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Do circular economy practices affect corporate performance? Evidence from Italian large-sized manufacturing firms

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Abstract

In recent years, corporate social responsibility has become the most outstanding challenges for firms and circular economy has emerged as an innovative business model able to transform corporate social responsibility into actions. Even if by adopting such a strategic model firms could enhance their performance, results continue to be mixed and unclear. The aim of the paper is twofold. First, the study investigates the effect of three circular economy practices (waste treatment, reduction and recycling), on brand reputation and financial performance. Second, the study tests the role of brand reputation in mediating the relationship between circular economy practices and financial performance. The findings highlight the crucial role of 3Rs practices and of brand reputation in enhancing firm performance. This paper contributes to a better understanding on the relationship between circular economy practices, as sustainable strategic and managerial practices, and firm performance, in both marketing and financial terms. Moreover, it sheds light on circular economy implementation and its effect at the firm level, by analyzing managers perceptions on how firms and policy makers have to incorporate the circular economy concept in their sustainability agenda.

KEYWORDS
brand reputation, circular economy, corporate social responsibility, firm performance

1 | INTRODUCTION

Circular economy (CE) and corporate social responsibility are increasingly interconnected and converging concepts, since CE puts corporate social responsibility to practice (Esken et al., 2018; Fortunati et al., 2020). In fact, the concept of CE intervenes in the debate about how firms may fully meet their corporate social responsibility into their operations and core strategy to tackle the increasing resource scarcity and depletion of non-renewable resources (Stewart & Niero, 2018). CE, based on the 3Rs, namely recycle, reduce, and reuse, represents a new business alternative to the prevalent linear economy approach based on production-consumption-disposal and it allows the reduction of resource usage and waste production (Geissdoerfer et al., 2018; Gupta et al., 2019; Pagoropoulos et al., 2017; Teixeira et al., 2016; Tseng et al., 2018). For these reasons, the CE concept has become a topic of interest for both academics and practitioners, and has started to be integrated into the corporate social responsibility agenda of firms all over the world (Heyes et al., 2018; Mendoza et al., 2017; Urbinati et al., 2017; Yang et al., 2019).

In recent years, an increasing number of mainly large-sized firms are using a CE approach, namely a new way of thinking about sustainability and corporate social responsibility that allows them to enhance their image, reputation and financial performance (Fortunati et al., 2020). At the firm level, this new way of thinking mainly involves waste management, reduction and recycling practices to meet environmental requirements and customer needs (Agan et al., 2013; Ghisellini et al., 2016; Yang et al., 2019).

At the same time, the CE approach leads firms to gain good reputation that positively affects financial performance. Brand reputation, at its core, is a firm strategic resource and an important intangible asset that reflects the stakeholders opinion about the firm ability to meet stakeholder expectations (Fombrun, 1995). In the particular context of corporate social responsibility, brand reputation plays a further role in signaling the firm ability and behavior in accordance with stakeholder expectations about sustainability concerns (Agus Harjoto & Salas, 2017; Brammer & Pavelin, 2006; Galbreath & Shum, 2012; Khojastehpour & Johns, 2014; Pérez-Cornejo et al., 2020).

Even if previous studies have analyzed the potential benefits, both environmental and economic, of CE, mixed results have emerged and clear empirical evidence on the relationship between CE practices and firm performance is still scarce (Moric et al., 2020). In this regard, many scholars suggest that the mixed results emerged because most studies examine only the direct relationship between sustainability practices and firm performance and omit important intervening variables, such as brand reputation (Galbreath & Shum, 2012; Grewatsch & Kleindienst, 2017; Saeidi et al., 2015). In addition, the majority of these studies have investigated the relationship between CE practices and firm performance on data retrieved from yearly release corporate sustainability reports rather than on firm primary data and only few studies have shed light on CE practices at the firm level (Stewart & Niero, 2018).

To address these gaps, the research aims to empirically analyze the causal relationships between three CE practices, namely waste treatment, reduction and recycling within the firm, and brand reputation and between brand reputation and financial performance, as firm performance indicators.

Drawing from the data of 404 large-sized manufacturing firms operating in Italy recruited from an online panel, the study uses structured equation modeling (SEM) to test the hypothesized relationships between the study's constructs. The study's findings reveal that waste treatment and recycling practices positively affect financial performance through the impact of brand reputation, while reduction practices, acting directly on the costs of the firm, directly affect financial performance.

The research theoretical contribution is threefold. First, the empirical research contributes to a better understanding of CE practices, as new strategic business practices that allow firms to put corporate social responsibility into real actions, and of their effects on firm performance, in terms of both reputation and financial performance. In particular, the study answers the call to develop more research to fully understand the relationship between corporate social responsibility (in general) and CE (in particular) and firm performance (Fortunati et al., 2020; Stewart & Niero, 2018; Turoń & Czech, 2017). In this regard, the study emphasizes the crucial role of waste treatment and recycling practices in positively affecting brand reputation and of reduction practices and brand reputation in enhancing financial performance in a CE perspective. Second, this study contributes in overcoming some of the ambiguity surrounding the relationship between CE and firm performance and extends sustainability and corporate social responsibility literature by revealing that brand reputation mediates the relationship between CE and firm financial performance. Finally, this study adds to the extant literature that has mainly focused on the effect of corporate social responsibility practices by analyzing secondary data retrieved from corporate sustainability reports rather than on firm primary data. In fact, the research sheds light on CE practices implementation at the firm level by processing primary data collected through a survey administered to managers of Italian firms that have adopted CE principles.

The rest of the paper is organized in four major sections: presentation of the conceptual framework and research hypotheses; description of the methodology; presentation of the empirical analysis conducted; and, finally, conclusions and implications for both theory and practice, and suggestions for further investigation are presented.

2 | LITERATURE REVIEW AND RESEARCH HYPOTHESES

The economic development of the past decades has increasingly brought a resource depletion and an environmental degradation. As a consequence governments, institutions, non-governmental organizations, and practitioners have introduced in their agendas to examine innovative mechanisms, procedures, and practical solutions that can support firms to pursue their economic goals in an environmentally sustainable manner (de Jesus & Mendonça, 2018).

