Evidences on sustainability issues in the Fashion Supply Chain: An empirical study in Italy

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ARTICLE INFO	ABSTRACT
	The fashion industry is among the most polluting in the world, consuming large quantities of resources, hydric above all, and is responsible for massive harmful emissions and wastewaters. Moreover, demand for new products is currently extremely high, thus determining more sources to be managed, waste, a greater impact of production systems. Several studies have been proposed in literature addressing sustainability issues, but companies' perspective is rarely included and empirical research was highly recommended from researchers. In response, the will to collect evidences of some selected aspects related to drivers encouraging sustainable actions, practices, and performances reached. To this end, a survey was developed and sent to some Northern Italian companies operating in the fashion field. Descriptive, factor, cluster and discriminant analyses were performed on the sample using Statistical Package for Social Science software package. The companies surveyed show awareness and information about the issues related to sustainability and they are also willing to support actions for greening their supply chain. However, they are also hesitant towards the concrete adoption of green practices (both at present and in the future). Among the main findings, unexpectedly, the topic of Reverse Logistics turned out to be of scarce interest, while the quality of garments is perceived not to be affected by the usage of recycled or alternative raw materials. The same survey was also sent to 253 academics for comparing the two perspectives; overall, they turned out to be aligned regarding the issues investigated. This work contributes to enrich research about sustainability on the Italian fashion context, in which a similar investigation actually lacks.

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1. Introduction

The Fashion Supply Chain (FSC) embraces some of the most polluting industries of the world (Boström and Micheletti, 2016); just think that in 2018 it was estimated to be responsible for approximately 2.1 billion metric tons of greenhouse gas emissions, half of which were created by fast fashion (Wren, 2022). Water as well represents a big issue in this field, since annually 93 billion cubics meters of water are involved (Gazzola et al., 2020), given the fact that 20.000 l are needed for producing just one t-shirt and one pair of jeans (Rooney, 2019) and that approximately 8500 are required for growing one kilogram of cotton (Desore and Narula, 2018). Moreover, the recent abovementioned fast fashion models generated increased consumption of resources, with subsequent millions of tons of textile waste (Bick et al., 2018) resulting from increased purchasings and fashion products' turnover (Xie et al., 2021).

Additionally, the recent challenges the field has to face such as the spread of e-commerce systems and the increased demand for products in an extremely high rapidity, rather than the labour exploitation or the production outsourcing in emerging and developing countries have attracted researcher and practitioners in investigating issues related to the FSC sustainability from all its three perspectives, namely environmental, economic and social (Tebaldi et al., 2021).

What however emerges is that seldom companies are directly involved in research activities relating to sustainability, while some key questions would deserve empirical evidence, given their relevance and topicality. In line with this consideration, the aim of this paper is to present results from a survey analysis carried out among some northern Italian companies operating in the fashion field. The survey focuses on some questions related to: (i) drivers that encourage companies towards the adoption of green practices; (ii) the level of adoption of these practices; and (iii) the performance that companies concretely achieve at present. The outcomes obtained were elaborated through IBM

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Statistical Package for Social Science (SPSS) for Windows software package. To be more precise, reliability and factor analysis were firstly performed to assess the trustworthiness of replies and of the structure of the whole survey; then, some descriptive metrics were determined, followed by a cluster analysis for grouping companies according to their sustainable performance and a discriminant analysis for understanding the variables impacting the most on the clustering and its goodness.

These analyses are functional to address the following two research questions: (1) do companies positively assess sustainability practices and actions, and are they aware of what can be done for ecosystem protection? (2) is there a positive trend in Italy towards the adoption of green practices among companies of the FSC?

For completeness, the survey was also sent to a list of researchers and academics in order to highlight possible differences among the industrial and the academic world. An *independent-samples T-Test* was carried out to compare the opinions two groups: from the comparison, it emerged that most of the opinions are aligned, and no particular inferences were detected; accordingly, this part of the analysis will not be detailed in this manuscript. However, specific outcomes can be provided to interested readers both for this final comparison, and for the whole survey as well.

Hereinafter, Section 2 presents a literature overview for defining the trends of the research related to sustainability within the FSC, while Section 3 details the methods followed in this study, together with the structure of the survey; results and statistical analyses are then illustrated in Section 4, including a brief discussion. Section 5, finally, presents conclusions and future research directions.

2. Literature review

As emerged from a literature analysis aiming at defining the trends of research of scientific documents in the FSC, the sustainability issue is one of the most addressed topics (Tebaldi et al., 2021), and there is a plethora of issues that can be addressed. Recalling a subdivision in functions of a FSC proposed in (Bottani et al., 2020), i.e., supply, warehousing, production, distribution and RL, below some main studies will be proposed in order to provide a brief overview of the main actions and practices.

First of all, note that the supply phase is intended to be the textile industry, namely the one that deals with raw materials production, and what emerges is that most of the existing studies refers to the textile and fibers production rather than on the manufacturing of finished products. The reason is that the raw materials production is the most critical phase in sustainability terms; indeed, these processes consume large quantities of water, generate huge wastewater and consequently it has a great impact on the environment (Gomes De Moraes et al., 2000).

Starting from the beginning of the journey (supply stage, *alias* textile industry), the main cruciality from literature turned out to be the production of sustainable fibers and materials, and a correct supplier selection, better known as green supplier selection practice. As far as the first argument, for instance, the authors recall Radhakrishnan (2017), who examined different practices for organic cotton production, from its growing to its industrialization; Sanches et al. (2015), instead, proposed a comparative study of garments produced by organic cotton, lyocell (a sustainable fibre obtained from cellulose) and a third fibre from soy, showing that the raw materials in question are suitable for fashion products, and that production which involves these materials is less polluting and dangerous for the environment and the society. Another interesting work by Wankowicz (2016) represents a case study of an Italian company producing synthetic fibers, in which the sustainable practices adopted by the company are detailed; the most interesting, is a dedicated brand called Econyl, which includes spun material entirely produced from waste, and 100 % recyclable. Moreover, this company pays attention towards the social sustainability as well,

encouraging integration among employees, disabled people inclusion, projects with schools or awareness campaigns towards recycle. Other studies, instead, deal with the industrial usage of solvents replacing water (e.g., for whitening); this is the case for Eren et al. (2018), who proposed to use supercritical carbon dioxide ($SC-CO_2$) instead of water. Again, Hussain and Wahab (2018) examined different existing practices for water conservation and grouped them into four categories: water conservation through treatment and reuse of textile wastewater; through machinery innovations for textile production; through textile processing methods innovations; through innovation of chemicals; finally, they also proposed tools for carrying out analysis and thus allowing water conservation. Also in this study, the $SC-CO_2$ turned out to be a promising material for dyeing, as well as the use of low liquor ratio machines in textile wet processing is another proper approach, even if both require huge initial investments.

The second key element regarding the supply stage, is the supplier selection in which usually the focal company is involved. In this perspective, Amindoust and Saghafinia (2017) and Winter and Lasch (2016) listed different criteria to be observed for a green choice towards those suppliers who spend themselves for sustainability; for instance, these criteria are environmental certificates, eco-friendly material offer, adoption of emissions monitoring systems or wastewater treatments, or also social sustainability aspects such as prohibition of children or forced labor, working hours, or non-discrimination. More recent is the analysis performed by Pischulov (2019), who implemented a Voting Analytic Hierarchy Process (a hierarchical multi-criteria decision method) and achieved the absolute importance of 133 criteria for selecting suppliers, divided according to the three sustainability pillars. For further deepening these criteria the authors invite the readers to refer to the publication itself.

