Traceability for sustainability: seeking legitimacy in the coffee supply chain

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Abstract

Purpose – The adoption of traceability systems (TS) and sustainability programs responds to different objectives among which the companies need to be considered legitimate; hence, this study aims, first, to identify what is the relationship between traceability and sustainability in the food supply chain (SC) and, second, to characterize the legitimacy-seeking purposes, i.e. moral, cogniti60ve or pragmatic-driving companies to implement TS along with sustainability initiatives.

Design/methodology/approach – This study analyses the coffee SC, a globally dispersed commodity chain, where traceability initiatives usually respond to mandatory and voluntary quality standards and certifications of origin. The study involves nine cases at different stages of the coffee SC.

Findings – This study provides a taxonomy of the TS applied in the coffee SC. In addition, three main approaches to traceability for sustainability are found in the coffee SC: synergistic, complementary or disconnected. Findings also reveal how traceability responds to different legitimacy-seeking objectives while triggering or complementing sustainability practices. Five research propositions and related directions for further investigations are elaborated from the results of our study.

Originality/value – This study explores a rather limited studied area, investigating how companies in a food commodity chain address traceability and sustainability together while seeking legitimacy in the market. Moreover, the study is grounded on legitimacy theory, thus adding robustness to the analysis.

Keywords Traceability, Sustainability, Coffee industry, Legitimacy theory

Paper type Research paper

Introduction

This study aims to address an increasing challenge in food supply chains (SC), that is traceability for sustainability (TfS), considering that consumers around the world emphasize the need for food that is not only safe and healthy but also ethical, organic, generates low carbon footprint, etc., which in turn calls for better and more efficient traceability systems (TS) (Aagerup *et al.*, 2019; Dabbene *et al.*, 2014; Rainero and Modarelli, 2021; Mohammed, 2020) in light of sustainability demands as well. Indeed, the relevance of traceability implemented not only for tracking and visibility purposes but also for sustainability objectives is evidenced in the previous literature. Specifically, TfS in food commodity chains is said to be a tool to guarantee products features, e.g. origin, quality, respect for people and the environment (Norton *et al.*, 2014; Kuit and Waarts, 2014). Nonetheless, research on the relationship and the purposes for implementing TfS is not yet covered along multiple stages of the food SC and research in this area could provide important insights to practitioners and policymakers for understanding and promoting the role TS for sustainability objectives.

Recognition in the market or the perception from the public or other stakeholders that companies are conforming to the societal expectations, values and beliefs is known as legitimacy (Schuman, 1995) without which a company is not able to operate and grow (Castelló and Lozano, 2011). Sustainability is growingly expected in the food industry (Dabbene *et al.*, 2014) becoming a requirement in the market under the consumer's demand for more responsible products. Hence, authors have highlighted how actions towards sustainability, environmental performance and reporting can help companies to demonstrate accountability and thus obtain, maintain or repair legitimacy (Ellram and Goliac, 2016; Alrazi *et al.*, 2015). In this scenario, the theoretical lens setting the ground in this study is the legitimacy theory (Schuman, 1995) which provides the views for defining the scope of the research and for explaining the findings. The theory defines three forms of legitimacy (i.e. pragmatic, moral and cognitive) a company could use to be recognized, specifically for our study, regarding traceability and sustainability.

It is widely known that traceability requires substantial investments in technology and processes aimed at tracking goods along the SC. Traceability implementation cost is still proving to be a major barrier to overcome (Norton *et al.*, 2014; Kuit and Waarts, 2014; ITC, 2015; Saberi *et al.*, 2019), especially in the first production phases (Dabbene *et al.*, 2014; ITC, 2015). However, the benefits of traceability that could counterbalance the costs along food supply chains (Dabbene *et al.*, 2014) are recognized as well. For instance, traceability helps reduce foodborne outbreaks (Magalhães *et al.*, 2019), manage risks (Ringsberg, 2015), keep consistency and market-specific product features, efficient recall procedures and keep a chain of custody (Norton *et al.*, 2014; ITC, 2015; Karlsen *et al.*, 2013; Mejías *et al.*, 2019). In this line, authors in previous literature also highlight how traceability could contribute to achieving competitive advantages in terms of operational efficiencies, cost reductions, increased productivity, reputational benefits and improved environmental performance along the supply chain (Norton *et al.*, 2014; Karlsen *et al.*, 2013; Canavari *et al.*, 2010; Stranieri *et al.*, 2017; Marconi *et al.*, 2017; Ringsberg, 2015; Rainero and Modarelli, 2021).

