of paying higher prices for environmentally friendly products and services (Wright and Nyberg, 2017). Hence, the seventh hypothesis is:

H7. In innovative SMEs, the community affects the decisions regarding GIs.

The presence of many *competitors* in the markets served by the company is a clear reason to pursue sustainable development and a stimulus to develop GIs. As explained, this approach mirrors the empirical evidence, according to which pursuing sustainable development principles is perceived as a way of distinguishing one's company from competitors, or adapting to their previous choices of innovations. Other investigations have already positively tested the positive influence of competition on the adoption of GIs among SMEs and high-tech SMEs (Cai and Li, 2018; Tumelero *et al.*, 2019). Therefore, the last hypothesis is:

H8. In innovative SMEs, competitors affect the decisions regarding GIs.

### 3. Method

To fulfil the aim of our research, a sample survey of innovative SMEs enrolled in a special section of the Italian Chamber of Commerce registry was conducted. A stratified sampling was chosen to select the SMEs, using the region in which a company is registered as a stratification variable and, from each stratum, the sample units proportional to the size of the same stratum were randomly extracted. The minimum sample size was of 200 SMEs, about the 20% of the population of innovative SMEs. To prevent bias and increase in the total variance of estimates caused by total non-response, we take a sample that is larger than the minimum size. It was fixed at 225 units, about 22% of the target population. The selected SMEs were quite heterogeneous. A large proportion of them were active in the service sector (about 71%), followed by manufacturing (about 23%) and trade (about 6%). They were mainly small firms (about 75% having less than 20 employees), with low capitalisation (55% less than €100,000) and turnover (about 60% with no more than €1,000,000). Moreover, most of them were located in the regions of Northern Italy.

The SMEs in the sample answered an online questionnaire inspired by the one proposed by Cai and Li (2018). It was based on 52 questions (Appendix), and the respondents specified their level of agreement or disagreement on a symmetrical 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) [2]. To overcome the problem due to common method variance, we (1) assured respondents (owners or executives) we would protect their identities, and (2) minimised evaluation apprehension by using a web-based questionnaire. These procedures can minimise method bias at the reporting or response-editing stage (Tehseen *et al.*, 2017).

Considering the multidimensionality of stakeholders, a model based on structural equations – in particular the partial least squares (PLSs) – was used to estimate the supposed relationship between the same categories and GIs. The survey was conducted in June 2019. At the end of the survey period (30 June), despite reminders, three companies in the sample had not responded [3]. The final sample size was therefore 222, meeting the minimum sample size.

### 3.1 PLS

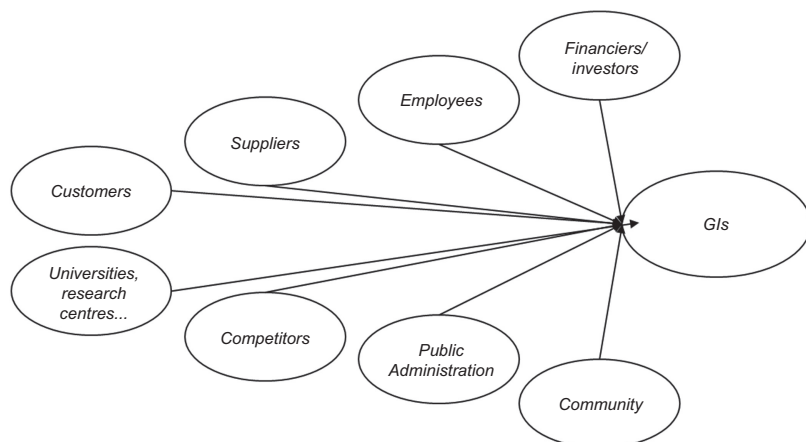
To estimate the relationship between stakeholders and the propensity to realise GIs, we developed a structural model based on PLS (PLS-SEM). The PLS-SEM method has been designed as a prediction-oriented approach to structural equation modelling (SEM). It can reliably estimate complex models using only a few observations and without imposing distributive assumptions on the data. In a nutshell, its statistical properties make PLS-SEM particularly useful for exploratory research settings that are “simultaneously data-rich and theory-primitive” (Wold, 1985, p. 589). It allows researchers to model, simultaneously estimate and test complex theories with empirical data (Hair *et al.*, 2011). Figure 2 presents the structural equation model and represents the underlying theory (or concept) with its constructs (i.e. variables that are not directly measured, or latent), which are represented in structural equation models as ovals (stakeholders), and the hypothesised cause-effect relationships.