The concept of CE was proposed as a feasible solution with an emphasis on achieving the dual environmental and economic performance goals and, actually, the progressive transition to a sustainable economic system is considered a key element of the European industrial strategy (European Union, 2020). In a context characterized by the environmental protection and resource conservation, firms are becoming environmentally aware (González et al., 2008) and, to mitigate the environmental burden and overcome the resource scarcity, they are trying to fully exploit the potential of a CE for creating a sustainable transition.

In particular, environmental practices, especially CE practices, have been seen as a valid solution to generate wealth, and are adopted by firms for their implications on performance improvement, from both marketing and financial perspective. From the marketing performance perspective, several studies have tried to demonstrate that firms' commitment and involvement in corporate responsibility affect their performances also as a consequence of their influence on customer perceptions (Caputo, 2021; Laszlo, 2003). By adopting a more responsible approach to sustainability, firms could add value to their products and gain a stronger reputation (Panagiotakopoulos et al., 2016). Environmentally oriented firms could benefit from spillover effects that enhance their brand reputation and increase demand for their offerings (Galbreath & Shum, 2012; Gilley et al., 2000; Kucharska, 2020). In addition, employing digital and social technologies as an enabling factor of sustainability, firms could improve their brand reputation by communicating real-time their CE practices implementation directly to customers (Belabbes et al., 2020; Caputo et al., 2018; Del Giudice et al., 2019; Del Giudice & Della Peruta, 2017). In this vein, brand reputation in CE refers to the extent to which customers perceive that the cause being supported in the CE practices has significant connections with the brand. Brand reputation

assists the market to transfer positive perceptions from CE practices to the brand associated with that practices (Ferraris et al., 2019; Liew, 2008).

From the financial performance perspective, previous studies have suggested that firms' CE adoption could generate significant effect, suggesting the existence of a relationship between CE practices and financial performance (Kurapatskie & Darnall, 2013). Accurate measurements of the performance advantage firms could derive from their CE and corporate social responsibility initiatives have become of great interest, since managers have to justify their decision to allocate their resources on this particular practices and have to demonstrate that they could generate tangible benefits for their firms (Peloza, 2006). However, controversy remains about the impact of CE on firms financial performance. In fact, firms that decide to implement CE principles have to operate according to the materials, water and energy cycling principles, and that implies to improve firms capacity of recycling, generate waste that can be reused as a resource, and reduce the amount of materials used in the producing cycle (Ghisellini et al., 2016; Wang et al., 2014). This could be seen as a double-edge sword because firms have to sustain costs to implement these CE practices but, at the same time, benefits gained could be greater than the costs involved. Even though positive financial benefits to CE of firms are well accepted (de Jesus & Mendonça, 2018), previous studies that have tested the returns to firms' environmental investments (Cheng et al., 2014; Demirel & Danisman, 2019) convey that it is not always possible for firms to gain benefits from CE practices adoption. Moreover, the relationship between corporate social responsibility practices and firm financial performance seems to be not straightforward. In fact, according to many scholars, the link between CSR and firm performance may be affected by some other intervening factors, especially firm reputation that reflects the degree to which stakeholders are satisfied that firms are meeting their socially responsible expectations (Galbreath & Shum, 2012; Kucharska, 2020; Mulki & Jaramillo, 2011; Park, 2017; Saeidi et al., 2015). Therefore, some scholars call for further studies to uncover the complex relationship between CSR and financial performance and better understand the mediating mechanisms that could affect this relationship (Galbreath & Shum, 2012; Park, 2017). In the circular economy context, sustainability, corporate social responsibility, brand reputation and financial performance are not only crucial factors individually but they are closely related and support each other in the achievement of the firm competitive advantage and success (Kucharska, 2020).

2.1 | Waste treatment and brand reputation

In recent years, it has become evident that consumers feel increasingly responsible for sustainable consumption and production issues that go beyond their individual needs (Stolle et al., 2005), show a growing interest in understanding what firms they support are doing to address social and environmental issues (Sen & Bhattacharya, 2001), and are gradually increasing their willingness to purchase from firms they perceive as responsible (Parsa et al., 2015). The 3Rs significantly contribute to satisfy customers with safe and quality products and, at the same time, these principles support firms in reducing their footprints and costs (Tong & Wong, 2016). In this perspective, waste treatment ranks first among the activities firms could activate to react to legislative environmental pressure and enhance their reputation among customers. In fact, every production cycle generates waste and firms are aware that they are legally responsible for it. Adopting solutions to curb waste is a first step to adopt CE principles and firms are trying to implement waste treatment solutions as this is perceived as the least for being environmental responsible (Agan et al., 2013). By implementing the 3Rs principles, firms have to engage themselves in decreasing the amount of waste they generate and correctly manage the litter they cannot avoid of producing. This allows to demonstrate to customers and prospects that the firm is environmentally conscious, improving their reputation towards the firm itself. An efficient waste management practices emphasize and demonstrate firms commitment to sustainability in an attempt to help differentiate themselves from their competitors and to enhance their brand reputation, drastically influencing positively consumers' attitudes toward them (Jones et al., 2015; Rosa et al., 2019). In addition, by developing waste treatment practices, a firm could earn a reputation as a socially responsible firm (King et al., 2002).

Therefore, this study hypothesizes:

H1: Waste treatment as a circular economy practice has a positive and significant effect on brand reputation.