When talking about sustainable supply chain, the logistics aspect (including warehousing and distribution), is consolidated. Indeed, if considering that logistics and distributive activities are the major responsible for huge carbon dioxide emissions and for the massive use of fossil fuels (Bottani et al., 2015), it follows that this is one of the main functions to be monitored and on which to intervene for reducing harmful emissions. Moreover, as already stressed, this sector has to face many challenges due to the spread of e-commerce channels, and in this sense logistics systems are involved. Despite numerous studies that have dealt with the sustainable aspect of logistics operations, from the transport to the inventory optimization, few of them specifically focused on the FSC (Bottani et al., 2020). As far as the warehousing, the only study in which this function is clearly mentioned is the development and implementation of an analytical model for quantifying the economic and environmental sustainability dimensions of a FSC (Bottani et al., 2019), and the activities contributing to costs and emissions are detailed (i.e., storage; heating/cooling and lighting; material handling equipment). Other than that, in no other scientific contributions the warehouse is mentioned. However, it is worth mentioning other studies that can be indirectly addressed to sustainability: specifically, in these works the aim is to optimize and improve performances of activities such as picking or sorting, thus including an economic (e.g., expressed in processed units per hour) and a social (e.g., allocation systems for facilitate the picker within the warehouse) sustainability. To this end, it is worth mentioning the studies by Bottani et al. (2022), who proposed a strategy for allocating products in a warehouse of an e-commerce retailer selling fashion products for optimizing the outbound flow, or Gonzalez et al. (2017) who revised the existent Radio Frequency Identification applications in the fashion field with the same purpose of flows optimization; finally, Lucci et al. (2016) analyzed the traditional inventory management strategies for determining optimal stock level for luxury products. As already stressed, these mentioned works do not specifically refer to sustainability issues, rather on efficiency and optimization, and according to that they can fit among papers which contemplate the economic or the social side of the warehouse function.

The same reasoning holds true for the distribution: as done for the warehousing function, widening the horizons, there is some research which can be seen under a sustainability perspective. For instance, Hu et al. (2013) proposed a model for determining the optimal routes between supplier – cross-docking center – customer in a FSC, with an implicit resulting attempt of environmental impact reduction; Delgoshaei et al. (2021) as well illustrated and successfully implemented a model for scheduling distribution and sales of fashion products under stochastic demand, whose aim is to maximize profits and minimize lead-times and customer dissatisfaction; part of the same group of authors, two years earlier, presented a similar model aiming at optimally scheduling products distribution but this time for a fashion closed-loop supply chain (FCLSC) (Delgoshaei et al., 2019). Other similar studies could be mentioned, but unfortunately, exception made for the last since a FCLSC itself embodies the concept of sustainability, do not refer to this aspect, despite these arguments are well-established among the sustainable supply chain from an academic point of view. For concluding the logistics section, among the green practices which can be related to this aspect, the green packaging of the fashion product fits: this is the topic of the study carried out by Zhang and Yso (2018), who proposed focused action for letting the packaging be more sustainable, starting from avoiding excessive oversizing at the design stage, reaching sustainable and recyclable raw material for producing the packaging.

The last function included among those constituting an FSC is the RL, whose definition includes itself the concept of sustainability since the aim is to give again value to a determined product. This product (or part of it) could be recycled, regenerated, repaired or remanufactured for being sold again, or finally properly disposed of (Govindan et al., 2015). Moreover, nowadays the presence of a RL channel is considered a real service from the consumer side, which can also go beyond the sustainability aspect; indeed, customers expect to benefit from a returns service, possibly free of charge, which necessarily includes the presence of a system for managing physical, information and monetary flows back. It follows that the RL is the necessary function for closing the loop (and let the FSC be a FCLSC). In terms of literature, firstly, the already mentioned paper by Bottani et al. (2020), is recalled, which dealt with the development of a model under Microsoft Excel™ for determining the environmental and economic sustainability dimensions of a FSC, and in the modeling the RL channel is included; however, it shall be indicated that the implementation of the model in an Italian focal company of a FSC did not contemplate the RL function, as this company did not manage a RL channel; it follows that this part was not empirically tested. Janeiro et al. (2020) the same year proposed a conceptual model for a RL system managed by Third Party Logistics (3PL) for FSCs; Kim et al. (2018) developed and successfully implemented a deterministic model for flows optimization in a CLSC of the fashion industry, including concerns about demand uncertainty of recycled garments; again, Beh et al. (2016) illustrated a business model for second-hand fashion products retailers; Fitzsimmons et al. (2019), instead, investigated the topic of product optimal price when dealing with a FCLSC, allowing the system to be sustainable in economic terms, while Dissanayake and Sinha (2015) concentrated on the process of product development for fashion items which have to be remanufactured (from the quality issue to the disassembling phase, to the redesign of models).

From this last study, it emerged that partnership strategies among the actors operating in a RL system may lead to synergies and bring benefits to the system itself, including towards innovations. Finally, going back to the burning issue of managing returns and backward flows from e-commerce purchases, it is worth mentioning the work by Das et al. (2020), who designed a RL system for a company selling online.

More in general and not specifically related to a given function or area of a FSC, other interesting studies address sustainability issues; this is the case for Karaosman et al. (2016), who reviewed the recent literature concerning the integration between sustainability and FSC operations, confirming the positive relation between green practices implementation and improvement of performances both of the supply chain and of single actors; they also proposed a framework for classifying sustainable practices according to products, processes or supply chain. Desore and Narula (2018) some years later proposed an overview on sustainable practices adopted by companies in this context, highlighting that firms prove themselves to be active and willing towards the improvement of their environmental performances, even if this happens only in more industrialized countries. It is then worth mentioning the research by Wang et al. (2012), who implemented an Analytic Hierarchy Process (AHP) approach for assessing the risk related to the implementation of green practice in FSCs; specifically, three sustainable practices were included in this evaluation: the use of sustainable materials for producing garments, the CO_2 emissions reduction in distribution and reducing pollution generated by packaging; results revealed that the practice turned out to be the riskiest is the first. Another interesting study, addressing the current and environment non-friendly fast fashion, was carried out by Bick et al. (2018), who emphasized its negative effects: despite it contributed to a sort of democratization of fashion, the associated risks for the environment and the society in general are huge, and present across the whole chain since they start from the water-intensive cotton cultivation, to the release of dyes into local water sources, to the low salaries and poor working conditions, and a waste increase due to the rapid change of products by consumers. This is clearly intensified in the low and medium-income countries (LMIC), where safety actions for the environment and the human health are lacking (in this perspective the topic of production outsourcing is recalled). Other relevant argument treated in literature are the Corporate Social Responsibility adoption within fashion companies (Perry and Towers, 2013), the sustainability governance for a FSC with fast fashion characteristics (Li et al., 2014) or the consumer behavior towards eco-fashion (Chan and Wong, 2012), from which emerged a conflicted relation of a sensible customer towards environmental issues, but at the same time disinclined to by sustainable fashion products.

Finally note that most of the screened papers focus on environmental sustainability; economic aspects follow, and finally the social ones, which turned out to be rather lacking investigations and research (Tebaldi et al., 2021).

For concluding this brief overview on studies dealing with sustainability in the FSC, it is worth mentioning that no empirical contributions in terms of surveys involving companies were recorded, and this is the gap intended to be partly filled with this manuscript. The only survey investigations are consumer-centered, to assess their behavior towards sustainable fashion (e.g. Gazzola et al. (2020) or Gwozdz et al. (2013), who demonstrated that among the new generations and specifically the Z one, there is great awareness of these themes).

3. Methods

3.1. Research design

The survey was developed between December 2020 and January 2021 after a careful and accurate analysis of the literature carried out in a previous review study (Tebaldi et al., 2021), whose aim was to identify the main research trends in the fashion sector. To this end, a query on the Scopus database was performed with the unique keyword "Fashion Supply Chain", resulting in 118 scientific documents reviewed, 32 of which dealt with sustainability issues. On the basis of these findings, given the general highlighted need for empirical research involving companies, actually lacking, some aspects were selected for empirical validation, deserving attention according to the opinion of the authors. For more details on the literature review, the reader is referred to the previous publication.

3.1.1. Samples definition and data collection

This study makes use of two samples, including the industry and the academic field.

As far as the industrial sample is concerned, 250 companies were randomly selected from a preliminary list retrieved by carrying out some queries on the Kompass database (https://it.kompass.com/en), a leading provider of business information that can be used for multiple purposes such as sales, marketing, procurement or research. Specifically, considering the context under investigation, the category "Clothing and footwear" belonging to the macro category "Textiles, Clothing, Leather, Watchmaking, Jewelry" was selected, which includes companies whose core business includes garment and accessories manufacturing. The only constraint set was that of having the headquarter based in Emilia-Romagna or Lombardia regions, two of the most productive areas of northern Italy. The rationale for this geographical location is that at this stage the survey is to be regarded as a pilot study; based on the results of the first analysis, it is expected to be refined and sent to companies on the whole Italian territory. Finally, note that the results from the query on the Kompass database had an order of magnitude of thousands of companies; and this stage the number of 250 companies was chosen for consistency with the number of academics.