GIs, as well as stakeholders, are multidimensional concepts defined by a large set of indicators measured during the survey, or manifest variables (MVs). Following the methodology of the PLS-SEM, these indicators were grouped into the latent construct, or latent (LV). We further assume that a change in MV reflects a change in the latent construct. In other words, we estimate a reflective PLS-SEM model. Following Coltman *et al.* (2008), many reasons are behind this choice, such as (1) the nature of the construct (stakeholders exist, in an absolute sense, independently from the measures), (2) the direction of causality (change in the construct causes a change in the indicators) and (3) characteristics of indicators (change in the LV must precede variation in the indicator(s)).

The analysis of this class of model was first based on the assessment of the reliability and validity of the relationships between the MVs and the LVs to which they are associated, known as the measurement model. Then, the structural model was validated. Moreover, given that PLS-SEM is nonparametric, a bootstrap procedure was implemented in order to assess the significance of the estimated coefficients. Data were analysed with SmartPLS 3.0 (Ringle *et al.*, 2015).

### 3.2 Reliability and validity of the measurement model

MVs were firstly grouped into latent constructs using confirmatory principal component analysis, and, subsequently, the subdivisions obtained were submitted to a group of experts



**Figure 2.**  
The estimated  
PLS model

(business managers and researchers). Secondly, we analysed the presence of common method bias, the reliability and the validity of the measurement model, considering the factor loadings, Cronbach's alpha and average variance extracted (AVE).

In this step, we estimated the measurement model.

Despite the procedure followed in the survey to limit the common method bias, we still prefer testing its presence. Several procedures are proposed to assess the presence of common method bias, such as the Harman's single factor test, well summarised in [Jakobsen and Jensen \(2015\)](#). Following this technique, we first introduce all the scale items into an exploratory factorial analysis, and then we examine the unrotated factor solution. The basic assumption is that, if common method bias exists, only one component will account for more than 50% of the covariance between the items and the criterion construct. In our case, factor explain about 38.75% of total variability. So, we can exclude the presence of common method bias.

To assess the items' reliability, we examined their factor loadings. It is commonly assumed that loadings greater than the minimum suitable of 0.4 and to the preferred level of 0.7 ([Bagozzi and Yi, 1988](#)) are acceptable. However, some authors specifically discussing GIs (e.g. [Mazzanti and Zoboli, 2009](#)) suggest using 0.5 as threshold level.

Model was iteratively estimated. First, we estimate a model in which the 40 MVs related to stakeholders were partitioned into the 9 constructs (LVs). We observed that some of the indicators presented loadings smaller than the threshold level, so we dropped one of these indicators (PA7) and performed a new model estimation. We repeated these steps until all the loadings were greater than 0.5. At the end of the iterative procedure, we observed that all of the items now considered in the measurement model presented loadings greater than 0.5 (UNI1, PA6, FIN5 and PA5 were progressively dropped). Therefore, items show a sufficiently strong relationship with their own LVs.

The reliability of the latent constructs was assessed with Cronbach's alpha. The value of this index suggests that proposed LVs are internally consistent ([Table 1](#)). Following the criterion suggested by [Fornell and Larcker \(1981\)](#), we analysed the convergent validity with the AVE. It presents values greater than the 0.5 threshold, confirming the validity of the model. On the basis of these results, we conclude that the measurement model satisfied both the criterion of internal consistency reliability and the convergent validity.

### 3.3 Assessment of the structural model

Once the quality of the measurement model had been assessed, the quality of the structural part of the model was evaluated by examining the full collinearity of the model, the determination coefficients ( $R^2$  and *Adjusted R<sup>2</sup>*) of the endogenous latent constructs, the effect size ( $f^2$ ), the predictive relevance ( $Q^2$ ) and the path coefficients.