2.2 | Reduction and brand reputation

According to Porter (1991), firms investing in environmental practices have the opportunity to reduce waste and, in turn, have better performance (Porter, 1991). Reduction is about "preventing' pollution at the source (in products as well as manufacturing processes) rather than 'removing' it after it has been created" (Srivastava, 2007, p. 62). Engaging this same logic, waste reduction is not an additional part of recycling but it represents a fundamental step in the relationship between environmental practices and firm performance (Sroufe & Gopalakrishna-Remani, 2019). Due to the existence of a pressing to transition to a more sustainable future (Geissdoerfer et al., 2017), firms have assumed a duty of care over their manufacturing process that not only implies a circular flow of materials in the production phase (Gullstrand Edbring et al., 2016) but also requires to reduce firm impact on the environment (Liao & Zhang, 2020). Decreasing footprint is becoming a focal task of several firms since research has found that consumers are increasingly making purchase decisions led also by moral rationale and pro-environmental motivation (Hoffmann & Hutter, 2012), confirming that the interest towards firm policies behind the products is rapidly growing (Grappi et al., 2017). Recent studies have also highlighted that consumers appreciate those firms that share information about their socially responsible activities (Griskevicius et al., 2010; Semmann et al., 2005), and good behavior towards the environment, such as commitment in reducing waste,

could support firm in generating benefits that include improved firm's reputation (Maleka et al., 2017; Song et al., 2017). In fact, customers are more likely to acquire products from those firms they perceive as being environmentally responsible and that demonstrate to be compliant with sustainable principles (Grimmer & Bingham, 2013).

By adopting processes that allow to prevent pollution generation and reduce waste production, firms can build a pro-social reputation that could generate a more favorable consumers' attitudes toward their brand reputation. Therefore, this study hypothesizes:

H2: Reduction as a circular economy practice has a positive and significant effect on brand reputation.

2.3 | Recycling within the firm and brand reputation

Since ethical consumption is progressively becoming widespread (Hoffmann & Hutter, 2012) and consumers interest in having access to ethically produced goods is higher than never before, managers are willing to adopt the 3Rs principles within their firms and let customers known about this orientation. By practicing the 3Rs, firms adopt innovative waste treatment processes, decrease the amount of waste and pollution generated, and implement recycling within their product creation process.

Recycling, that is about the reuse of waste generated by the production cycle as new raw materials, offers firms great opportunities. In fact, by recycling a firm can not only obtain new profitable business opportunity from making new products by using its industrial litter as input (Dong et al., 2013) but it can also reinforce customers opinion about the firm itself by showing them that the business is run in a strong ethical way (Lai et al., 2010). By developing and communicating a program for recycling, firms could effectively prove to their customers they are contributing to reduce the negative effect of their footprints on the environment (Alwi et al., 2017) and stimulate them to spread positive word of mouth about the brands (Becker-Olsen et al., 2006). In addition, today customers not only perceived themselves as accountable for their contribution to the planet pollution and waste buildup, but are interested in evaluating whether firms they are dealing with are damaging or protecting the environment. A firm that adopts a recycling program and that communicates this strategic choice to its stakeholders may be perceived as being environmentally responsible, thus enhancing its reputation (Alwi et al., 2017). Moving from these assumptions, it could be concluded that several benefits are associated with good environmental practices (Russo & Fouts, 1997) and, in particular, firms have the opportunity to reinforce their brand reputation through the adoption of effective recycling programs and by communicating to their customers how they are contributing to generate positive impacts on the environment.

Therefore, this study hypothesizes:

H3: Recycling within the firm as a circular economy practice has a positive and significant effect on brand reputation.

2.4 | Brand reputation and financial performance in a circular economy perspective

In recent years, it has become evident for firms that they could gain several benefits from CE practices and, consequently, an increasing number of firms have decided to adopt them. Internal benefits have been largely demonstrated, since reducing energy and material use could lead to important cost savings within the production cycle (Horbach et al., 2012). However, the 3Rs principles implementation is expected to increase also intangible assets (Székely & Knirsch, 2005) such as firm reputation and, consequently, it could be assumed that this strategic approach could contribute to firm performance.

Since consumers have become effective and successful in banning or refusing firms and their brands for ethical or environmental reasons (Yates, 2011), firms not respecting social norms such as CE principles, could cause irreparable damage to their reputation and, consequently, could negatively affect their performance. In this perspective, firms, especially large ones, recognize that business ethics principles adoption not only is expected by customers but is of value to their business (Klettner et al., 2014) since, by improving firms ability to attract new prospects and retaining actual customers, it could contribute to enhance firm reputational capital (Gangi et al., 2019; Miroshnychenko et al., 2017). Previous studies have also demonstrated that firms facing a crises that generate a detriment of the brands and cause a reputation loss, in the long run, also record bad financial performance (Bridoux & Stoelhorst, 2014). Finally, it has to be consider that CE principles adoption and, more generally, social behavior could represent a source of competitive advantage (Ducassy, 2013). In fact, marketing costs for firms that have a good reputation among their customers are lower because people are naturally attracted to firms that share their values, and this has to be supposed to contribute to financial performance.

Therefore, this study hypothesizes:

H4: Brand reputation has a positive and significant effect on financial performance in a circular economy perspective.

2.5 | Mediating role of brand reputation

Reputation is a key corporate social responsibility practices outcome that is associated with positive financial performance (Michelon et al., 2013). Previous studies suggested that the fit between brand reputation and sustainability practices lead firms to achieve better financial performance (Becker-Olsen et al., 2006). Even if this positive association has been dominant in the CSR debate (Carroll & Shabana, 2010), the result still remains inconclusive. It can be concluded that the correlation between CSR and FP is more complicated. In fact, some research reveal a negative correlation, while others even find no correlation (Lima Crisóstomo et al., 2011; McWilliams & Siegel, 2000; Smith et al., 2007; Teoh et al., 1999; Wagner et al., 2002), suggesting that external factors could affect this relationship. Drawing on the literature on the external factors to the CSR and financial performance relationship, reputation is

especially emphasized due to its importance as a strategic resource (Flanagan & O'Shaughnessy, 2005). However, despite its importance, reputation is still a largely understudied area in the context of both CSR and CE (Kowalczyk & Kucharska, 2020; Kucharska, 2020; Lai et al., 2010). Moving from these assumptions, it could be concluded that brand reputation is expected to play a mediating role in the relationship between circular economy practices and firm financial performance.

Therefore, this study hypothesizes:

> In the mediated relationship between circular economy practices and firm financial performance, brand reputation acts as the mediating factor.