The coffee SC is an industry that employs millions of farmers in the world (DeFries *et al.*, 2017) and approximately half of them are small landholders (ICO, 2017; Vorley and Fox, 2004). Coffee growers, processors, traders, roasters, packers and retailers are spread around the world and different sustainability challenges are faced upstream and downstream in this SC (FAO, 2010; Ortiz-Miranda and Moragues-Faus, 2015; Luna and Wilson, 2015; Bashiri *et al.*, 2021). Therefore, as a means to gain control and visibility of the more remote activities, different traceability solutions are emerging in this SC among which certifications are well spread. In addition to the standard voluntary certification schemes developed in the industry (i.e. Fairtrade, UTZ and Rainforest Alliance), some well-known coffee roasters in western economies have developed their private certification initiatives (Alvarez *et al.*, 2010; Longoni and Luzzini, 2016). However, traceability and sustainability are not necessarily observed simultaneously and the food SC is no exception. Considering how Garcia-Torres *et al.* (2019) defined traceability for sustainability as the "ability to combine SC information sharing and visibility [. . .] for operational reasons and to ensure the reliability of sustainability claims"; the coffee SC efforts on traceability implementation still need to be expanded as for their sustainability purposes. In this line, the ITC (2015) argued how TfS in food SCs becomes difficult because of a lack of capabilities or skills and multiple requirements to fulfil. Besides, the current debate in literature questions whether TS are driven by quality or sustainability performance goals (Garcia-Torres *et al.*, 2019; Marconi *et al.*, 2017) or by the will to be recognized and accepted in the market (Aagerup *et al.*, 2019; Mejías *et al.*, 2019).

Therefore, the coffee SC represents an interesting context for investigating the relationship between traceability and sustainability along with the SC, as well as the legitimacy motivations for implementing those in different tiers of the chain. Hence,

the objectives of this study are (1) to identify the TS implemented and their relationship with sustainability along the coffee SC and (2) to investigate how the implementation of TfS responds to legitimacy-seeking purposes in the coffee industry. This study is based on the analysis of multiple cases covering different stages in the coffee SC. Companies are of different sizes and in different geographical locations, allowing for a broader view of traceability and sustainability implications in this industry.

The findings in our study provide several contributions. First, by identifying three types of TS for sustainability implemented in the coffee SC including companies in different SC tiers and observing the level of technology adopted. Second, the characterization of three types of relationships between traceability and sustainability that are influenced by company size, volume, product type and legitimacy-seeking form. Third, another novelty in our study is to lever on legitimacy theory for explaining the legitimacy-seeking forms that companies in the coffee SC have when implementing traceability and sustainability.

Legitimacy theory in sustainability studies

Schuman (1995, p. 574) defined legitimacy as the "generalized perception or assumption that actions or an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions". Several authors have refined the concept by explaining that legitimacy is a status or condition that is temporally and culturally defined (Alrazi *et al.*, 2015) that comes from meeting stakeholders' expectations (Ellram and Golicic, 2016).

Researchers agree on three forms of legitimacy (Schuman, 1995; Castelló and Lozano, 2011; Alrazi *et al.*, 2015):

(1) Pragmatic legitimacy: is granted based on the audience's (e.g. stakeholders) self-interest perception of benefiting from the organization's actions. It refers to the exchange between companies and their stakeholders as long as stakeholders receive a direct or indirect benefit. Thus, companies face the challenge of demonstrating the value of their products and processes to get legitimacy.

(2) Moral legitimacy: is positive evaluation and approval when companies perform actions that promote societal well-being. It refers to the "right thing to do" as judged by the stakeholders' beliefs. This form of legitimacy is considered to be more resistant to manipulation than pragmatic legitimacy.

(3) Cognitive legitimacy: is granted based on the comprehensibility of societal models in such a way that the organization's actions are taken for granted. It refers to an organization is consistent with audiences' (e.g. stakeholders) expectations. It is the most powerful source of legitimacy and the most difficult to influence.

Therefore, legitimacy exists whenever an organization's actions are in accordance with societal expectations (Alrazi *et al.*, 2015). Accordingly, companies design their strategy for acquiring, maintaining or repairing legitimacy (Schuman, 1995). The process aiming at any form of legitimacy is known as "legitimizing", for obtaining legitimacy as a proactive strategy, while repairing implies the reaction to facing a crisis (Alrazi *et al.*, 2015). Hence, legitimizing refers to the actions that organizations put in place to be accepted in society by complying with norms, values, beliefs and definitions (Castelló and Lozano, 2011).

With regard to sustainability, previous studies underlined that for gaining legitimacy, an organization benefits from its sustainability-related efforts. Starting with the environmental dimension, Ellram and Golicic (2016) argued that sustainability helps to enhance, maintain and acquire legitimacy. On the same line, Alrazi *et al.* (2015) highlighted how environmental performance and reporting help companies demonstrate accountability and in turn obtain

legitimacy when there is a general perception of sustainability being desirable and appropriate. Similarly, Castelló and Lozano (2011) highlighted that sustainability, implemented as Corporate social responsibility (CSR) initiatives could be driven by different types of legitimacy strategies among different types of companies. As Ellram and Golicic (2016) pointed out when studying environmentally friendly freight transportation services: the perception of legitimacy differs in different SC positions, where different approaches and perceptions of value exist. Other factors that Castelló and Lozano (2011) identified as influencing CSR are the cultural differences, industry sector, type of firms and geographical locations.