To test the presence of collinearity, we use the approach proposed by [Kock and Lynn \(2012\)](#) with the full collinearity test. This test is a comprehensive procedure that allows to evaluate both vertical and lateral collinearity ([Table 2](#)). There are no rules of thumb in the literature on the threshold value of the variance inflation factor (VIF) (eg, [O'Brien, 2007](#)). [Hair et al. \(1995\)](#) suggest that the maximum acceptable level of VIF is 10, [Becker et al. \(2015\)](#) argue that values above 5 are acceptable, while [Kock \(2015\)](#) suggests that VIF values should be close to 3 and lower.

In this analysis, almost all stakeholders have a VIF close to 3, while financiers/investors and customers have values higher than 3 but still close to or lower than 5. Some of LVs (community and competitors), instead, present a VIF higher than 5. Following the criterion suggested by literature, we can exclude the presence of collinearity.

In PLS-SEM,  $R^2$  can be interpreted similar to any multiple regression analysis indicating the amount of variance in the endogenous LV explained by its independent variables. In the proposed model, the *adjusted R<sup>2</sup>* is 0.664, indicating a high relationship between the



Latent constructs	Factor loadings	Cronbach's alpha	Composite reliability	Average variance explained (AVE)
Financers/investors		0.736	0.827	0.617
FIN1	0.693			
FIN2	0.768			
FIN3	0.884			
Community		0.751	0.858	0.669
COMM1	0.839			
COMM3	0.864			
COMM2	0.746			
Customers		0.855	0.910	0.771
CUS1	0.852			
CUS2	0.908			
CUS3	0.873			
Competitors		0.914	0.933	0.699
COM1	0.870			
COM2	0.859			
COM3	0.890			
COM4	0.770			
COM5	0.846			
COM6	0.775			
Eco-innovation		0.909	0.936	0.786
EI1	0.911			
EI4	0.824			
EI2	0.912			
EI3	0.897			
Suppliers		0.705	0.839	0.650
SUP1	0.489 <sup>a</sup>			
SUP2	0.917			
SUP3	0.933			
Public administration		0.914	0.939	0.794
PA1	0.908			
PA2	0.903			
PA3	0.870			
PA4	0.882			
Employees		0.850	0.893	0.626
EMP1	0.710			
EMP2	0.824			
EMP3	0.792			
EMP4	0.829			
EMP5	0.794			
Universities <i>et al.</i>		0.723	0.829	0.559
UNI2	0.882			
UNI3	0.883			
UNI4	0.543			
UNI5	0.618			

**Table 1.**  
Factor loadings,  
reliability and validity  
statistics

**Note(s):** <sup>a</sup>The factor loading is slightly below the suggested threshold level but still within the limits proposed by [Bagozzi and Yi \(1998\)](#). For this reason we prefer to keep this item

stakeholders considered and the outcome variable. For assessing the predictive accuracy of the model, we use the  $Q^2$ . Usually, value greater than 0 indicates that the path model's accuracy is acceptable. In the estimated path model, the  $Q^2$  is 0.518, confirming the predictive relevance of stakeholders on GIs.

### 3.4 Significance of the estimates

By virtue of the analysis of the reliability and validity of the measurement model and of the variance explained ( $R^2$ ) and predictive relevance ( $Q^2$ ) of the structural model, we can assume that the model is correctly specified. Therefore, it can adequately explain the hypothesised relationship among the drivers and the eco-innovative behaviour of SMEs.

Since PLS does not rest on any distributional assumptions, that is, it is a nonparametric method, significance levels for the parameter estimates are not suitable. Instead, resampling procedures such as bootstrapping are used to obtain information about the variability of the parameter estimates. To test the significance of the estimated coefficients (path coefficient) related to the research hypotheses, a bootstrapping technique employing 6,000 sample replications was used. Table 3 reports the estimated path coefficients, the standard errors, the  $p$ -values and the effect size ( $f^2$ ).