Concerning the academic sample, the names of 253 academics were retrieved from the list of authors quoted in the previous literature review by Tebaldi et al. (2021); relating contacts were taken from the Scopus database or from other official websites (e.g., the university website). Having published literature about sustainability in the fashion industry, it is reasonable to assume that the cited authors are familiar with related issues and can be considered experts in the field. The full list of companies and academics can be made available to interested readers upon request.

The survey, whose structure is detailed in Section 3.3, was sent to the sample of companies and academics on 14th January 2021, via the Google Forms platform. Respondents had one month for completing the survey.

3.1.2. Data analysis

Once the responses were collected, in the summer of 2021 they were analyzed through the above mentioned software SPSS (release 27). The following analyses were performed:

– *Reliability Analysis* (Cronbach's Alpha test), for validating the replies obtained;
– *Confirmatory Factor Analysis* (CFA), for confirming the structure of the survey (and, where necessary, *Exploratory Factor Analysis* (EFA) for determining the proper grouping of items into factors according to the replies);
– *Descriptive Analysis* (arithmetic mean, variance and standard deviation for each item);
– *Cluster analysis,* for grouping companies according to some selected variables and identify common characteristics;
– *Discriminant analysis,* for confirming the goodness of the clustering and analyzing the most impactful variables.

3.2. Starting framework

A preexisting framework, developed by Caniato et al. (2012), was used as the basis for delineating the survey. This previous paper has dealt with a case study-based research on environmental sustainability in FSCs; specifically, the focus was on the drivers encouraging companies in implementing sustainable practices, these sustainable practices, and the key performance indicators (KPIs) most commonly used at the firm level for evaluating the sustainability level. The research framework in question is depicted in Fig. 1.

According to this approach, firstly *drivers* are defined, that is to say those factors that stimulate companies in adopting sustainable practices; these drivers can originate from inside the firm (internal drivers),
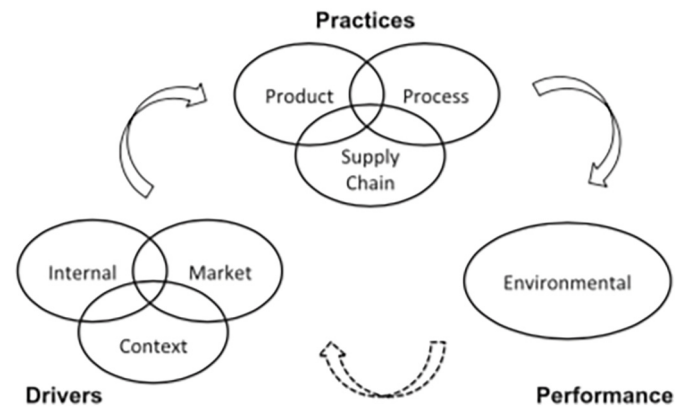

Fig. 1. Starting framework for the development of the survey (source: Caniato et al., 2012).

and in this case they can be related to efficiency targets (e.g., cost reduction), or to a specific virtue of the company itself (such as CSR objectives), or to the mere desire to set and reach determined sustainable targets. In other words, the push for sustainability comes from the inside. Drivers can also come from the market (market drivers), deriving both from the final customer or from other stakeholders which may have interest in the company's operations. Finally, drivers can be related to the context in which the firm works (context drivers), mainly of a legislative nature and due to governments and authorities' impositions.

Regarding *practices*, three subcategories as well were delineated by Caniato et al. (2012), referred to: the product, including its design and features, raw materials, its development or its packaging; the processes (process), responsible for transformation and operations from raw materials to the finished items; finally, the supply chain, including decisions related to in- or out-sourcing, logistics activities (from distribution to the reverse logistics channels) or relationships with other actors in the supply chain. This specific classification of practices was observed in other scientific publications (e.g., Karaosman and Brun, 2015 or Dotti et al., 2013).

The last aspect of the framework refers to the environmental *performances*; Caniato et al. (2012) have identified nine different performance categories, namely: materials, energy, water, biodiversity, emissions effluents and waste, products and services, compliance, transport and business integration. For the sake of simplicity, these nine classes were aggregated by the authors of the present manuscript and resulted in three groups, labeled production, environmental pollution and relationship. The former class includes performances related to manufacturing processes, namely materials, energy, water, transport and compliance; biodiversity and emissions effluents and waste deal instead with the issue of environmental pollution; finally, products and services and business integration fit in the last group of relationship (the first aspect is mainly addressed to the final customer, while the second one is mainly aimed at managing relationships within the company or with other actors of the supply chain such as suppliers or third party logistics).

3.3. Structure of the survey

Both versions (industrial and academic) of the survey start with a preliminary section aimed at delineating the respondents' and companies' profile. Sections relating to drivers and practices follow, while as far as the performances section is concerned, it was included in the companies' version only, since its aim is to investigate the achieved level of sustainability, which necessarily applies to the industry only.

The subsections that follow provide the details of the three main sections of the survey.

3.3.1. Drivers

As anticipated, drivers were divided based on their nature, and accordingly they can be internally generated, or can be due to the market or the context in which the company operates.

In Table 1, the 7 items proposed are listed and described; in particular, the last column of the table details the reason why each specific statement was proposed (e.g., to support or confute evidences from literature, or for collecting mere opinions).

Respondents were asked to express their level of agreement with each item on a 4-point Likert scale, ranking from 1 – Strongly disagree to 4- Strongly agree; 0 was added as a "not applicable" option.

For the sake of simplicity, each item was also associated to a code for being easily recalled in the text; the coding is alpha-numerical, and can be derived by considering the first initial letter of the section (i.e., "D" in this case); the second letter refers to the initial letter of the subcategory (e.g., "I" for internal drivers); the third numerical element simply corresponds to the appearance order of the item in that specific subcategory.

3.3.2. Practices

The second section refers to the items related to the practices, which can be implemented for sustainability purposes in a fashion company. These practices, in turn, can refer to the product, processes, or supply chain the company belongs to (Caniato et al., 2012). Respondents had a list of 16 statements (2 for the product design and 7 respectively for processes and supply chain), provided in Table 2, following the same structure of the previous Table 1. Similarly, the scale for rating each statement was the same as that of the drivers, and even in this case, a coding was assigned to each item: for product, the code is "PD" (which stands for Product Design) plus the numerical order of the two statements; for processes it is simply represented by "P" (for Processes) followed by the numerical order and for the supply chain "PSC" (for Practices of Supply Chain) plus the numerical order of the statements.

3.3.3. Performances

The last section, reserved to companies only, dealt with the performances that respondents perceive to have been achieved in their company. As recalled earlier, three categories of performance were identified, relating to production, environmental pollution, and relationship, detailed in Table 3. In this table, the last column refers to the references in which that specific performance index was recognized as being implemented for sustainability purposes.

As far as the coding, its first letter refers to the section (i.e., "P"), the second letter refers to the subcategory (e.g., "P" for the production subcategory), while the third numerical element always reflects the appearance order.

A total of 10 performance indexes was investigated, which the respondents were asked to rate on the basis of their perceived frequency of usage, using the following scale: 0 (not applicable); 1 (never); 2 (sometimes); 3 (often); 4 (always).

According to this description of the survey structure, it is evident that the version for companies included of a total of 33 items; academics had 23 items instead, since the performances section was not included.

3.3.4. Closing questions

For concluding the survey, a final section with one last question was included in both versions of the questionnaire. As far as companies, respondents were asked about their willingness to implement some green practices in the future. The response options were simply "yes" or "no"; in affirmative case, the respondent was provided with a list of specific practice(s) among with to choose those they were willing to implement.

The final question proposed to the academics, instead, was the following: "Do you think that Italian fashion companies reached an acceptable standard in terms of sustainability?". That question aimed at gathering a *super partes* opinion about the sustainability performance of the Italian fashion industry. Response options ranged from 1 – completely disagree to 4 – completely agree, including the option of 0 - "no opinion".

4. Results and discussion

Results from the statistical analyses made on the responses collected from companies are presented in this section, together with relating comments. The order in which results are presented reflects the order in which the analyses were listed and illustrated in the Methods section. We recall that academics replies are not detailed here, as their contribution was only considered for validating results of companies and they lie outside the scope of the present manuscript, not addressing the two RQs.

It should be mentioned that comments and discussion obviously ground on the achieved replies, on which they were formulated, and therefore, can be typically referred to the sample in question; opportunities for generalising the outcomes are nonetheless suggested.