In this study, legitimacy-seeking approaches are observed with the aim of characterizing the motives for the TS and sustainability strategies that are deployed along the coffee SC.

Traceability for sustainability in food commodity chains

TfS, as defined by Garcia-Torres *et al.* (2019) is the "ability to combine SC information sharing and visibility [...] for operational reasons and to ensure the reliability of sustainability claims". On a similar line, Marconi *et al.* (2017) argue that in order to succeed in sustainability, it is not enough to do well within company boundaries as all the actors that contribute to the final products should be traced. Companies that invest in increased transparency and traceability could have a competitive advantage (Canavari *et al.*, 2010) and reputational benefits, thanks to TS that demonstrate a commitment to sustainability (Norton *et al.*, 2014; ITC, 2015). As shown in Mejías *et al.* (2019)'s study, implementing and managing sustainability in multi-tier SC, characterized by complexity and globalization, is still a challenge and TS can also help mitigate the risk of unknown sourcing and the consequent social and environmental impacts along the SCs.

Food quality and safety are expected from food SCs and they could be ensured through traceability (Dabbene *et al.*, 2014; Karlsen *et al.*, 2013) implemented with different types of technologies (Magalhães *et al.*, 2019; Rainero and Modarelli, 2021; Saberi *et al.*, 2019: Kittichotsatsawat *et al.*, 2021). Several definitions of food traceability are proposed. For instance, the Food and Agriculture Organization (FAO) defines traceability as "the ability to follow the movement of a food through specified stage(s) of production, processing and distribution" (Codex Alimentarius, 2006). In Europe, a definition of traceability in agri-food supply chains is stated as "the ability to trace and follow a food, feed, food producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all the stages of production, processing and distribution" (European Commission, 2002). Other organizations such as the ITC and the International Organization for Standardization (ISO) also offer their definitions considering identification, tracing and tracking.

Among the benefits of TS in food chains are the huge potential for efficiency gains (Costa *et al.*, 2013; Ringsberg, 2015), competitive advantage (Canavari *et al.*, 2010) food process control (Magalhães *et al.*, 2019) and quality and identity preservation (Dabbene *et al.*, 2014; Smith, 2018; Rainero and Modarelli, 2021). Nonetheless, traceability implementation in food supply chains depends on several aspects such as the company mission, the type of firms involved, technology constraints (Kittichotsatsawat *et al.*, 2021) and the legal environment (Canavari *et al.*, 2010). Therefore, also TfS in this sector addresses diverse challenges due to the level of company capabilities, skills, interest and willingness and multiple requirements needed for implementation (ITC, 2015). In this line, certifications on agri-food commodities have become particularly important given an increased stakeholder pressure (Kolk, 2012; Reinecke *et al.*, 2012) and given the certification's capacity to address a wide range of attributes (Ringsberg, 2015; Bashiri *et al.*, 2021), among which sustainability. Coffee certification schemes are varied in their scope, premium prices and requirements. In order to

fulfil the requirements of these different certifications, different TS can be adopted with different levels of complexity (Stranieri *et al.*, 2017).

Considering the characteristics of information shared, strategic or operational (Canavari *et al.*, 2010), and how the information is transmitted in the TS and according to the definitions by Dabbene *et al.* (2014), companies use different platforms that can be summarized in the following categories:

(1) Simple TS: mostly, operational information and product information are traced by means of documentation, e.g. transportation and import-export documentation, invoices.

(2) Advanced TS: can involve operational and strategic information. Tracing and tracking are recorded in databases developed by the companies themselves or by external organizations.

(3) Integrated TS: usually involves operational and strategic information. It is a system that allows all the actors in the SC to input product information into a common platform. An administrator is appointed to keep consistency and control of the information inserted into the platform.

Then, traceability and sustainability are indeed related and expected in the food industry (Dabbene *et al.*, 2014) where companies aim at promoting, implementing and assessing sustainability along the SC (Garcia-Torres *et al.*, 2019; Marconi *et al.*, 2017) and varied TS are being implemented (Dabbene *et al.*, 2014; Stranieri *et al.*, 2017; Saberi *et al.*, 2019; Rana *et al.*, 2021) with different levels of technology (Magalhães *et al.*, 2019; Rainero and Modarelli, 2021; Kittichotsatsawat *et al.*, 2021), to conform to such expectations, and in turn achieve legitimacy (Alrazi *et al.*, 2015). However, the relationship between traceability and sustainability in the global and complex context of food chains is still to be studied.

In Table 1, the main constructs in the study are summarized.