As usual in exploratory studies, coefficients with a  $p$ -value of less than 0.10 are considered significant (e.g. Cecere and Mazzanti, 2017; Cai and Li, 2018). Among contractual

Latent constructs	VIF
Financers/investors	3.6
Community	5.2
Customers	4.4
Competitors	6.3
Suppliers	2.3
Public administration	1.3
Employees	3.0
Universities <i>et al.</i>	2.3

**Table 2.**  
Full collinearity test

Hypotheses	Path coefficient	SD	$T$ -statistic	$p$ -value	Confirmed / not confirmed	$f^2$
H1 In innovative SMEs, customers affect the decisions regarding GIs	-0.078	0.083	0.938	0.348	Not confirmed	0.004
H2 In innovative SMEs, suppliers affect the decisions regarding GIs	0.001	0.072	0.018	0.986	Not confirmed	0.000
H3 In innovative SMEs, financiers/investors affect the decisions to produce GIs	0.115	0.078	1.483	0.138	Not confirmed	0.011
H4 In innovative SMEs, employees affect the decisions to produce GIs	0.243	0.079	3.086	0.002	Confirmed	0.060
H5 In innovative SMEs, public administrations affect the decisions concerning GIs	-0.078	0.042	1.869	0.062	Confirmed	0.014
H6 In innovative SMEs, universities, research centres and other agencies affect the decisions concerning GIs	0.130	0.066	1.981	0.048	Confirmed	0.022
H7 In innovative SMEs, community affects the decisions regarding GIs	0.169	0.100	1.698	0.090	Confirmed	0.017
H8 In innovative SMEs, competitors affect the decisions regarding the adoption of GIs	0.360	0.101	3.573	0.000	Confirmed	0.063

**Table 3.**  
Hypotheses, path coefficients, standard deviation,  $t$ -statistics,  $p$ -value and effect size

stakeholders, we find that only employees exert pressure to incentivise the adoption of GIs, while among non-contractual ones, all actors considered affect the adoption of innovations capable of promoting production processes more responsive to environmental conditions.

As complement to null hypothesis significance testing, we report the [Cohen's \(1988\)](#) effect sizes ( $f^2$ ). They represent the change in the value of  $R^2$ , when a certain exogenous variable being omitted from the model is known as effect size ( $f^2$ ), and they offer a measure of practical significance in terms of the magnitude of the effect, independently of sample size. According to [Cohen's \(1988\)](#) guidelines,  $f^2 \geq 0.02$ ,  $f^2 \geq 0.15$  and  $f^2 \geq 0.35$  represent small, medium and large effect sizes, respectively. We observe that, in the significant variables, the  $f^2$  is just above the lowest threshold indicated by [Cohen \(1988\)](#) in three stakeholders (employees, competitors and universities). In the case of public administration and community, the effect size does not exceed the threshold, indicating that the two stakeholders, although significant at 10%, do not affect the choices to adopt GIs.

### 3.5 The IPMA

To identify the stakeholders exerting the greatest pressure for the adoption of GIs, we use the *importance performance model analysis* (IPMAs). IPMA is an evaluation tool to discover constructs that are doing well or that need to be improved.

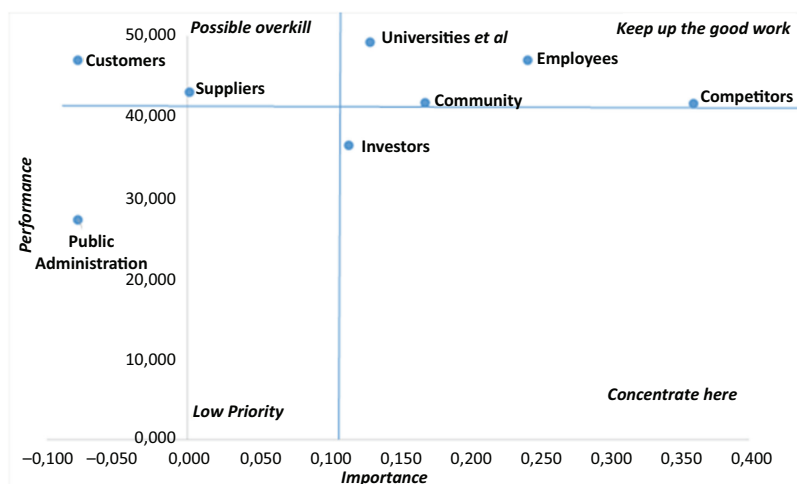
The objective of this analysis is to identify the (unstandardised) total effect of a predecessor construct's importance (e.g. community) in anticipating a specific target endogenous construct (e.g. GIs) ([Ringle and Sarstedt, 2016](#)). The total effect demonstrates the importance of LVs, whereas the average value of the scores of the latent variables and their indicators reflects their performance ([Höck et al., 2010](#)). The interpretation of IPMA is that a unitary increase in the performance of one of the latent constructs (e.g. community) increases the performance of the target construct (GIs) by the size of the predecessor's unstandardised total effect ([Hair et al., 2016](#)).