4.1. Reliability analysis

Overall, 59 companies provided their contribution, which corresponds to a response rate of 23.06 %, value that is in line with the minimum threshold of investigations of this kind set at 20 % (Malhotra and

Table 1
Items of the section "drivers".

Category	Item	Coding	Element to be supported/confuted/investigated
Internal	The Corporate Social Responsibility allows to improve the well-being level (both in economic and social terms) in a responsible way.	DI1	CSR not necessarily brings improvements or greater involvement from employees [e.g. (Raj-Reichert, 2013), (Ruwanpura, 2013) or (Perry et al., 2015)] and in the fashion field it is rarely considered (Thorisdottir and Johannsdottir, 2020).
Internal	In a fashion Green Supply Chain, the "environmental costs" (e.g. waste disposal, waste tracking, energy monitoring etc.) are a major cost items.	DI2	Intention to include "environmental costs" in a model developed for quantifying economic and environmental sustainability dimensions of a FSC (Bottani et al., 2020).
Market	Environmental sustainability motivates companies in their actions as well as consumers' needs.	DM1	The relation between sustainability and customer's need is sometimes conflicted, since customer can also be considered a barrier towards green practices (Desore and Narula, 2018). Companies strive for satisfying customers (and thus gaining profits), but nowadays also in the cause of sustainability. Related to the customers' needs, does sustainability have a leading role?
Market	If consumers perceive more sustainability, the brand is enhanced.	DM2	Adopting green practices has a positive effect on demand and loyalty (Shi et al., 2017).
Market	Companies can promote their sustainability through marketing activities.	DM3	Confirmation of the positive role of green marketing for promoting a sustainable chain (Oliveira Duarte et al., 2022).
Context	If waste is not properly disposed of, additional costs occur.	DC1	Is it economically convenient to comply with regulations on waste disposal? Sometimes the belief is that alternative methods (illicit, often) may generate savings.
Context	The carbon tax should enter into force.	DC2	Respondents' opinion.

Table 2
Items of the section "practices".

Category	Item	Coding	Element to be supported/confuted/investigated
Product	A proper packaging can influence the RL process and reduce costs.	PD1	Packaging costs considerably impact on the whole system (Freichel et al., 2020) and fashion product are the most returned in Europe (PostNord, 2018); the opinion on this issue is investigated.
Product	Quality of products produced from recycled textiles/alternative fibers is not altered.	PD2	Some customers consider products made by recycled textiles or alternative fibers of poor quality (Pal et al., 2019).
Processes	It is possible to reduce its own environmental impact whilst maintaining operating and economic efficiency.	P1	Companies usually look for a trade-off between implementation of sustainable practices and maintaining their efficiency (Shi et al., 2017); is it possible a win-win strategy?
Processes	Implementing green practices may lead to an increase of production and logistics KPIs.	P2	Some studies demonstrate a positive relation between green practices adoption and KPIs increase (e.g., Martínez-Ferrero and Frías-Aceituno, 2013; Hristov and Chirico, 2019; Karaosman and Brun, 2015); some others state the opposite (e.g., Lopez et al., 2017; Oelze et al., 2014). What about the fashion field?
Processes	Recovery and recycling are common practices within the fashion industry.	P3	Recovery and recycling are listed among common and promising practices for sustainability purposes in the fashion field (Islam et al., 2020).
Processes	A RL channel builds customer loyalty.	P4	The possibility of returning products is considered a critical selection discriminant (Freichel et al., 2020). Are companies aware of that?
Processes	Digital innovations for production discourage workers against their abilities.	P5	Literature on digital innovations applications is lacking (Tebaldi et al., 2021); workers are often seen as a barrier towards that as they could not feel confident and are discouraged (Müller, 2019). Is it perceived that?
Processes	When dealing with sustainability issues, higher expertise figures are required.	P6	Quite often project managers lack competencies for including the sustainability aspect (Gilbert Silvius and Schipper, 2014). Have companies experienced or believe that?
Processes	Returns management for the RL may lead to a decrease of internal cost.	P7	Respondents' opinion since in case of mismanagement costs could increase (Jack et al., 2010).
Supply Chain	Setting sustainable goals is a growth opportunity for a company and its supply chain.	PSC1	Respondents' opinion with reference to the whole supply chain's growth.
Supply Chain	CLSCs allow to reduce greenhouse gas emissions.	PSC2	Remanufacturing processes (of a CLSC) are responsible for great carbon emissions (Choi and Li, 2015), but often CLSC is associated to sustainability.
Supply Chain	In a CLSC, using digital tools generates an increase in costs, but also in revenues.	PSC3	Digital innovations are crucial for supporting the management of a CLSC (Arenkov et al., 2019). Respondents' opinion is investigated with reference to the fashion field, since research on digital innovation turned out to be meager (Tebaldi et al., 2021), but quite advanced instead with reference to the CLSC.
Supply Chain	Cooperation among actors of the supply chain allows to achieve sustainable goals.	PSC4	The positive impact of collaboration among the actors of a supply chain on sustainability issues was demonstrated in literature (Tebaldi et al., 2018). Does that apply for the FSC?
Supply Chain	The main advantage of being a Green Supply Chain is that of reducing consumes and, consequently, costs.	PSC5	One of the main benefits of a Green Supply Chain is that of reducing consumes (e.g., from water to raw material consumption, to electricity - Al-Ghwayeen and Abdallah, 2018; Çankaya and Sezen, 2019).
Supply Chain	The use of renewable energy sources increases costs for the supply chain.	PSC6	The economic issue is one of the main barriers when dealing with renewable energy sources (Jelti et al., 2021).
Supply Chain	It is convenient to outsource green logistics activities (e.g. to Third Party Logistics – 3PL).	PSC7	3PL achieved a great maturity on sustainable practices (Evangelista et al., 2018), and respondents' opinion with reference to this issue was investigated.

Grover, 1998). A reliability analysis carried out using SPSS on the responses collected returned a Cronbach alpha coefficient (α) of 0.911, resulting in an excellent value (George and Mallery, 2003).

4.2. Factor analysis

The *CFA*, whose aim was to assess the reliability of the items grouping into factors, always provided acceptable results, exception made for the two items related to the "product" practices, which were therefore rearranged according to a subsequent *EFA*. For interested readers, the complete scores can be made available upon request.

4.3. Descriptive analysis

The respondents include of 22 micro-companies (37.5 %), 30 small- (50.8 %), 5 medium-sized ones (8.5 %) and 2 large companies (3.4 %); 90 % of them has been operating in the field for over 10 or more years. Only 17 (approximatively 29 %), declared that they already adopt green practices. According to these preliminary outcomes, it can be stated that the sample is suitable for the investigation in place: indeed, besides being in the field for long time, the size of the companies is representative of the Italian scenario, where approximately 92 % of manufacturing companies is small-medium sized (IlSole24Ore, 2019).

Table 3
Performance indexes investigated in the third section of the survey.

Category	Item	Coding	Source
Production	Energy consumption reduction.	PP1	Islam et al. (2020)
Production	Raw material reuse and recycle.	PP2	Islam et al. (2020)
Production	Water consumption tracking.	PP3	Islam et al. (2020)
Environmental Pollution	Limitation of carbon emissions and other toxic production waste along the supply chain.	PEP1	Islam et al. (2020)
Environmental Pollution	Emissions and production waste monitoring.	PEP2	Islam et al. (2020)
Environmental Pollution	Usage of toxic/dangerous materials reduction.	PEP3	Islam et al. (2020)
Relationship	Sustainable products promotion.	PR1	Oliveira Duarte et al. (2022)
Relationship	Procurement of eco-friendly raw material.	PR2	Islam et al. (2020)
Relationship	Provide the customer with information to support "green choices".	PR3	Rotimi et al. (2021)
Relationship	Increase employees' motivation and satisfaction.	PR4	Ali and Anwar (2021)

The contribution of the respondents against the various items investigated has been elaborated in terms of some key descriptive metrics, i.e., arithmetic mean, variance, and standard deviation. Relating outcomes are presented in the subsections that follows, recalling the sections of the survey. Overall, no relevant or abnormal values of variance and standard deviation were recorded.

4.3.1. Drivers

Replies and descriptive metrics dealing with drivers are detailed in Table 4.