3 | METHODOLOGY

Figure 1 portrays the conceptual model, stating the relationship of each 3Rs construct with brand reputation and financial performance.

The hypothesized relationships were tested by means of structured equation modeling (SEM) in order to assess whether and how the three CE practice constructs identified—waste treatment, reduction and recycling within the firm—have a positive effect on brand reputation and, in turn, on financial performance. Despite some limitations especially connected to multi-collinearity issues of the independent variables, the SEM technique was applied in order to estimates simultaneously the net effect of each independent variable with the dependent ones (Woodside, 2013), also by taking measurement errors into account (Iacobucci et al., 2007). Moreover, the SEM approach is more suitable and powerful than other methods in testing mediation effects among independent and depend variables (Iacobucci et al., 2007).

3.1 | Sample and data collection

To successfully address the research aim, the study investigates a sample of large-sized manufacturing firms operating in Italy recruited from an opt-in panel by an end-to-end platform that, by automating sample fieldwork and operations, scales and manages multiple online panel sources across different industries around the world.

According to the The Circular Economy Network (2019), in 2018 Italy has recorded a huge improvement in CE practices by adopting innovative waste, reduction and recycling management practices and developing new business and consumption models centered around the sharing economy in order to reduce and recycle waste and use secondary raw materials. Moreover, among the European countries, Italy ranks first in terms of circularity of production compared to the top 5 European economies, ranks third ahead of Germany in terms of domestic consumption, and ranks seven in adopting policies dedicated to the transition to CE useful to make more sustainable and competitive its national economy (Spaini, 2018; The Circular Economy Network, 2019).

Furthermore, large-sized manufacturing firms operating in Italy represents a suitable research context. In fact, corporate social responsibility and CE orientation appears to be widespread especially between large-sized firms that operate in the Italian manufacturing industry (Istat, 2020). More in detail, since 2018, the majority of large-sized manufacturing firms (71.6%) have implemented 3Rs practices to effectively reduce their environmental impact. Italy is known as a country with a strong tradition in manufacturing, but it lacks raw materials and energy sources and thus Italian firms tend towards circularity as a basis for their sustainable manufacturing (Istat, 2020). Therefore, the Italian setting and the sample of large-sized manufacturing firms are suitable and consistent with the aim of the research.

Data were collected through an online questionnaire distributed to a population of managers that work within manufacturing firms that have started to adopt CE principles. The questionnaire was created in Italian and translated into English by language experts following Brislin (1970) back-translation procedure. The questionnaire was also pre-tested by bilingual researchers to avoid any potential sources of bias and prevent misunderstanding. Thereafter, 10 randomly selected participants were involved in a pilot study in order to

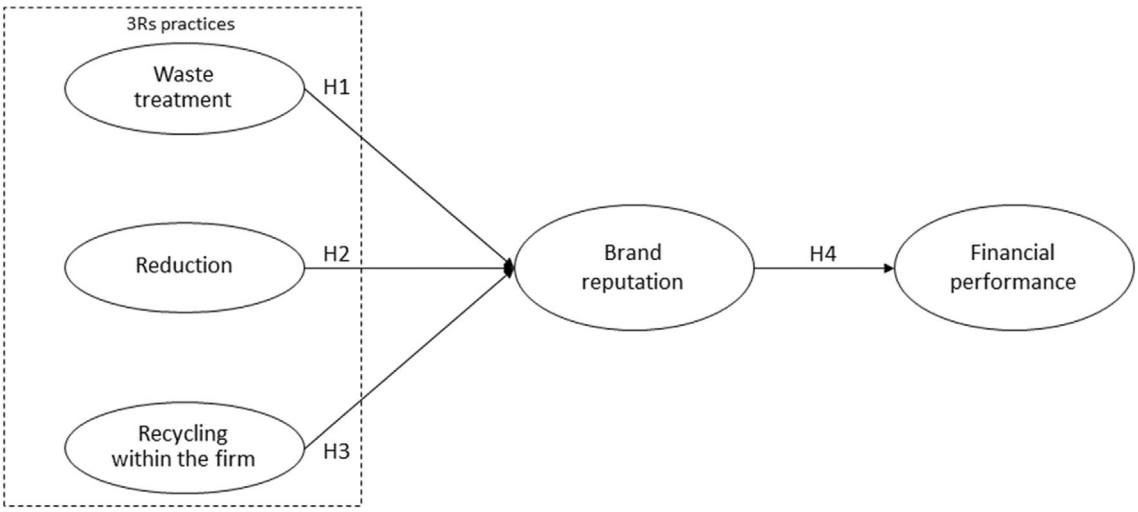

FIGURE 1 Conceptual model

evaluate the validity of the items within the questionnaire, and to check the overall reliability and usability of the questionnaire.

The questionnaire, in which respondents self-reported their answers on 5-point Likert scales, was developed according to the extant literature on corporate social responsibility, CE and corporate performance. Specifically, the questionnaire was structured in two parts: the first one was devoted to investigate the constructs under observation and the existing relationships among them, while the second part addressed general information of the investigated firms, such as number of employees, and sales revenue.

Data were collected in one wave that lasted for 2 months, from January 2020 to March 2020. In order to reach the study aim, four screening questions were used to ensure each participant was qualified to participate in the survey. These questions concerned whether the individual was employed or unemployed, his/her job position, the firm's field of activity and the firm's adoption of CE principles. At the end of the data collection process, a total of 772 questionnaires were returned in a completed form. Since the research aim is to investigate how large-sized firm CE practices affect firm performance, of these 772 questionnaires, 404 remained after eliminating 368 questionnaires filled out by managers that have declared to work in small and medium enterprises (SMEs). Therefore, the final sample consists of more than 150 respondents that is the threshold recommended as "sufficient for a convergent and proper solution" in SEM methodology (Anderson & Gerbing, 1984; Iacobucci, 2009).