Sustainability in the coffee industry

Food commodity SCs, such as coffee, are said to be important contributors to global greenhouse gas (GHG) emissions, from production (and its inputs) through processing, distribution and consumption to the disposal of waste (FAO, 2010). Processing, trading, transporting, roasting, packaging, retailing, brewing, serving, etc., also have an important contribution to emissions, communities' well-being and employment (FAO, 2010; ICO, 2017). Especially upstream actors face sustainability challenges as they deal with several constraints and restrictions. For instance, regarding economic development: price volatility, lack of long-term contracts and spot transactions that create huge uncertainty for farmers and cooperatives, limited access to credit or financial aid and side selling for solving short-term liquidity problems (Ortiz-Miranda and Moragues-Faus, 2015). Instead, on the environmental side, farmers struggle with pest control and diseases and the need of using pesticides and fertilizers (Ntiamoah and Afrane, 2008), climate change, i.e. rising temperatures and rainfall variability, decrease yield and reduce quality as well (Ovalle-Rivera *et al.*, 2015). These economic and environmental challenges are, in turn, closely related to the social development in the producing regions (Vorley and Fox, 2004; Pay, 2009; Winston *et al.*, 2005).

The coffee industry employs millions of farmers, and export often represents a significant portion of sales. Coffee prices are determined in the commodity markets, and selling far ahead is considerably risky (Pay, 2009). Low prices are driving poverty, ill health, unemployment, lack of education and forced migration and risk of increasing crop diversification (Pay, 2009; Winston *et al.*, 2005). Besides, farmers in producing regions face a lack of technical

Concept	Concept	Reference
Traceability	"The ability to follow the movement of a food through specified stage(s) of production, processing and distribution"	Codex Alimentarius (2006)
	"The ability to trace and follow a food, feed, food producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all the stages of production, processing and distribution"	European Commission (2002)
Traceability for sustainability	"Ability to combine SC information sharing and visibility [. . .] for operational reasons and to ensure the reliability of sustainability claims"	Garcia-Torres et al. (2019)
Simple traceability systems	Includes operational information and product information that is traced by means of documentation	Canavari et al. (2010), Dabbene et al. (2014)
Advanced traceability systems	Involve operational and strategic information. Tracing and tracking is recorded in databases developed by the companies themselves or by external organizations. e.g. certification entities	
Integrated traceability systems	Involve operational and strategic information. A system that allows all the actors in the supply chain to input information into a common platform. An administrator is appointed to keeping consistency and control	
Legitimacy	"Generalized perception or assumption that actions or an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions"	Schuman (1995, p. 574)
	Legitimacy exists whenever an organization's actions are in accordance with societal expectations	Alrazi et al. (2015)
Pragmatic legitimacy	It refers to the exchange between companies and their stakeholders as long as stakeholders receive a direct or indirect benefit	Schuman (1995), Castelló and Lozano (2011), Alrazi et al. (2015)
Cognitive legitimacy	It refers to an organization being consistent with stakeholders' expectations. It is the most powerful source of legitimacy and the most difficult to influence	
Moral legitimacy	It refers to the "right thing to do" as judged by the stakeholders' beliefs. This form of legitimacy is considered to be more resistant to manipulation than pragmatic legitimacy	

Table 1.
Main constructs from
literature applied in
the study

competencies for specialty or organic production that require specific agronomic knowledge to improve yields and quality (Ovalle-Rivera et al., 2015).

On the buying side, the demand is strong in many countries, particularly in North America, Europe and Japan; but the biggest potential is in emerging markets and coffee-exporting countries, e.g. Brazil, Indonesia, India and Mexico (ICO, 2019; Pay, 2009). Mature markets of Europe and North America observe a higher preference for specialty coffee (ICO, 2019; Pay, 2009; Reinecke et al., 2012; Pascucci, 2018) for which buyers pay premium prices. Small local brands and small roasters are spreading, in particular, for specialty coffee (Pascucci, 2018). Hence, buyers are motivated to deploy sustainability initiatives mainly to face competition, due to legal requirements and policies, because of stakeholder expectations, or to get closer to important suppliers or local communities (Karlsen et al., 2013).

However, the relationship between traceability and sustainability is not necessarily automatic. Recently, some authors have started to discuss how and when traceability and sustainability are indeed connected (Garcia-Torres *et al.*, 2019) and investigated in other industries, such as fashion, the use of TS in the achievement of sustainability objectives (Marconi *et al.*, 2017; Mejías *et al.*, 2019). However, as far as our knowledge, studies aiming at understanding the relationship between traceability and sustainability for legitimacy seeking in food commodities SCs are scarce.