IPMA helps to gain additional insights by utilising the LV scores, and it is useful for determining each predecessor construct's importance in terms of its total impact on each target endogenous construct (performance). By taking in its purview the average values of the LVs, it builds on the estimates of PLS-SEM, thereby providing an extra dimension. Moreover, the non-significant stakeholders have been retained in the IPMA since "this outcome may also represent a valuable finding, which also can change with different data" ([Ringle and Sarstedt, 2016](#), p. 1872).

According to [Höck et al. \(2010\)](#), IPMA helps to prioritise areas requiring improvements. As a result, areas with relatively high importance and relatively low performance may be identified and improved upon through appropriate management activities. This step provides guidance for strategic development.

The two-dimensional IPMA is divided into four quadrants, with performance on the y-axis and importance on the x-axis. As a result, the following four quadrants are created ([Figure 3](#)):

- (1) High importance/high performance is labelled "Keep up the good work". All constructs that fall into this quadrant represent the stakeholders who have exhibited their influence in favour of GIs.
- (2) Low importance/high performance is labelled as "Possible Overkill". It denotes a set of stakeholders considered excessively important by companies in their choices related to GIs.
- (3) Low importance/low performance is labelled "Low Priority". Thus, any of the constructs that fall into this quadrant indicate stakeholders who do not actively participate in GI choices.



**Figure 3.**  
Importance –  
performance map  
analysis

- (4) High importance/low performance is labelled “Concentrate Here”. Constructs that fall into this quadrant represent key areas with the most influential stakeholders.

The intersection in the IPMA is made available using the mean level of importance at 0.108 and the mean level of performance at 41.7. Thus, from the IPMA analysis (Table 4), it can be seen that, with regard to the decision to invest in GIs, customers, universities and employees have the highest performances, while three stakeholders present the highest importance (competitors, employees and community) with regard to the choice to engage in sustainable development.

Furthermore, looking at the graphical representation of the IPMA map reported in Figure 3, it is possible to observe that universities, employees, community and competitors are in the first quadrant (“Keep up the good work”) that identifies the stakeholders who have exhibited their influence in favour of GIs. These stakeholders show the highest performance index and also a good importance index, confirming the relevant role played by them into supporting small businesses.

Customers and suppliers are characterised by a low (below average value) importance but high influence (performance) and fall in the area of “Possible Overkill”. On the other hand, investors exhibit an above-average performance index and fall in the fourth quadrant (“Concentrate here”) that represents key areas with the most influential stakeholders. This stakeholder does not affect the GIs choices of SMEs according to the PLS results. For this

Stakeholders	Importance	Performance
Investors	0.115	36.431
Community	0.169	41.796
Customers	-0.078	47.046
Competitors	0.360	41.705
Suppliers	0.001	43.120
Public administration	-0.078	27.284
Employees	0.243	46.987
Universities <i>et al.</i>	0.130	49.243

**Table 4.**  
Importance and  
performance of the  
stakeholders exerting  
pressures on SMEs

reason, it would be appropriate for management to concentrate mainly on the pressures exerted by investors.

Another significant result is represented by the role played by public administrations. As already confirmed by the estimates of the proposed structural model, public administrations can be considered as a brake on the SMEs' decisions to invest in environmental innovations. Moreover, it can be observed that the relationship between universities, research centres and specialised agencies and innovative SMEs is adequately valued.

#### 4. Findings

Outcomes reveal that not all stakeholders influence innovative SMEs in their decisions to invest in GIs.

Regarding the stakeholders qualified as contractual by [Clarke \(1998\)](#), only the workforce affects SMEs' GI decisions. The importance of employees can be attributed to the fact that they are at the same time beneficiaries of GIs as consumers, citizens and workers. In addition, SMEs are characterised by informal ties among personnel who make managers more sensitive to the employees expectations ([Marangos and Warren, 2017](#)).