Regarding DI1, firstly note that 23.7 % of respondents did not provide their opinion; probably the reason is that the term CSR is ignored in its English version and Italian interlocutors were not confident about the answer to provide, or that having not implemented green practices they preferred not to express a judgment. Indeed, among these 14 non-respondents, 13 declared the non-implementation. In the remaining cases, the average reply is equal to 3.02, with low variance and standard deviation. It thus follows that respondents agree on the fact that the CSR can improve the corporate welfare, thus confuting previous studies (e.g., Raj-Reichert, 2013; Ruwanpura, 2013; Perry et al., 2015). In support of this answer, it was also recently demonstrated that the application of a CSR approach has a positive influence on both communication with stakeholders and the corporate reputation (Vatamanescu et al., 2021). DI2, instead, has a lower average response (2.69) with higher variance and standard deviation, and referred to the impact of "environmental costs". However, approximately the 67 % agree or totally agree, suggesting to include this cost item in a model for quantifying environmental and economic sustainability dimensions of FSCs presented in Bottani et al. (2020), given the perceived relevance of this components. Turning to drivers related to the market, the first statement (DM1) deals with the sustainability's role as leading factor in relation to the role of consumers' needs; its trend can be compared to that of the previous one: 37 affirmative replies including 7 completely agreeing, and 17 which conversely do not support the statement. All in all, despite an unsure average, it can be stated that the sample of interviewees ascribes to sustainability an important role, thus deserving attention in selecting strategic actions and operational decisions. Instead, 96 % of respondents are aligned with DM2 demonstrating that being more sustainable increases demand and loyalty (Shi et al., 2017), and the role of green marketing for promoting their sustainability is confirmed by DM3, supporting what stated by Oliveira Duarte et al. (2022). In this latter case, however, the standard deviation is slightly

higher, since compared to the previous statement 10 companies do not agree, and the number of interlocutors who totally agree is lowered.

The last two statements refer to the context in which the company operates; the first one got a satisfying result, since almost 90 % of valid replies supports the fact that if waste is not properly disposed of additional costs would occur; in other words, this confirms that greater investments in sustainable practices implicate lower environmental taxes (Shi et al., 2017). As far as the carbon tax (DC2), an interesting result is achieved as well, since the majority of the sample supports its approval; this result was somehow unexpected, since this tax could weigh on them.

4.3.2. Practices

The second section dealing with practices is the most copious in numeric terms, with 16 statements. Their replies are detailed in Table 5, below.

The first two statements deal with the product and are specifically related to the packaging cost in a RL system (PD1) and to the quality of products manufactured using recycled or green synthetic material (PD2). Respectively 72 % and 65 % of respondents agree with the

Table 4
Descriptive analysis of drivers.

Item	Judgment					Mean	Variance	Std. Dev.
	0	1	2	3	4			
DI1	14	0	6	32	7	3.02	0.295	0.543
Total %	23.7	0	10.2	54.2	11.9			
Valid %	–	0	13.3	71.2	15.5			
DI2	7	4	13	30	5	2.69	0.570	0.755
Total %	11.9	6.8	22.0	50.8	8.5			
Valid %	–	7.7	25	57.7	9.6			
DM1	5	3	14	30	7	2.76	0.564	0.751
Total %	8.5	5.1	23.7	50.8	11.9			
Valid %	–	5.5	26	55.5	13			
DM2	3	0	2	26	28	3.46	0.326	0.571
Total %	5.1	0	3.4	44.1	47.5			
Valid %	–	0	3.6	46.4	50			
DM3	9	0	10	28	12	3.04	0.447	0.669
Total %	15.3	0	16.9	47.5	20.3			
Valid %	–	0	20	56	24			
DC1	2	1	6	39	11	3.05	0.372	0.610
Total %	3.4	1.7	10.2	66.1	18.6			
Valid %	–	1.8	10.5	68.4	19.3			
DC2	11	3	10	27	8	2.83	0.610	0.781
Total %	18.6	5.1	16.9	45.8	13.6			
Valid %	–	6.25	20.9	56.25	16.6			

Table 5
Practices descriptive analysis.

Item	Judgment					Mean	Variance	Std. Dev.
	0	1	2	3	4			
PD1	16	0	12	28	3	2.79	0.312	0.559
Total %	27.1	0	20.3	47.5	5.1			
Valid %	–	0	28	65	7			
PD2	2	4	16	27	10	2.75	0.689	0.830
Total %	3.4	6.8	27.1	45.8	16.9			
Valid %	–	7.1	28.1	47.3	17.5			
P1	3	0	4	38	14	3.18	0.295	0.543
Total %	5.1	0	6.8	64.4	23.7			
Valid %	–	0	7.1	67.9	25			
P2	4	3	16	30	6	2.71	0.543	0.737
Total %	6.8	5.1	27.1	50.8	10.2			
Valid %	–	5.4	29.1	54.5	11			
P3	4	10	15	22	8	2.51	0.921	0.960
Total %	6.8	16.9	25.4	37.3	13.6			
Valid %	–	18.2	27.3	40	14.5			
P4	16	2	12	25	4	2.72	0.492	0.701
Total %	27.1	3.4	20.3	42.4	6.8			
Valid %	–	4.6	27.9	58.1	9.4			
P5	8	8	32	9	2	2.10	0.490	0.700
Total %	13.6	13.6	54.2	15.3	3.4			
Valid %	–	15.7	62.7	17.6	4			
P6	4	0	7	32	16	3.16	0.399	0.631
Total %	6.8	0	11.9	54.2	27.1			
Valid %	–	0	12.7	58.2	29.1			
P7	20	0	22	15	2	2.49	0.362	0.601
Total %	33.9	0	37.3	25.4	3.4			
Valid %	–	0	56.4	38.4	5.2			
PSC1	3	1	9	36	10	2.98	0.418	0.646
Total %	5.1	1.7	15.3	61.0	16.9			
Valid %	–	1.8	16.1	64.3	17.8			
PSC2	23	0	4	27	5	3.03	0.256	0.506
Total %	39.0	0	6.8	45.8	8.5			
Valid %	–	0	11.1	75	13.9			
PSC3	16	1	17	20	5	2.67	0.511	0.715
Total %	27.1	1.7	28.8	33.9	8.5			
Valid %	–	2.3	39.5	46.5	11.7			
PSC4	4	0	3	35	17	3.25	0.304	0.552
Total %	6.8	0	5.1	59.3	28.8			
Valid %	–	0	5.5	63.6	30.9			
PSC5	10	2	5	33	9	3.00	0.458	0.677
Total %	16.9	3.4	8.5	55.9	15.3			
Valid %	–	4.1	10.2	67.4	18.3			
PSC6	19	0	20	17	3	2.58	0.404	0.636
Total %	32.2	0	33.9	28.8	5.1			
Valid %	–	0	50	42.5	7.5			
PSC7	8	3	18	27	3	2.59	0.487	0.698
Total %	13.6	5.1	30.5	45.8	5.1			
Valid %	–	5.9	35.3	52.9	5.9			

relating items. However, note that in the first one 16 companies did not provide their feedback (almost 30 % of the sample), and this will be the case of all the items in which the term RL compares. Specifically, the topic of packaging was associated to RL since nowadays the e-commerce systems are spreading, and fashion products turned out to be both the most sold via web (Eurostat, 2020) and the most returned (PostNord, 2018), preferably at company expense (Daugherty et al., 2003), and as already stressed packaging costs considerably impact on the whole system (Freichel et al., 2020); according to those who rated the statement in question, the proper packaging (primary, implied) can also help reducing costs of the RL management. As far as the second statement is concerned, it can be argued that, overall, the quality of garments made by recycled or alternative sustainable materials is not compromised (65 % of valid responses), contrary to what Pal et al. (2019) assert; in support of the latter, instead, 20 companies do not agree.