Research questions and framework

The implementation of TS is increasingly appealing for companies in search of efficiency, consistency, differentiation, for ensuring customers the product features advertised (Norton *et al.*, 2014; ITC, 2015; Karlsen *et al.*, 2013; Canavari *et al.*, 2010) and reduce foodborne outbreaks too (Magalhães *et al.*, 2019). In some companies, traceability is implemented as a tool to assure and verify sustainability in their SC; however, only a very small percentage of food commodities are traceable on sustainability attributes (Kuit and Waarts, 2014; Norton *et al.*, 2014). The implementation of TS along multiple tiers of a global SC (Marconi *et al.*, 2017; Garcia-Torres *et al.*, 2019), as is the coffee SC, can provide insights from a wider view of the phenomenon.

Hence, TfS leads to unexplored opportunities for assuring sustainability and providing sound evidence for the actual commitment of a company to specific sustainability initiatives, without the fear of leaving blind spots in their supply base. Moreover, TfS can represent a fundamental step for improving performances in different SC stages through the systematic collection of sustainability-related data. These potentially promising developments support the formulation of the first research question, as follows:
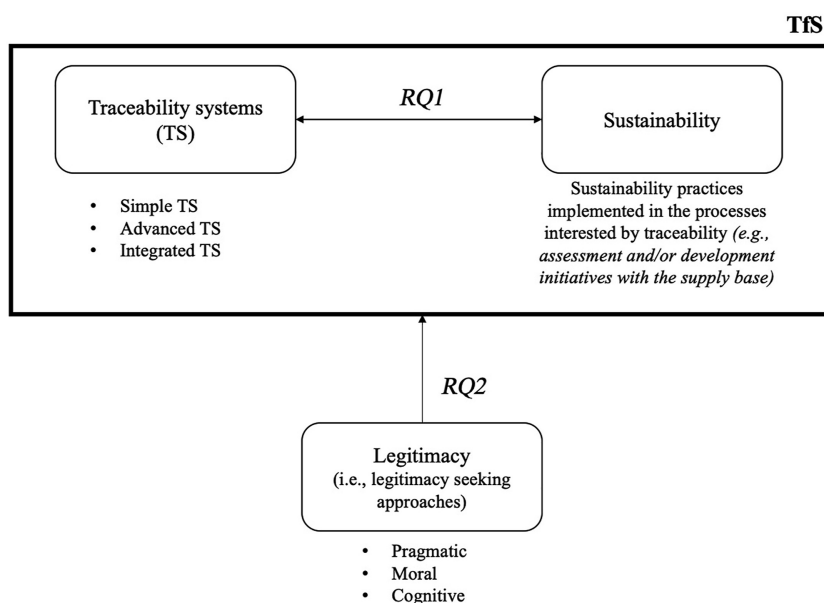
RQ1. What is the relationship between traceability and sustainability in the coffee SC?

Furthermore, companies aim at being recognized, accepted and respected according to the market's expectations and beliefs and might perceive legitimacy in different ways (Ellram and Golicic, 2016). Several authors agreed that sustainability efforts help to gain and maintain legitimacy (Ellram and Golicic, 2016; Alrazi *et al.*, 2015; Castelló and Lozano, 2011). Nonetheless, observing the relationship between legitimacy-seeking purposes and the implementation of traceability and sustainability could provide additional insights for understanding the motivations and strategies underlying a global SC like the coffee SC. Hence, the second research question in this study is as follows:

RQ2. How is legitimacy-seeking influencing the implementation of TfS in the coffee supply chain?

Our study adopts a SC perspective given that companies in different positions in the coffee SC are urged by different sustainability challenges (e.g. certifying the sustainable origin of coffee for coffee roasters, the environmental impact of transportation for the logistics operator) and they are exposed to different complexities (e.g. coffee traders generally interact with multiple roasters and several exporters and farmers). Companies can influence the perceptions that the market and other SC actors have of them, and they might want to gain legitimacy for sustainability as for other performance dimensions, hence be driven by different legitimacy-seeking approaches.

The research framework representing the main constructs and research questions is depicted in Figure 1, where different types of relationships between TS and sustainability are implied by the bi-directional arrow connected to RQ1. In addition, the legitimacy-seeking approaches (RQ2) are instead depicted as influencing factors for TfS.

TfS

Traceability systems (TS)

- Simple TS
- Advanced TS
- Integrated TS

RQ1

Sustainability

Sustainability practices implemented in the processes interested by traceability *(e.g., assessment and/or development initiatives with the supply base)*

RQ2

Legitimacy (i.e., legitimacy seeking approaches)

- Pragmatic
- Moral
- Cognitive

Figure 1.
Research framework

Methodology

Method and case selection

Choices regarding traceability and sustainability are tightly interwoven within the context of analysis in this research. Literature suggests approaching both traceability and sustainability with an SC perspective, given they are both highly influenced by SC dynamics. Under these premises, multiple exploratory case studies in different stages of an SC are the chosen methodology, to be consistent with the tight link between the research objectives and the setting as well as to increase the external validity (Voss *et al.*, 2002). Moreover, multiple cases per SC stage are selected aiming at more robust findings according to a replication logic (Yin, 2009) and for grasping the heterogeneous behaviours that companies in different SC stages might have, and the differences in size and power along the chain. Similar criteria for case selection have been developed in previous literature on sustainability in food SCs (León-Bravo *et al.*, 2019, 2021; Cannas *et al.*, 2020).