The absence of influence from customers and suppliers could partly be traced back to the specificity of the sample. Indeed, we considered SMEs with small average dimensions. Thus, it is possible they are weakly integrated into relational networks or supply chains ([Mohannak, 2007](#); [Troshani and Doolin, 2007](#)). Furthermore, the investigated SMEs could still do not perceive the pressure of their suppliers and customers (i.e. other firms) because, presumably, they are devoted to end-consumers (individuals) ([Cristo-Andrade and Franco, 2019](#); [Tumelero et al., 2019](#)), or specifically dedicated to provide specialty supplies linked to their innovative and high-tech nature ([Acs et al., 2009](#)).

Similarly, although financiers are increasingly careful to develop financial offers to support sustainable growth or to select socially responsible investments, they do not affect GIs. This result can be explained in several ways. First of all, it is to be assumed that the aforementioned changes in the lenders' approach are not yet sufficiently widespread to be clearly perceived by the SMEs. SMEs usually have more difficulty accessing finance than larger companies. This is more likely when companies base their competitiveness on intangible assets without collateral to offer to lenders, as often happens with SMEs of an innovative nature ([Heimonen, 2012](#)). In addition, the lack of influence can also mirror the absence of a consolidated system of business angels and serial investors.

Focusing on the second category of non-contractual stakeholders, all of them impact the choice of companies to adopt GIs. It is important to note how these innovative SMEs pay attention to the competitors, maybe looking at the GIs as a means to differentiate their output from competitors ([Oxborrow and Brindley, 2013](#)). Moreover, SMEs recognise how community expectations are changing, and therefore they must adapt. It is intrinsic to an innovative company to anticipate trends and expectations of markets.

SMEs also pay attention to the solicitations coming from external organisations, such as universities, research centres or other agencies, whose duty is to support, directly or indirectly, SMEs in their development pathways. The role of these organisations is judged crucial for fragile SMEs with possible shortages of competencies, knowledge and financial resources ([Bjerregaard, 2009](#); [Olsson et al., 2020](#)). As argued in the literature ([Acs et al., 2009](#); [Storey and Greene, 2010](#)), their role can be even more critical for innovative SMEs that often need bridges and linkages to be able to approach the cutting-edge technologies and techniques.

Public administration deserves a separate mention. As previously explained, almost all the investigations found that they affect the choices regarding GIs, and even in this research, the coefficient is significant. But here, it exhibits a negative sign. This is a remarkable aspect

that merits deeper thought and contextualisation in terms of the investigated framework. Scholars agree that the investigated Italian business climate is overall inadequate with respect to the needs of an internationalised modern economy. These constraints can be more evident for SMEs aspiring to be cutting-edge. Hence, we expect that the mentioned answers of innovative SMEs are a reaction to an excess of regulations that penalise ambitious companies and that reduce the effectiveness of possible incentives. The inherent public administrations, therefore, could be very far from the expectations, needs and requests of innovative enterprises, especially SMEs normally unable to converse with public managers or to channel their decisions (Marangos and Warren, 2017).

## 5. Conclusion and policy implications

Achieving the principles of sustainable development is becoming a strategic orientation for all types of businesses. Although the reasons for this approach have been widely studied with reference to large corporations engaged in traditional activities with high environmental impact, studies on SMEs are still rare, even though they represent the vast majority in many countries' economies. Specifically, there is a lack of investigations on innovative companies that frequently operate in the service sector and incorporate the greatest potential with regard to the ability of a country to maintain a highly competitive level.

Adapting to the logic of SDGs presupposes the predisposition of companies to invest in GIs in order to minimise the impact of their production processes. This goal is influenced, among other things, by the expectations and pressures of the stakeholders with whom companies relate. These expectations are often independent of the mere convenience of investments in terms of cost-benefit ratios, even if intangible benefits could occur over time (from customer retention to a proactive image).

With this in mind, the present work attempted to investigate how eight main stakeholders affect the choice of innovative SMEs to invest in GIs. A sample of 222 companies located in Italy and enrolled in a special register of innovative SMEs was investigated.

Results show that the stakeholders qualified as non-contractual, such as public administrations, competitors, universities, research centres and other agencies, and the whole community affect the SMEs' decisions to make GIs. Among stakeholders with a contractual relationship, just the workforce influences the SMEs' choices, while customers, suppliers and investors/financiers do not.