Next part is dedicated to the practices related to processes, and it is immediately noticed that firms almost in unison believe that it is possible to reduce their negative impact without compromising their efficiency (operating and economic), and that production and logistics KPIs could benefit from the adoption of green practices, supporting the already mentioned studies available in literature. These two questions are further validated by the companies which implement green practices and experience that: for P1, 15 out of 17 agree (approximately half of them is in total agree), while for P2 the sample is divided in two groups: 8 respondents do not agree, while 9 agree. This fact evidently suggests that these companies did not record an improvement in KPIs, supporting for the fashion field that performances do not necessarily bring benefit; this is what asserted, for instance, by Lopez et al. (2017) or Oelze et al. (2014). In order, a great component of the sample does not regard recovery and recycle as common practices of the fashion field (variance and standard deviation are among the greatest values recorded in the whole survey); however, 54.5 % of the valid replies are in line with Islam et al. (2020), who instead confirm that they are quite common, and among these 30, consistently, 22 also agree on the fact that starting from recovered material would not alter the quality of products. Dealing with RL, statement P4 presented a high non-response rate (nearly 30 %); however, those who replied, mainly agree with the item (loyalty from the presence of a RL channel), meaning that they are aware that nowadays RL represents a competitive leverage and at the consumers' eye, it is a selection discriminant, as also asserted by Freichel et al. (2020). Almost all views (40 out of 51 valid) are negative for P5, but this result is encouraging since the topic was the disincentive of digital innovations caused by their negative perception of workers (social sustainability), suggesting that this is not considered as a barrier, and thus confuting Müller (2019).

Always on the theme of workers, instead, almost 90 % of the respondents agrees that higher expertise is required for dealing with sustainability, and this can be considered as a barrier and thus a possible reason for the scarce adoption of green practices among these companies. The last item referring to processes aims at investigating whether the process of returns management may bring a decrease of internal costs; being the RL mentioned, the non-response rate is noteworthy (33.9 %). Among the remaining opinions, the disagreement dominates (22 versus 17).

The last 7 statements of this section deal with sustainability referred to the supply chain. To begin with, PSC1 aimed at having a general opinion, and specifically it investigated if sustainability is considered as a growth opportunity; 82 % of valid responses positively rate that (36 agree and 10 totally agree), even if 4 companies out of the 17 which implement green practices are not aligned with this statement. The subsequent item as well got overall a positive judgment (≈87 % of respondents), even if the same line of reasoning followed for the RL still holds true: items in which the term CLSC appears returned high numbers of non-respondents (39 % of interlocutors, the highest value of the whole survey). This is not surprising at all, since the RL is the element that allows the SC to become a CLSC; the relation among the two is

thus immediate. As far as the interpretation of this result, in the authors' opinion this reflects a mere perception that associates to a CLSC benefits regardless of real outcomes; indeed, in literature it was demonstrated that CLSCs are responsible for relevant carbon emissions due to the remanufacturing processes (Choi and Li, 2015). Exception made for the 16 non respondents, PSC3 as well got a positive result, although slightly more modest, as a discrete part of respondents does not agree (approximately 40 % of valid scores). Since in literature it was demonstrated that digital innovations positively support CLSC management (Arenkov et al., 2019) but this topic turned out to be barely debated in the literature of the fashion field (Tebaldi et al., 2021), the perception that respondents have towards their implementation with respect to costs and revenues was investigated. In the light of the replies obtained, it can be argued that an economic benefit is associated to digital innovations for the CLSC, but on the other hand also hesitation towards the implementation. The next topic addressed is the collaboration among the actors of a SC for sustainability purposes; 88.1 % of companies and 94.5 % of the valid replies confirm benefits from collaborations. PSC5 aimed at investigating whether a reduction of consumptions (and, consequently, costs) is associated to a green FSC; apart from 10 companies which did not provide any feedback, most of the remaining (67.4 %) recognized that, confirming what asserted by Al-Ghwayeen and Abdallah (2018) or Çankaya and Sezen (2019). Also, 16 of the 17 "green" companies agree with this statement.

A burning issue is then introduced: the use of renewable energy. Specifically, the survey investigated if costs would increase, since this is recognized as being a barrier for the usage of renewable sources (Jelti et al., 2021). It was found that 19 respondents (32.2 %) abstained and that the remaining 40 are divided into two homogeneous groups. Indeed, 20 disagree and 20 agree (3 of which totally). Obviously, no specific conclusions can be derived from these outcomes, except the confirmation of the hostility of the topic. The last statement deals with the possibility of outsourcing logistics activities, and firms mainly agree with that; only 21 negative contributions were recorded.

Table 6
Performances descriptive analysis.

Item	Judgment					Mean	Variance	Std. Dev.
	0	1	2	3	4			
PP1	7	0	14	18	20	3.12	0.653	0.808
Total %	11.9	0	23.7	30.5	33.9			
Valid %	–	0	26.9	34.6	38.5			
PP2	8	6	14	20	11	2.71	0.892	0.944
Total %	13.6	10.2	23.7	33.9	18.6			
Valid %	–	11.7	27.5	39.2	21.6			
PP3	18	6	7	9	19	3.00	1.250	1.118
Total %	30.5	10.2	11.9	15.3	32.2			
Valid %	–	14.6	17.1	21.9	46.4			
PEP1	19	4	11	12	13	2.85	1.003	1.001
Total %	32.2	6.8	18.6	20.3	22.0			
Valid %	–	10	27.5	30	32.5			
PEP2	13	4	9	13	20	3.07	0.996	0.998
Total %	22.0	6.8	15.3	22.0	33.9			
Valid %	–	8.7	19.6	28.3	43.4			
PEP3	6	1	2	17	33	3.55	0.445	0.667
Total %	10.2	1.7	3.4	28.8	55.9			
Valid %	–	1.9	3.8	32.1	62.2			
PR1	2	0	16	26	15	2.98	0.744	0.553
Total %	3.4	0	27.1	44.1	25.4			
Valid %	–	0	28.1	45.6	26.3			
PR2	5	5	23	13	13	2.63	0.917	0.958
Total %	8.5	8.5	39.0	22.0	22.0			
Valid %	–	9.3	42.5	24.1	24.1			
PR3	9	5	10	26	9	2.78	0.747	0.846
Total %	15.3	8.5	16.9	44.1	15.3			
Valid %	–	10	20	52	18			
PR4	5	4	23	20	7	2.56	0.667	0.816
Total %	8.5	6.8	39.0	33.9	11.9			
Valid %	–	7.3	42.6	37.1	13			

4.3.3. Performances

The last section of the survey switches to the practical side; indeed, the perceived achievement of selected performances was rated. Descriptive outcomes are presented in Table 6.

The first aspect was referred to the reduction of the energetic consumption (PP1); exception made for 7 respondents who abstained, the remaining results are satisfying, considering the high energy quantities involved for the industrial processes, as also emerged from a recent life cycle assessment study carried out by Moazzem et al. (2021) on two different apparel clothes in Australia. No firm declares to never implement that at present. The subsequent action, dealing with the reuse or recycle of raw material is more interesting: in 6 cases this never happens, for 8 this information was not available. However, approximately 61 % of the companies who provided feedback and 52 % of the total sample reuses and recycles materials with high frequency, despite the fact that respondents were not convinced at all about the diffusion of this practice (item P3). A possible explanation could be that P3 was a general statement, not specifically referred to the own company. Specifically, among the 31 employees who state that this happens often or always, 13 do not agree that this is true in general. The last item of the performances related to the production returned a high non-response rate (30.5 %); however, among the respondents, 46.4 % perceived that the water consumption is always tracked, even if a great component (31.7 %) is more lacking with regard to this issue (never or rarely monitored).

Regarding the environmental pollution, as far as the limitation of carbon emissions and other substances as well the non-response rate is noteworthy, suggesting that probably these dynamics are still unclear among the companies. However, for those who replied, the implementation of this practice is performed in most cases. Moreover, it turned out that those companies which try to reduce these emissions and waste are the same that also tend to reduce energetic consumes (item PP1). The second practice of this subsection is related to the previous one: in the first the limitation was investigated, in this second the monitoring; the relation is immediate, since achieving limitation is possible when the amount is known. In line with PEP1 results, 13 companies (the same of the previous item) did not provide feedback. Overall, what emerges is that monitoring is more common than limiting (it is probably easier, in practice). No specific relation between emissions monitoring and water consumption was observed. Overall, the sample turned out to be active towards the reduction of toxic or dangerous materials, since approximately the 85 % of companies which provided feedback performs that (33 often and 17 always).