The coffee SC, being a global commodity, deals with long geographical distances, the increasingly relevant need to monitor the quality of coffee and the need to assure and communicate the sustainability of production, mostly located in developing countries. All these aspects support the choice of coffee SC in the context of our study on TfS. For the aims of this research, case studies are selected on the grounds of their overall strategy for sustainability reflected in their mission, vision, communication, awards received, etc. The cases are also chosen according to their interest in traceability as declared in the company statements, Website and industry reports. Cases are companies of different sizes, belonging to different SC stages and offering different product types (i.e. bulk vs. specialty coffee) but they do not necessarily buy and sell from each other (Table 2).

In two cases, in particular, Company B and Company F, the chains of two product typologies are analysed. Thus, the two units of analysis within these cases are separated because they adopt two distinct TS (i.e. in both cases: certification and advanced traceability systems).

Company	Location	Product analysed	Role in the SC	Interviewees	Type and number of interviews
A	Italy	Specialty coffee	Artisan roaster	General manager	1 online interview
B1 B2	Italy	Certified coffee Coffee traced with digital technologies	Retailer and distributor	Head of marketing	1 face-to-face interview
C	Germany	Coffee transported on GPS-tracked cargos	Logistic carrier	Senior manager and project lead smart container	1 online interview
D	Italy	Coffee	Roaster	Quality director	2 online interviews
E	Italy	Specialty coffee	Artisan roaster	Owner	1 online interview
F1 F2	Switzerland	Certified coffee Coffee traced with digital technologies	Trader	Sustainability manager	1 online interview
G	Italy	Coffee	Roaster	Chief purchasing officer Coffee buying department director Environmental sustainability & LCA team	2 face-to-face group interviews

Table 2.
Cases analysed in this study

Data collection and data analysis

Data is collected by means of multiple sources, summarized in Table 3. As the table outlines, the steps in the research process with different research aims were supported by multiple sources of information. As reported in Table 2, primary information were collected through semi-structured online and face-to-face interviews performed between January and March 2019 with different people who hold different roles within their organization, as sustainability and quality managers, as well as head of projects related to traceability. In the cases of two small enterprises (Cases A and E), we interviewed the founder of the company and a general manager, respectively, both being informants with a transversal and in-depth knowledge of all the processes within the organization.

Primary sources of information were complemented with secondary sources (i.e. internal documents, direct observations, news and press information, technological and industry benchmarks) for ensuring validity and reliability (Yin, 2009).

As for the collection of primary information, multiple researchers performed the interviews that were outlined in three parts:

(1) General business aspects: company characteristics (size, product lines and markets), business model and relationships with other SC actors.

(2) Traceability: TS, currently, is used to collect the information as well as to transmit information to customers; drivers and barriers connected to their adoption; future perspective towards new TS.

(3) Sustainability: practices implemented upstream processes are traced, also tested drivers and barriers and the role of certification, if available.

Steps in the research process with reference to research aims	Source and type of data collected for case studies
RQ1 – Traceability systems in the coffee supply chain	*Source 1 (primary) – interviews* Face-to-face and/or phone interviews on general business aspects, types of traceability solution(s) for data collection and data communication, drivers, barriers in the adoption, expected benefits and future traceability perspectives *Source 2 – news and press* Up-to-date preliminary information on the companies' traceability systems through a Google search on re-known traceability projects *Source 3 – technological and industry benchmarking* Certification schemes and standard information traced, general information of traceability solutions and modes of adoption in the coffee industry *Source 4 - direct observations* Product direct observations for the traceability information communicated to the final customer
RQ1 – Relationship between traceability and sustainability	*Source 1 (primary) - interviews* Face-to-face and/or phone interviews on drivers, barriers in the adoption of traceability solution(s), expected benefits, future traceability perspectives, sustainability initiatives and certification, their relationship with quality and traceability *Source 5 – internal documents* Company websites, sustainability reports/ethic codes, corporate presentation on specific sustainability initiatives
RQ2 – Legitimacy seeking approach	*Source 1 (primary) – interviews* Face-to-face and/or phone interviews on drivers, barriers in the adoption of traceability solution, expected benefits, future traceability perspectives, sustainability initiative and certification, their relationship with quality and traceability

Table 3.
Sources of data collected for the different RQs

For the purpose of this study, TS are classified according to three types as defined above: simple, advanced and integrated (Dabbene *et al.*, 2014). Furthermore, according to McEntire *et al.* (2010) and as cited by Stranieri *et al.* (2017), four elements characterize the level of traceability: breadth (number of attributes), depth (how far upstream or downstream in the SC), precision (how accurately is the attribute characterized) and access (how fast an SC member can visualize the traced information). In this study, we focus on traceability breadth and depth.