There are many explanations for these results closely linked to the features of SMEs, especially when of innovative nature. Innovative SMEs are proactive companies that appear to exhibit their innovativeness vis-à-vis the external context, and especially from the environmental and social standpoints. This is because they seem more attentive to the requests of the stakeholders with whom they do not have legal relationships, compared with the stakeholders with whom they are in contractual relationships.

Of course, it is also possible that the investigated companies, owing to their reduced size, have few structured relationships with clients and suppliers, or are not held in due consideration by investors and lenders, while the more direct link between employees and executives typical of smaller units makes workforce expectations particularly influential.

The importance of public administrations that try to channel companies' choices within a framework of sustainable development through regulations, incentives or tax benefits is also confirmed. But in this case, public administrations do not exert a propulsive influence. Conversely, they are perceived as discouraging GIs. This is probably due to an excessive level of bureaucracy and the consequent slowness due to administrative onus and compliances, or to lack of attention towards SMEs in general, and of innovative nature in particular.

The above considerations reveal a fairly truthful picture of the investigated context characterised by a very high presence of SMEs, but little focused on cutting-edge sectors.

However, they cannot be generalised for all contexts or for all types of companies. Clearly, decisional processes that take place in innovative SMEs can diverge from those of SMEs operating in the so-called traditional sectors, or in innovative but large corporations. Furthermore, for each context, the relevance of every stakeholder could differ.

What has been said so far also suggests that for innovative SMEs, the choices regarding sustainable development are intrinsic and underlying aspects of innovation. The innovations introduced are focused on social and environmental benefits. This assumption is particularly relevant. Indeed, it is consistent with the recent warning by [Stiglitz \(2019\)](#), who pointed out that only an enormous amount of responsible green investments aimed at changing the approach of production systems (“a green new deal”) will prevent the world economy from falling back into the abyss of the recession. This statement is even more evident today due to the danger of a prolonged recession caused by the recent Covid-19 pandemic. Not surprisingly, 37% of the recovery funds formally announced by the EU will be used to sustain a green deal and sustainability projects.

These considerations suggest some basic objectives to be accomplished by policymakers and decision makers. The lack of influence of the upstream and downstream networks with suppliers and customers can be a clear sign of an intrinsic weakness of SMEs, which slows down the adoption of GIs and, therefore, could jeopardise their development capacity. Even the non-influence of financiers and investors can be interpreted as a consequence of the difficult access to the financial and investment resources dedicated to these SMEs, which hampers their GIs. If these outcomes were confirmed by other surveys, then public administrations would have the duty to carry out numerous interventions in several directions in order to modify the negative perception of their actions among local entrepreneurs.

The first direction is to increase the effectiveness of their actions by extending the facilities and regulations in favour of innovative small businesses, given their strategic importance for the future development of the context in question, but also encouraging the adoption of GIs by all SMEs. Stimulating relationships with universities, research centres and other public agencies could be a valid way to reach this objective. In addition, encouraging partnerships and networking among firms or with larger companies could be fruitful.

The second correlated direction concerns the types of measures proposed, which should be well aimed at specific purposes focused on GIs. For example, it may be advisable to move from financing generic investments in fixed assets to investments in R&D.

The third direction concerns the proposal of financial measures aimed at overcoming any qualitative or quantitative rationing of the credit of innovative SMEs wishing to invest in GIs, as they often lack collateral. The fourth direction concerns the consolidation of a system of private and institutional investors who support SMEs by sharing risks linked to the implementation of innovations. The fifth direction concerns the strengthening of support organisations that mainly offer real services to innovative SMEs, which often still are in the development phase, in the form of consultancy, mentoring, participation in international projects and so on.

Although this study can be useful to improve the effectiveness of policies aimed at encouraging innovative SMEs to invest in GI, in order to circumvent its endogenous limitations, it may be useful to consider the mediating effects of stakeholder categories through future in-depth studies. In any case, the first two obvious directions are to extend the survey to other categories of SMEs, due to their heterogeneity, and to identify SMEs belonging to and operating in different countries under different contextual conditions, due to the importance that the external context has been shown to exert on the propensity of SMEs to support GIs. A second step is to examine a wider number of stakeholders, possibly subdividing the categories here considered. This purpose is preferably achieving involving larger samples of SMEs.