The last part deals with the relationship with the different actors and stakeholders, intended to be both upstream and downstream, and also internal. As far as the first issue addressed, most of respondents thinks that the sustainable products promotion is often performed; 15 even always. This is certainly a promising result, since the promotion strictly depends on possessing sustainable products to be advertised. The subsequent practice instead deals with the procurement of green raw material; among the 12 companies which confirm they perform green supplier selection, 7 also declare that eco-friendly materials are always purchased, 4 often and only one sometimes, suggesting that the selection of that specific supplier in that case originates from different principles. Most of the respondents (approximately 40 %) thinks that this is "sometimes" performed. Surprisingly, among the 26 that perceive that the green raw material purchase is often/always performed, 9 declared to disagree on the fact that quality of finished garments is not affected by the usage of alternative fibers; the remaining ones, instead, consistently believe that this does not impact on quality. Also, 26 respondents perceive that often their company tries to guide customers towards green choices, 9 always. The last statement dealing with social sustainability got a fair result between negative and positive opinions; indeed, regardless of 5 non-respondents, a 27 versus 27 is recorded. More into detail, 4 does not feel to be motivated and satisfied (very negative outcome), 23 only sometimes, 20 often and the luckiest

7 always. This fact suggests that the social aspect is still frequently neglected in the working environment. However, according to these outcomes of relationship performances, it is possible to confirm results from PSC4 on the relations with the actors of the supply chain aimed at pursuing sustainable goals, which got 88 % of agreement.

4.3.4. Closing question

For concluding the survey, companies were asked whether they intend to implement green practices in the future or not. In the face of 59 companies (with 17 already adopters), again 17 declared the intention of future adoption (among which 2 current adopters); the remaining 27 companies, instead, do not plan to implement any green action, which corresponds to a noteworthy percentage (46 % of the whole sample).

4.4. Cluster and discriminant analyses

A cluster analysis was performed on the sample of respondents, with the aim to segment the 59 companies according to common characteristics against some selected clustering variables, as they were identified using SPSS software package. The number of clusters to be found was preliminary set at 3. Since the aim of the analysis was to determine the various levels of sustainability according to the performances achieved by the companies, the selected clustering variables correspond to some new variables computed as arithmetic means of the three types of performances (production, environmental pollution and relationship) of each company. The k-mean algorithm was implemented, and after only three iterations the final configuration of the centroids' values of each cluster was achieved, which is illustrated in Table 7. Note that all the nine values correspond to the means of the clustering variables of the companies belonging to that cluster.

Into detail, SPSS includes in the first cluster 24 companies, 22 in the second, and 13 in the third.

In ascending order of averages values of performances, the worst is the less populated (22 % of companies); 9 firms out of 13 are micro-sized, while the remaining 4 are small. However, despite their size, they are quite steady in the field, as most of them operates in the field since 10 years or more. None of them implements green practices, and 2 companies only are interested in their adoption for the future. Overall, the environmental pollution class returned the worst performances: indeed, none of these companies limits/monitors harmful emissions, and the same goes for tracking the water consumption. As far as the opinion of respondents of this cluster with reference to the survey's items, no specific correlations or similarities were recorded. The only aspect worth mentioning is that all the 13 companies agreed with statement PSC4, concerning the cooperation with other actors of the FSC for reaching sustainable goals; this fact is in line with the values achieved against the category of relationship' performances, which are the best in numerical terms (even if insufficient).

In second place, the most numerous cluster fits (41 % of observations); 8 of these companies are micro-sized, 14 small, one medium and one large company. Confirming the intermediate position, 6 companies declared the adoption of green practices and 9 are interested in the future, while as far as performances, the companies of this group achieved slightly better results in terms of environmental pollution, while the remaining two classes got a value just over 2 ("sometimes"). The limitation of hazardous substances turned out to be one of the

Table 7
Final centroids' values of the 3 clusters.

Clusters			
Clustering Variables	1	2	3
Mean - Production	2.17	3.33	1.20
Mean - Env. Poll.	2.74	3.33	0.67
Mean - Relationship	2.17	3.09	2.10

most spread actions: one company stated to implement that "sometimes", while all the remaining "often" or in 11 cases "always".

The last cluster, which is the most performing, includes 12 small firms, 5 micro, 4 medium (out of a total of 5 in the whole sample) and the last remaining large. According to that, it is possible to derive a slightly proportional trend of increase in firm performances according to an increase of dimensions. 9 companies already implement green practices, and despite that 2 of these 9 intend to further expand the range with additional practices in the future, together with other 7 companies which declared their interest: this is a satisfying result since overall, 16 companies out of 22 of this group demonstrate to be active or willing to be active in this direction, thus confirming their affinity with this cluster. As far as performances, in this group as well the most common is that of trying to reduce the use of harmful materials (in 19 companies this happens "always" and in 3 "often").

Starting from these characteristics, it was possible to define the profile of companies belonging to each cluster and entitle the three groups as follows: cluster 3 with insufficient results "passive awareness"; the intermediate cluster 1 "timidly active awareness" and finally, the second cluster which occupies the first place "full active awareness".

Assuming that in the whole sample there is a certain awareness on sustainability, since respondents were pretty informed on the issues addressed, in the third cluster this awareness is not enough to trigger actions at the corporate level; this is clearly supported by the complete lack of implemented green practices, both at present but above all in the future, and by the lack of actions for monitoring or limiting the usage of resources or harmful emissions. This cluster, overall, shows no propension towards sustainability, which means that this topic is only passively perceived. Halfway, companies belonging to the first cluster turned out to be slightly active, despite their performances could still be improved since they do not reach a sufficiency level. Nevertheless, some of them declared to already implement green practices, and the higher number of companies of the three clusters is willing to consider the adoption in the future. At the present stage, however, there is no match between the implementation of green practices (among the adopters) and good outcomes in performances: this can be interpreted in a way that suggests that some companies are in the right direction, but on the other hand sustainability is not harmoniously embodied within the business dynamics. This is the reason why this group is tagged as "timidly active awareness". This does not apply for the last cluster, whose peculiarity is surely that of reaching the best performance levels; contrary to the previous group, it is curious to note that companies not implementing green practices are those to which lower performances values correspond. It follows that the remaining firms got higher performance values, and this fact leads to believe that within these subjects, sustainability is well-included in the business thinking, and that they are well-conscious of this issue and strive themselves to the cause. This supports the name itself of this group.

For confirming the clusters obtained, a discriminant analysis was then carried out on SPSS, with the aim of identifying the variables that discriminate between the three groups, as well as the goodness of the clustering itself.

First of all, the discriminant analysis returns for each of the three clustering variables the Wilk's lambda, which is a measure of how each of them separates cases into groups; smaller values indicate greater discriminating power (Bottani and Rizzi, 2008). Results,

shown in Table 8 below, confirm that all the three variables are relevant for discriminating and thus clustering the surveyed companies.

The relationship variable is the one which got the higher value, meaning that it had a lower impact for the clustering. This is also confirmed by the fact that the four statements belonging to this group recorded similar average values, thus meaning that the behavior of respondents was somehow homogeneous (see the previous Table 6). Consistently, the environmental pollution which got the lowest Wilk's lambda, is the one that manifested the greater differences between average replies.

As second output, SPSS returns the two canonical discriminant functions, whose structure is shown in Table 9 (note that two is the maximum number of discriminant functions, as it corresponds to the number of initial clusters minus 1).

These two functions were identified starting from the three clustering variables, and respectively explain 94.9 % and 5.1 % of groups variance; both are significant, as a result of the Wilk's lambda test. Coherently, the function returning the lower value, i.e., function 1, is the one explaining most of the variance. Values marked with (*) indicate the highest correlation between the variable and the discriminant functions; what emerges is therefore that the production variable impacts the most on function 1, while the remaining two variables on function 2.

Finally, for confirming once again the goodness of the performed clustering, the last output (shown in Table 10) refers to the predicted group membership for each company.

According to these results, 98.3 % of the original grouped cases are correctly classified; exception made for just one company supposed to be included in cluster 1 instead of cluster 3, the performed clustering can be therefore considered accurate and reliable.

4.5. Discussion

Overall, the results obtained let emerge a behavior from companies which can be considered inconsistent: indeed, the sample demonstrated to be aware of the issues related to sustainability, as well as to positively evaluate green practices and benefits which could derive from the implementation of these practices, but this does not correspond to a positive implementation trend. In fact, respondents agree on the increase of economic and social well-being generated by including sustainability policies and actions, as well as on the fact that operational and economic efficiency would not be damaged. Most of respondents considers the sustainability inclusion as a growth opportunity for the whole supply chain, from which improvements of KPIs (both logistics and productive) would occur. So why are firms hesitant? Costs cannot be considered as a barrier, since respondents associate to a Green Supply Chain a reduction in consumes and accordingly related costs, and the "environmental costs" are in general not perceived as a prevalent cost item. However, in line with the scarce adoption, they hesitated when they were asked whether sustainability has a leading role compared with customers' needs, even if most of them agree with that. With reference to the final customer as well, opinions could be interpreted as *pro* sustainability: indeed, >90 % of companies believes

Table 8
Wilk's lambda for each clustering variable.