In order to control for non-response bias, four different approaches were performed. First, by pre-testing the questionnaire through a pilot study, each item was clarified to minimize its ambiguity, and the questionnaire was structured to distribute the independent and dependent variables across its different sections (Jahanmir & Lages, 2016). Second, the questionnaire guarantees the respondents anonymity, by removing all information that could be used to identify them. Third, the aim of the study was not revealed to the respondents. Finally, to check whether the variance of all constructs was explained by only one component, Harman's single-factor test was performed (Podsakoff et al., 2003). The Harman's single-factor test indicates that the total explained variance of a single factor is 49.12%, suggesting that common method bias was not a concern for this study.

3.2 | Measures

The study uses constructs' items from previous studies and all measures were adapted to suit the research context. The waste treatment construct was measured using three scale items (Agan et al., 2013). This construct refers to the firm practices (such as water filtering system, air filters usage and waste recycle) aimed at preparing waste for better recovery and disposal in order to preserve ecosystems and, at the same time, provide sustainable development. With regard to the reduction construct, the scale used derives from the definition given by Agan et al. (2013) and consists of three items. These items measure the degree to which firms conserve energy, water, and raw materials. A set of five-item scale was used to measure the recycling within firm construct (Agan et al., 2013). This scale was adapted to capture the degree to which firms collect and reprocess raw materials, scrap, and water and recycle them into reusable raw materials. The measurement scale of brand reputation was borrowed from the studies of Lai et al. (2010) and Kucharska (2020) and was measured by using four items. These items reflect the degree to which customers think about a firm, and whether they judge it as highly valued, well-intentioned, and praiseworthy compared to its competitors. Finally, the financial performance construct was measured using five scale items, drawing from the studies of Rao (2002), Schramm-Klein et al. (2015) and Zhu et al. (2007). The construct was adapted to measure profit and operational performance such as productivity, increase of market share and return on investment (ROI).

All items were measured on a 5-point Likert scale (1—strongly disagree and 5—strongly agree).

3.3 | Data analysis

Structural equation modeling with LISREL 8.80 was performed to test the model and the hypotheses presented in Figure 1, evaluating interrelationships between 3Rs constructs—waste treatment, reduction, and recycling within firm—brand reputation, and financial performance, as outcomes.

4 | RESULTS

4.1 | Measurement model

Using SPSS and LISREL 8.80, the study estimates Cronbach's alphas (CA) and confirmatory factor analysis (CFA) to test reliability, convergent validity and discriminant validity of each construct (Anderson & Gerbing, 1988; Jöreskog & Sörbom, 2006).

With regard to reliability, all Cronbach's α values are greater than 0.70 (Bagozzi & Yi, 1988; Nunnally & Bernstein, 1994), suggesting an acceptable reliability of each of the study's constructs.

Referring to the CFA, convergent validity is supported, since all item loadings are greater than the recommended threshold of 0.50 (Hair et al., 2013), all the composite reliability values (CR) are higher than the minimum threshold of 0.70 (Bagozzi & Yi, 1988; Nunnally & Bernstein, 1994), and all the average variance extracted values (AVE) exceed the recommended threshold of 0.50 (Fornell & Larcker, 1981), except for waste treatment construct. Waste treatment AVE value is 0.496 that, according to Fornell and Larcker (1981), still corresponds to an acceptable convergent validity for the construct.

Moreover, since all AVE values are greater than the squared correlations of the constructs (Fornell & Larcker, 1981), also discriminant validity is supported, confirming the validity of the measurement scales used.

Table 1 shows reliability and CFA results.

4.2 | Structural model

The fit statistics of the structural model are within acceptable ranges, with χ^2 726.125; degrees of freedom 163; χ^2/df 4.455; root mean square error of approximation 0.094; comparative fit index 0.967; standardized RMR (SMRM) 0.069. All items load significantly on their assigned latent constructs.

The results from the SEM analysis shown in Table 2 indicate that waste treatment has a positive and significant impact on brand reputation ($\gamma = 0.329$, $t = 2.661$, $p < 0.01$), supporting H1. Further, the results show that recycling within the firm directly and positively affects brand reputation ($\gamma = 0.518$, $t = 5.276$, $p < 0.01$), supporting H3. There is also a significant and positive relationship between brand reputation and financial performance ($\beta = 0.773$, $t = 11.945$, $p < 0.01$), supporting H4. However, the findings do not provide support for H2, showing a not significant effect of reduction on brand reputation ($\gamma = -0.092$, $t = -0.672$, $p > 0.05$). Finally, the structural model explains 51.1% of the variance in brand reputation ($R^2 = 0.511$), and 59.7% of that in financial performance ($R^2 = 0.597$) (Figure 2).

TABLE 1 Reliability and CFA results

Constructs	α	CR	AVE
Waste treatment	0.737	0.746	0.496
Reduction	0.836	0.837	0.633
Recycling within firm	0.889	0.888	0.613
Brand reputation	0.896	0.888	0.666
Financial performance	0.907	0.908	0.665

4.3 | Structural model: Mediating role of brand reputation

A formal test of mediation (Sobel, 1982) was performed in order to understand whether brand reputation acts as the mediating factor in the relationship between circular economy practices and firm financial performance. The results show that brand reputation fully mediates the impact of waste treatment on financial performance ($Z = 2.507$; $p = 0.012$), whereas it partially mediates the impact of recycling within the firm practices on financial performance ($Z = 4.385$; $p = 0.000$). Moreover, coherently with the results obtained in the baseline model, brand reputation does not mediate the impact of waste and pollution reduction practices on financial performance ($Z = -0.506$; $p = 0.613$), Table 3 provides the test of mediation.