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## Notes

1. They are: ensure access to affordable, reliable, sustainable and modern energy for all; promote sustained, inclusive and sustainable economic growth; full and productive employment and decent work for all; and industry, innovation and infrastructure.
2. However, due to the purposes of this investigation, 12 questions were not considered.
3. It should be noted, however, that some of the sampled companies expressed their unwillingness to participate. They were promptly replaced by other companies with similar features.

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**Questionnaire**

Questions are articulated in closed demands with a 5-mode Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Label indicates the items included in the estimation procedures. If “dropped” is reported, it means that factor loading was below the threshold level and the items were eliminated.

NC indicates that items are not related to the aims of the paper.

Items	Label
In order to access at innovations, how important is it for your company?	
The relationship with universities / research centers	UNI1 (dropped)
Partnership with other companies	NC
The recourse to specialised consultancy	NC
The purchase of patents/licenses by providers	SUP1
Participation in workshops/exhibitions	NC
Does your firm have a documented plan or rules for eco-innovation and ecological management?	NC
Does your firm consider environmental audit as a management standard?	NC
Does your firm encourage staff to work towards energy saving and emission reduction?	EMP1
Does your firm advertise to stakeholders its commitment to eco-sustainability?	COMM3
Do your products / services meet the requirements of national and international environmental regulations?	UNI2
Do your productive processes meet the requirements of national and international environmental regulations?	UNI3
In your opinion, local public administration offers	
Adequate fiscal benefits for the eco-innovations of your company	PA1
Adequate monetary incentives for the eco-innovations of your company	PA2
A simpler bureaucratic procedure for the access to the expected benefits	PA3
A regulatory framework that supports the adoption of eco-innovations	PA4
Do your customers pay attention to environmental and sustainability issues?	CUS1
Is your firm encouraged to pursue eco-innovations from customers' requests?	CUS 2
Do your suppliers pay attention to environmental and sustainability issues?	SUP2
9. Is your firm encouraged to pursue eco-innovations from suppliers' proposals?	SUP3
10. Are banks and financial intermediaries more likely to finance eco-compatible investments?	FIN1
11. Are venture capitalists and business angels more likely to finance companies pursuing eco-compatible investments?	FIN2
12. Do the other actors of the local economic context call for the adoption of eco-innovations?	UNI4
13. Does the presence of research centers and universities favor the adoption of eco-innovations?	UNI5
14. Is environmental sustainability a very felt problem in your company?	EMP2
15. Do your employees propose environmental sustainability actions?	EMP3
16. Are there professional figures (e.g. energy managers) who deal with environmental sustainability issues?	EMP4
17. Do you plan to hire professionals who can deal with environmental sustainability issues?	EMP5
Investments in eco-innovations have made possible	

*(continued)*

Items	Label
Reduce energy and raw material consumption	EI1
Reduce the cost of energy and other raw materials	EI2
Reduce the pollution connected with the company activity	EI3
Investments in eco-innovation favour net employment	COMM1
Increase sales	COM1
Increase the use of productive capacity	COM2
Improve economic results to attract investors	FIN3
Gain a competitive advantage over competitors	COM3
Investments in eco-innovation retain customers	CUS3
Improve the working environment of employees	EI4
In the immediate future, does your firm plan to invest in eco-innovations in order to	
Reduce the cost of energy and other raw materials	COM4
Improve economic and financial performances	COM5
Improve the image or differentiate from competitors	COM6
Reduce the environmental impact	COMM2
Contribute to respect European targets	PA5
	(dropped)
Receive benefits and incentives	PA6
	(dropped)
Does your firm pay attention to the expectations of stakeholders with which it has tight relationships?	NC
Does our firm consider environmental audit as necessity to satisfy contractual stakeholders solicitations?	NC
Does your firm believe it important to take in account also the expectations of stakeholders with which it just has indirect relationships?	NC
Does your firm pay attention also to the environmental requests of not-contractual stakeholders?	NC
Green innovations you intend to adopt are appropriate to	
Increase technological skills of your firm	NC
Improve organisational skills of your firm	NC
Increase the managerial skills of your firm	NC
Increase the material and financial resources of your firm	FIN4
	(dropped)
Has your company applied for government subsidies?	PA7
	(dropped)

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