For breadth, we will look first at the general product information such as origin, composition and nutritional values; second, to quality and safety information; and finally, to sustainability practices. Concerning depth, it refers to how far upstream the supply chain the different traceability solutions attempt to reach, and at which granularity level. That is, traceability covers the country, region, cooperative (i.e. organised group of farmers) or individual farmer level. In terms of granularity, TS can be applied to all products (all the different product variants that are offered by the company) or only to some variants. Regarding sustainability, the three dimensions, environmental, social and economic, are considered.

For the first research question (RQ1), the coding was performed with an inductive approach. Each researcher shared his/her own results and discussed them in an analytical and interpretive process so that consistent interpretation of the findings was ensured and their internal validity (Seuring and Gold, 2012). After the first brainstorming session, the authors derived some first-level codes that subsequently evolved into three main codes, as

shown in Table 4, i.e. disconnected, complementary and synergistic. The research team agreed on these codes, directly derived from first-level codes or on direct quotations coming from interviews.

Finally, the study is grounded on legitimacy theory for addressing the second research question considering three legitimacy forms: pragmatic, moral and cognitive (Schuman, 1995; Castelló and Lozano, 2011; Alrazi *et al.*, 2015; Ellram and Golicic, 2016). Hence, for RQ2, the coding in the within-case analysis was performed on a deductive base and on theoretical constructs. In the findings, Table 6 provides details about first- and second-level coding assigned to the legitimacy-seeking construct for each of the cases, leveraging the most relevant quotations.

Finally, the cross-case analysis per SC tier and for companies sharing the same TS and for companies sharing the same legitimacy-seeking approach.

Findings and discussion

RQ1: traceability systems implemented in the coffee supply chain

Aiming at answering RQ1, we split the presentation of the findings into two parts. First, we describe the current TS implemented in the cases, and second, we identify the relationship between traceability and sustainability.

Therefore, thanks to the within-case analysis performed with the data collected from the interviews and secondary sources, we identified the TS adopted as well as the different technological solutions selected by the companies under study. In addition, we were able to describe the breadth and depth that these TS allow along with the motives for implementing them, for instance:

(1) Simple TS: companies such as Case E report the product information on the packaging. Besides, they rely on the HACCP standard for internal traceability and on the documentation provided by suppliers as transportation documents and invoices.

(2) Advanced TS: This is the case of companies (e.g. Case F1) that rely on certified purchases guaranteed by the third-party certification entities, e.g. Organic, Fairtrade, Rainforest Alliance and Utz. The information is transmitted through the packaging, including mandatory information and certification labels. This is complemented by extensive information reported on the company website together with processing methods and sustainability initiatives. Case F1 (trader) requires a guarantee of traceability from the certification bodies.

(3) Integrated TS: For instance, Case A (blockchain system) and Case C (real-time monitoring system with GPS). This type of system allows to reach consumers that, in turn, are directed to the company website to show the product's journey as well as information about certifications and sustainability practices.

Coding labels: TfS	Explanation in relation to first level codes
Synergistic	Traceability and sustainability are tightly related to achieving sustainability-related goals and also to demonstrate accountability for specific sustainability initiatives while keeping transparency along the chain
Complementary	Traceability complements the achievement of certain sustainability objectives and thus, sustainability arises as a positive "consequence" of the traceability efforts. Traceability helps at sustainability goals but "not as a main purpose, although relevant"
Disconnected	Traceability and sustainability initiatives are managed separately, each one with its own technology and procedures, often following different objectives

Table 4.
Definition of inductive codes for RQ1

The detailed information about the TS implemented in the set of cases is presented in Table 5. Specifically considering traceability breadth, evidence from the cases suggests, on one side, that companies in the coffee SC are indeed keener and more experienced in tracing regulatory attributes (product origin, ingredients and nutritional values) and quality and safety information (certifications). As seen in Table 5, all cases do this, except Case C with origin information. On the other side, additionally to some mandatory information, the traced data include sustainability practices as well. Being consistent with ensuring proper income to farmers is the most cited practice among the cases. In this way, companies practice SC responsibility, helping farmers to support their businesses and ensuring compliance with sustainability requirements. Furthermore, companies target several different levels of depth, i.e. up to the country, the region, the trader and the producer. Companies aim mostly to reach producers or the cooperatives they are part of, for tracing the coffee (Cases A, B, D and F1).