4.4 | Direct effect of reduction on financial performance

Since, according to Agan et al. (2013), Cesar da Silva et al. (2021) and Lin et al. (2019), reduction practices may positively and directly affect

TABLE 2 Structural relationships and hypothesis testing

Hypotheses	Path	Completely std β and γ	t Value	Decision
H1 (+)	Waste treatment → Brand reputation	0.329	2.661**	Supported
H2 (+)	Reduction → Brand reputation	−0.092	−0.672	Not supported
H3 (+)	Recycling within firm → Brand reputation	0.518	5.276**	Supported
H4 (+)	Brand reputation → Financial performance	0.773	11.945**	Supported

**$p < 0.01$.

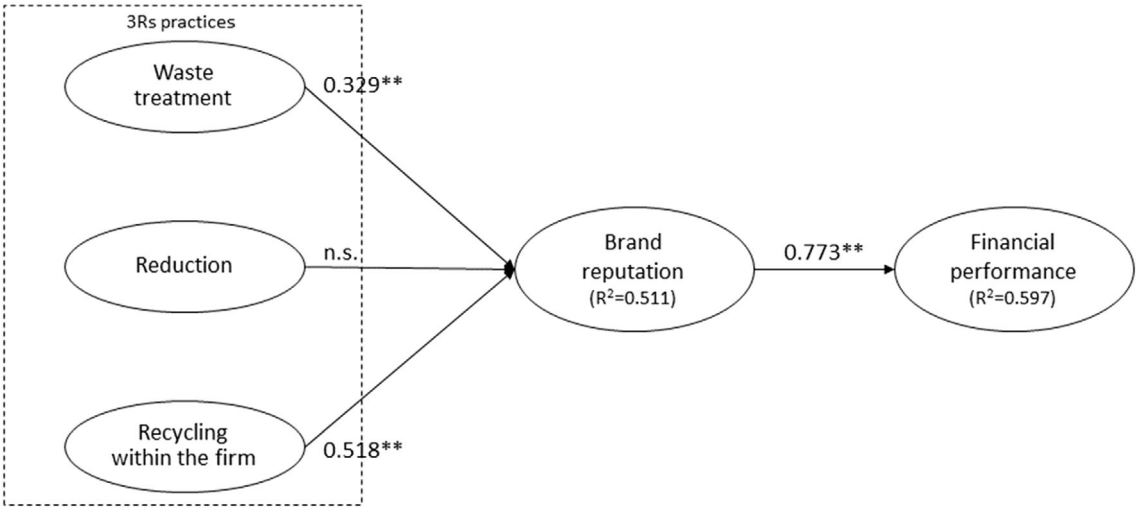

FIGURE 2 Structural model. *$p < 0.05$; **$p < 0.01$

TABLE 3 Test of mediation

Direct effect			Brand reputation	Financial performance
Waste treatment			0.322 (*2.533*)	*n.s.*
Reduction			*n.s.*	-
Recycling within firm			0.473 (*4.722*)	0.429 (*4.674*)
	Indirect effect	***Z* test**	***p* Value**	**Mediation**
Waste treatment	0.134	2.507	0.012	Fully
Recycling within firm	0.185	4.385	0.000	Partial

Note: The numbers in italics in parentheses are the *t* values.

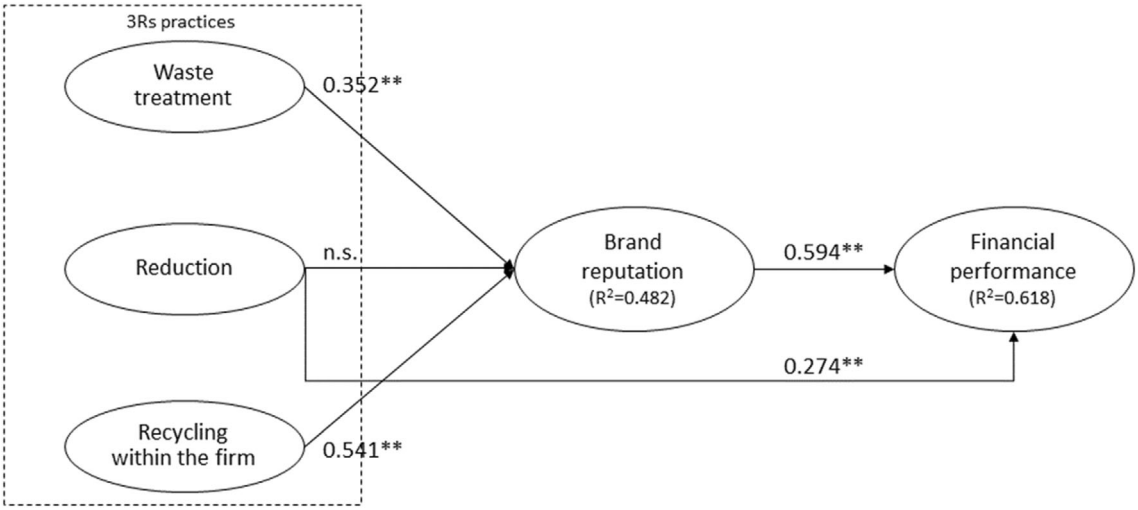

FIGURE 3 Structural model: Direct effect of reduction on financial performance. *$p < 0.05$; **$p < 0.01$

financial performance, the study also verified the direct effect of reduction on financial performance. In fact, reduction that refers to the saving of energy, water, and raw materials not only brings benefits to the environment, but also allows firms to reduce their costs and therefore to directly enhance financial performance. In this regard, findings reveal that the relationship between reduction practices and financial performance is effectively positive and significant ($\gamma = 0.274$, $t = 5.095$, $p < 0.01$) (Figure 3).

5 | DISCUSSION

In the last ten years, corporate social responsibility has become an economic imperative in the marketplace and firms have advanced and promoted their efforts to integrate environmental, social and corporate governance objectives into their business models and to develop a more social responsible decision-making process. In particular, CE has been recognized as a mechanism that could help firms to realize economic advancements in an environmentally sustainable manner (Moric et al., 2020).

Even if previous studies have examined the effect of CE adoption by firms on financial performance, results continue to be mixed and, thus, the literature lacks clear empirical evidence on the nexus of CE, corporate social responsibility and firm performance, in terms of both brand and financial performance, especially in Italian large-sized manufacturing context (Cillo et al., 2019; Crane et al., 2017; Kurapatskie & Darnall, 2013; Messeni Petruzzelli & Ardito, 2019; Moric et al., 2020; Scuotto et al., 2020).