	Wilk's lambda	F	Sig.
Mean - Production	0,345	53.295	<0.01
Mean - Environmental Pollution	0.277	73.115	<0.01
Mean - Relationship	0.664	14.194	<0.01

Table 9
Structure matrix returned from the discriminant analysis implemented through SPSS.

	Functions	
	1	2
Mean - Production	0.543(*)	0,315
Mean - Env. Poll.	0.616	−0.787(*)
Mean - Relationship	0.243	0.628(*)
Statistics of the functions		
% of explained variance	94.9	5.1
Canonical correlation	0.929	0.503
Wilks' lambda	0.102	0.747
Sig.	<0.01	<0.01

Table 10
Predicted group membership.

Predicted group membership			
Original cluster	Cluster 1	Cluster 2	Cluster 3	Total
1 Cluster	24 (100 %)	0 (−)	0 (−)	24
2 Cluster	0 (−)	22 (100 %)	0 (−)	22
3 Cluster	1 (7.7 %)	0 (−)	12 (92.3 %)	13

that if the client perceives sustainability the brand is enhanced, with a potential subsequent sale and sharing increase. Surely, the requested know-how can be recognized as an obstacle: in fact, respondents are sympathetic to recognize that specialized figures and higher expertise would be required, thus involving more resources in case these competencies lack within the firm.

It is curious to note that most of the participants supports the carbon tax, suggesting that they care about environmental issues and are aware of the fact that something should be done for protecting the planet, but until there is a legislation the *status quo* dominates, since perhaps they could be forced in amending processes.

Among other findings, given the high non respondents rate for the specific items, the terms CSR and RL (including the related concept of CLSC, to which a reduction of emissions is associated) turned out to be hostile, despite the relevance of the presence of a RL channel nowadays and despite they believe that this service builds customer loyalty. Probably, the fact that the surveyed companies are not directly interested towards RL can be attributable to the possibility of outsourcing this activity and delegating it to third parties; for supporting this hypothesis, it is recalled item PS7 referring to the convenience of outsourcing green logistics activities, which got >50 % of affirmative opinions.

Another issue deserving attention is the reuse of raw materials and recycled/synthetic fibers for producing garments: despite most of them states that quality would be retained (even if 30 % does not think that), almost half of respondents affirms that these practices are not common in the fashion field, even if 40 % perceives that "often" it takes place in their company and 20 % "always".

Overall, these outcomes are confirmed also from the academic side: indeed, an *independent-samples T-Test* carried out for comparing the means reveals that the two categories are aligned on the issues investigated.

As far as performances, in general, the environmental pollution turned out to be the most considered: approximately in 56 % of cases reduction and limitation of hazardous substances are always attempted, and a satisfying result was achieved as well regarding the monitoring/limitation of dangerous emissions (e.g., CO_2), even if companies which always declared to implement these actions correspond to the 30 % of the sample, which is a still too low percentage. Same reasoning for the energetic and hydro consumption; specifically, for the latter, what emerged is that less attention is paid, or simply, in contrast to the energetic issue, respondents were less informed meaning that probably there is no transparency.

Another issue emerged is that overall companies agree that pursuing sustainable goals benefits from cooperation among the actors of the FSC, and this is supported by relationship performances, since for all the actions the means of the companies was closer to 3 (which corresponded to the "often" option); the only point of reflection is the employees' motivation and satisfaction: the sample in this case was perfectly divided among who perceives that and who does not, confirming that sometimes the internal social sustainability is neglected.

According to the *cluster analysis*, respondent companies were divided into 3 clusters, defining a performances trend from insufficient (the less numerous group), to intermediate and to definitely satisfying and positive. The worst cluster was labeled as "passive awareness", since despite information and consciousness of sustainability issues demonstrated from the replies to the first two sections of the survey, firms of this group do not make enough efforts. As performances

increase (clusters 1 and 2), there is a progressive care towards the ecosystem translated into adoption of practices, but the main difference among these two groups is that in the second a correlation between green practices implementation and higher scores in performances, thus meaning that in these companies a "sustainability thinking" is well-established and included in operations; not surprisingly, 80 % of companies belonging to this cluster consider sustainability as a driver for a company's actions (in the intermediate group the percentage decreases at 50). A positive relation was detected between firm's size and performances increase.

5. Conclusions

In this paper, the outcomes from a survey analysis carried out on 59 Italian companies operating in the FSC have been presented and detailed, together with proper data elaborations through SPSS software package. Since, as it emerged from literature, companies are rarely involved when dealing with FSC sustainability issues, the aim of the study was to collect the opinions of insiders and empirically validate some key questions both emerged from the literature or being on the cutting edge in this socio-cultural moment, according to the expertise of the authors.

As it is typical in empirical studies, the primary aim of this paper was to reveal insights into a phenomenon, which suggests a theoretical contribution. Following this line of reasoning, the purpose of the study was to reply to two research questions addressed in the introduction section. This study, furthermore, proposes a statistically validated survey which could be adopted by other researchers in different countries for addressing the two RQ and making comparisons among different geographical areas. Starting from a pre-existing framework, the survey was divided into three main sections: drivers encouraging sustainable actions, common practices for greening product, processes or the supply chain and finally some performances achieved by firms.

First of all, recalling research question #1 (i.e., does companies positively assess sustainability practices and actions, and are aware of what can be done for ecosystem protection?) it is possible to confirm that from the industrial side there are great information and awareness, as well as a positive opinion towards green solutions; however, this does not necessarily have a practical confirmation in terms of actions for implementing sustainable practices. Indeed, referring to the research question #2 (i.e., is there a positive trend in Italy towards the adoption of green practices among companies of the FSC?), the surveyed companies do not seem to be likely towards the adoption, both at present and above all in the future. It follows that, according to the sample, the adoption level cannot be considered mature and sufficient to let sustainability be defined as well-included and considered among the objective to be achieved through actions. These two outcomes are somehow in contrast, since results shows both consciousness and information with regard to benefits which could derive from the implementation of green practices.

This survey, moreover, let emerge a somehow unexpected result, that is to say the fact that companies seem not to be interested towards the inclusion of a RL channel; surely, this issue deserves further investigation, since it is quite in contrast with the late trends of the field. Interviews with respondents and case studies are in plan for deepening this aspect. In the meanwhile, a possible explanation that could be conjectured, is that RL activities are often outsourced to third parties, and as such, they fall outside the company's control; their role for enhancing sustainability is not self-evident.

Overall, the contents of the present manuscript support what academics think about the Italian level of sustainability for FSCs, the last question posed to them: indeed, they agree on the fact that the Italian level is not sufficient, meaning in other words that too few companies spend themselves in cleaner actions, and in the meantime too much conscious damage to the ecosystem.

Because the study is empirical in nature, practical contributions are more limited. Indeed, the set of considerations made above could suggestions that there is the need for actions aiming at enhancing the adoption of sustainability practices by fashion companies. However, we cannot elaborate more on these actions, as the outcomes obtained do not allow to go too far in delineating them or suggesting effective ones. This is left for future studies. A practical consideration that can instead be made is that Italian companies have different views about sustainability, according to the clusters obtained, and therefore actions for enhancing the adoption of sustainability practice should take into account the company's view of sustainability, for being effective. Results of this study can be useful to this end.

Among the limitations of the present work the response rate was not so high, even if acceptable; probably the pandemic period could have impacted. However, starting from this pilot survey on a small scale, a second round of interviews is in plan for year 2022, aiming at reaching the whole Italian territory, in order to highlight eventual differences among geographical areas as well as to identify the cluster that better reflects the Italian scenario; the survey will have the new asset in the light of the *factor analysis* results. Moreover, given the relevance of the customer position, a survey will be developed for reaching this actor as well, starting from the results of the present investigation.

Finally, improving the already mentioned analytical model for quantify economic and environmental dimensions of FSCs in the light of results ("environmental costs") is planned among the future works.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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