In addition, there is a lack of studies that empirically explore whether and how CE practices affect firm performance at the firm level and by using primary data collected directly from firms' managers (Esken et al., 2018; Fortunati et al., 2020; Lai et al., 2010; Stewart & Niero, 2018; Turoń & Czech, 2017). Moreover, the extant literature has mainly investigate the direct relationship between sustainable practices and firms performance, without considering any intervening factor that could contribute understand this complex relationship (Galbreath & Shum, 2012; Grewatsch & Kleindienst, 2017; Kucharska, 2020; Saeidi et al., 2015). In this line, both theory and practices have highlighted the need of more research to fully understand whether and how corporate social responsibility contributes to enhancing firm performance (Crane et al., 2017).

Firms could benefit from the development of CE practices, by integrating environmental and consumers concerns into their operations and core strategy, since they foster the achievement of a superior brand reputation that, in turn, become a crucial driver of financial performance. Along with this idea, the objective of this research is to examine the link between CE practices, namely waste treatment, reduction, and recycling within the firm, and brand reputation and, in turn, financial performance, and to test whether and how brand

reputation mediates the relationship between 3Rs principles and financial performance.

Although not all the hypotheses developed are confirmed, the findings reveal that waste treatment and recycling practices positively and directly affect brand reputation. In line with the extant literature in corporate social responsibility field, this means that a CE is key to enhance brand reputation, since it gives firms a positive reputation among various stakeholders (Kowalczyk & Kucharska, 2020). Firms engaged in CE practices may strengthen their competitive position with regards to socially responsible behavior and tend to have higher levels of perceived reputation among stakeholders (Tkalac Verčič & Sinčić Ćorić, 2018). In fact, in response to the increasing expectations of society and stakeholders in a sustainable perspective (Ardito et al., 2020), firms implementing waste treatment and recycling practices are really engaged in changing their business operations and in integrating environmental concerns into their business practices. Through these important ways of implementing sustainable economy, firms could improve their overall performance (Ducassy, 2013). In fact, by adopting a social behavior, firms could enhance their reputation among customers, reducing marketing cost to acquire new customers and retain existing ones. Additionally, the positive reputation that can be achieved with the implementation of CE practices provides a competitive advantage since it is not a resource that can easily be imitated by competitors (Yildiz Çankaya & Sezen, 2019). Therefore, by working on the valorization of raw materials and industrial wastes (waste treatment) and by developing recycling practices to re-use waste and recover secondary materials (recycling within the firm), firms may enhance their corporate reputation among various stakeholder groups in a sustainable perspective (Lüdeke-Freund et al., 2019; Rosa et al., 2019).

The study finds that the relationships between waste treatment, recycling practices, and financial performance are mediated by brand reputation. The engagement in CE practices allows firms to shape stakeholders inferences positively and, subsequently, obtain a better reputation (Galbreath & Shum, 2012). Firms that have acquired higher level of reputation among their stakeholders are more likely to achieve higher level of financial performance. In this regard, the study findings suggest that CE practices are associated with firm performance, and that association is mediated by brand reputation. In line with the scholars that have tried to better explain the mechanisms that underlie between corporate sustainability and performance (Galbreath & Shum, 2012; Grewatsch & Kleindienst, 2017; Kucharska, 2020; Saeidi et al., 2015), the study provides additional information about the mediating role brand reputation plays as a critical variable in the relationships between CE practices adopted by firms and their financial performance. Moreover, the empirical results strongly support the positive and direct effect of brand reputation on financial performance in a CE perspective. According to previous studies on green and sustainability management (Miroshnychenko et al., 2017; Rosa et al., 2019; Schaltegger et al., 2011; Zhang et al., 2018), the relationship between firms success and CE view, especially in terms of environmental, social, and economic views, is positive, since by implementing CE firms may better manage their value proposition, customer views, infrastructures and networks, enhance their reputation and, in turn, their financial aspects. In fact, the extant literature has suggested that CE practices increase firms' reputation and image and lead to an increase in sales, and thus, they affect the firms' economic performance positively (Yildiz Çankaya & Sezen, 2019). The brand reputation gained by adopting CE practices is associated with positive financial performance (Gangi et al., 2019; Kowalczyk & Kucharska, 2020) because corporate reputation has a direct effect on consumer responses (Li et al., 2019). In this context, CE plays a secondary role in determining financial performance because it is targeted towards increasing corporate reputation through environmental, social and economic measures that, in turn, affects financial performance (Miroshnychenko et al., 2017). That is, CE practices improve corporate reputation that, in turn, helps firms to obtain higher financial performance, especially in terms of profitability, market share, revenue, and return on investment (Kazancoglu et al., 2018).

Finally, by testing the direct effect of reduction on financial performance, also this study findings provide evidence about the fundamental role played by CE practices in fostering firm performance. In line with previous studies (Agan et al., 2013; Cesar da Silva et al., 2021; Lin et al., 2019), firms that implement reduction practices increase their financial performance because these practices allow them to save energy, water, and raw materials and, thus, they not only generate environmental benefits but also costs reduction that directly impact economic-financial performance. Firms that reduce energy, water, and raw materials usage are more likely to improve their productivity and to enhance their profitability through reducing production costs and by increasing sales in a sustainable manner (Nishitani et al., 2017).

6 | CONCLUSIONS

This study sheds new light on the relationship between CE practices and corporate performance and the study's results provide useful insights, both theoretically and practically.

6.1 | Theoretical contribution

From a theoretical point of view, this study contributes to the academic literature in two ways. First, this study constitutes an important step forward in understanding the role played by three different CE practices in enhancing firm performance, both in terms of brand reputation and financial performance, by suggesting that CE strongly supports firm outcomes. In fact, this study is a first attempt to empirically investigate whether and how the implementation of waste treatment, reduction and recycling practices, as effective CE practices, contribute to brand reputation and, in turn, on financial performance. Extant literature has long emphasized the importance of corporate social responsibility and green management in order to achieve higher corporate social and financial performance, by emphasizing the widely accepted environmental benefits of sustainability practices. However,

the corporate financial benefits for the firms embarking on corporate social responsibility (in general) and CE (in particular) remain uncertain (Moric et al., 2020). Therefore, by highlighting the crucial role of waste treatment and recycling within the firm in improving brand reputation and of reduction and brand reputation in enhancing financial performance, the study's findings clarify and answer the call to develop more empirical studies useful to fully understand the relationship between sustainable practices and firm performance (Fortunati et al., 2020; Stewart & Niero, 2018; Turoń & Czech, 2017).

Second, the study tests the mediating role of brand reputation on the relationship between CE practices and financial performance to investigate whether and how the development of reputation through the 3Rs practices leads firms to obtain better financial performance. The study extends the current understanding of CE practices and their role in affecting stakeholders perceptions about the firm itself and in the enhancement of firms performances (Caputo, 2021; Laszlo, 2003). By providing empirical support for the mediating role of brand reputation as a critical resource, the study suggests that brand reputation support firms in better communicating their involvement towards the environment, supporting stakeholders to better recognize and appreciate firms commitment to act in ways consistent not only with their economic and financial targets but also with the interests of the natural environment. This result is important because they highlight that, thanks to brand reputation, firms can effectively exploit the initiatives they have adopted to reduce their environmental impact, transforming these activities from a merely item cost to an opportunity for enhancing the financial performance.

Finally, the study furthers the knowledge about CE practices implementation and their effect on overall corporate performance by analyzing primary data collected from managers operating within large-sized manufacturing firms. Moreover, this study adds to the extant literature because it investigate CE by adopting a firm level perspective. Therefore, this study represents an advancement of previous studies that have mainly focused on secondary data retrieved from yearly release corporate sustainability reports rather than on firm primary data, by filling this literature gap (Stewart & Niero, 2018).

6.2 | Managerial implications

Beyond theoretical contributions, this research offers practical implications for firms seeking to develop or optimize circular economy, by implementing sustainable practices, in terms of both environmental and social fields, and achieving higher levels of brand reputation and financial performance. By confirming hypotheses 1 and 3, the study highlights the importance of circular economy practices and, in particular, of waste treatment and recycling practices, in improving brand reputation and, in turn, fostering financial performance. Circular economy practices centered around waste and recycling management appear to be a key factor for improving brand reputation, by creating and reinforcing identification, trust, and emotional ties between customers and the firm/brand itself. Managers should work in order to adapt the existing products in environment-friendly ones, thinking not only to the environmental impact of the product itself, but also taking into account their producing process. In fact, due to the firm role in the society, engineering a product that contributes in reducing firm footprint plays a role in making customers aware of the firm environmental responsibility. In particular, since waste treatment has often been identified as first among the activities firms could adopt to enhance their reputation among customers, managers should engage themselves and their collaborators in thinking a production lifecycle that, by implementing an effective waste treatment, reinforces firms commitment for developing sustainable businesses. With regard to internal recycling practices, the study findings suggest to managers the critical role that the reuse of waste generated by the production cycle has assumed in the actual scenario. Customers are demanding firms to be aware of the important of recycling their waste, suggesting managers not to base their environmental practices solely on waste treatment but also on recycling within their firms if they aim to increase their brand reputation thanks to their circular economy practices.

Besides waste treatment and recycling practices, the implementation of reduction practices as strategic actions, which allow firms to reduce industrial waste, pollution generation and expenditures within production cycle, contribute to directly affecting the firm's ability to improve their financial performance and to achieve a sustainable competitive advantage. Even if the reduction of waste at the source plays a key role in the establishing and reinforcing the relationship between firms environmental practices and their performance, there should exist some criticalities in making customers aware of these efforts, making these practices currently useless for reinforcing brand reputation. However, managers should be interested in adopting reduction practices and moving towards a waste reduction to enhancing the proportion of non-waste leaving their production process because, in the short term, this contributes in enhancing firms financial performance and, in a long term perspective, it could support also brand reputation since customers are increasingly interested in evaluating firms environmental practices to establish relationship with brands.

Therefore, firms should pay attention to the development and integration of circular economy practices into their sustainability agendas. Accordingly, managers should try to implement effectively waste treatment, reduction and recycling practices, and, in turn, improve their firms' brand reputation by enhancing emotional attachment customers feel toward an organization, and to create a sense of identification by sharing the same ethical and social values of their customers. At the same time, even if it could be difficult to communicate these efforts externally, managers should be aware of the importance of interacting and establishing communication channels with different stakeholders to communicate the initiatives their firms have adopted to satisfy the 3Rs principles.

Finally, since the findings of this study suggest a role for circular economy practices in promoting firm performance indirectly through brand reputation, policy makers have to evaluate and analyze the current policy landscape and promote useful resources in order to favor circular economy and responsible corporate behaviors at an institutional level. In this regard, the study contributes to the nascent

body of circular economy literature by raising also policy makers' awareness about the necessity of a set of policy recommendations to promote the transition towards a circular economy through waste management, recycling, and reuse. Governments have to catch the opportunity to develop widespread circular economy practices that integrate reuse principles into production, as well as implement marketing and communications campaigns to awaken public opinion to new way of sustainable consumption, natural resources and waste management.

6.3 | Limitations and future research directions

This study has some limitations, so further research is necessary. First, the sample of the study comprises managers that operate in the Italian market. Future research should include managers from other countries in order to develop a comparative cross-country study and to provide evidence of generalizability. Moreover, the sample is referred only to large-size firms. Future research should analyze small and medium-size firm in order to understand both the commonality and differences between these two different firm sizes.

Moreover, future research should be taken into account other explanatory variables of CE and corporate performance, such as eco-design, environmental management system, CE communication, brand image, environmental and social performance which are referred to play potential roles in enhancing financial performance and in creating and maintaining firms' competitive advantage.

Finally, a further limitation of the present study that could be overcome with future research is that the study analyzes only three CE principles. Future research should investigate other CE principles, such as refurbishing, remanufacturing, and prolonging.

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