Specifically, several cases implemented *Advanced TS* to trace the most complete information breadth, from origin and quality to sustainability practices (Cases B1, C, D and F1). Moreover, these companies prefer to invest in a TS that goes as much in depth as possible for all products, i.e. up to the producer or the cooperative if possible. Instead, the lack of interest in tracing sustainability practices in Case C could be attributed to the supply chain role, being this company is a logistic operator and thus not having the same sustainability or traceability objectives as the coffee roasters.

Lastly, in Cases B and F, the two units of analysis reflect two different sets of products that are traced with the same TS for collecting information from the upstream stages, but with different systems for transmitting the information downstream (e.g. Case F1 adopts UTZ-Rainforest alliance certification label, while in Case F2, the company adopts an Integrated TS with QR code as communication technology).

Notably, the structure of the upstream SC influences the level of depth as well as the type of traceability technology adopted. As Marconi *et al.* (2017) proposed, in order to use traceability as a means to collect information about sustainability, it is necessary to model the SC and identify all the actors involved. Findings in our study indicate that the more fragmented the SC, the more difficult it is to reach higher levels of depth and granularity. For instance, interviewees from Company B and Company D both underlined the peculiar features of Brazilian production where farms are well-established cooperatives of considerable size. This means that working closely with farmers on sustainability initiatives is easier because roasters can directly buy from them via the cooperative (without middlemen intermediation). At the same time, given the cooperative's long-lasting experience and size, it is easier to implement even more expensive and extensive traceability solutions, such as the integrated system and QR code in Case B2. It is important to underline that the implementation of such solutions would not be feasible with a different configuration of the upstream SC, i.e. with intermediaries or middlemen, as Saberi *et al.* (2019) explained, when scalability is a challenge (Rana *et al.*, 2021) or when there is consumer's scarce knowledge and perception of the technology implemented (Rainero and Modarelli, 2021).

Lastly, in terms of granularity, findings suggest that TS can be applied to all products (all the different product variants that are offered by the company) or to just some variants. In particular, Case A traces every SKU thanks to the blockchain technology adopted, instead, the rest of the cases mostly trace-specific product lines for specific customers.

Accordingly, for achieving sustainability, especially in global chains, where reaching and assessing supplier sustainability could become unsurmountable (Mejías *et al.*, 2019; Norton *et al.*, 2014), it is seen that the *Advanced* or *Integrated TS* could be a key factor for reducing such distances and better collect information and ensure transparency (Marconi *et al.*, 2017; Rana *et al.*, 2021; Ringsberg, 2015; Saberi *et al.*, 2019). However, findings in this study reflect that different types of TS with their corresponding breadth and depth will reach different

Case	Role in the supply chain	Traceability system (type)	Technology to transmit information to customers	Information breadth		Sustainability practices	Information depth	
				Regulatory (origin, ingredients, basic safety information)	Additional: Quality and safety information		Granularity level	How in depth upstream?
A	Roaster	Blockchain-based *(Integrated)*	QR code on the packaging	X	X	Proper income to farmers	Single SKU: Blockchain-based traceability	Producers
B1	Retailer	Integrated management system *(Integrated)*	QR code on the packaging	X	X	Proper income to farmers, helping farmers in keeping up their businesses	Two SKUs	Producers (generally organized in cooperatives)
B2	Roaster	Third party certification *(Advanced)*	(Proprietary) certification label on the packaging	X	X		Most of the product lines	Producers
C	Logistic operator	Real-time monitoring system *(Integrated)*	N/A	/	/	/	Specific product lines (specific customers)	Real-time position from exporting countries to western roasters and product parameters
D	Roaster	Documental *(Simple)*	(Proprietary) certification on the company website	X	X	Responsible supply chain practices	All product lines	Producer in Brazil, cooperatives in Colombia, exporters in Africa and south-East Asia
E	Roaster	Documental *(Simple)*	Basic information on the packaging	X	X	Sustainability is delegated to first-tier supplier	All product lines	Supplier 1 tier upstream

(continued)

Table 5.
Traceability systems implementation in the cases under study

Case	Role in the supply chain	Traceability system (type)	Technology to transmit information to customers	Information breadth			Information depth	
				Regulatory (origin, ingredients, basic safety information)	Additional: Quality and safety information	Sustainability practices	Granularity level	How in depth upstream?
F1	Trader	Third party certification (*Advanced*)	Certification label	X	X	Proper income to farmers, farmers to be compliant with social and environmental standards	Specific product lines (specific customers)	Producers
F2		Integrated management system (*Integrated*)	QR code on the packaging			Information about the "family behind the farm" and quality standards	Specific product lines (specific customers)	Region/cooperative (depending on where)
G	Roaster	Third party certification (*Advanced*)	Certification label	X	X	Proper income to farmers, farmers to be compliant with social and environmental standards	Specific product lines (specific customers)	Traders (1 tier upstream)

Table 5.

Case	Most significant quotation on legitimacy-seeking purposes	First level coding	Second level coding: Legitimacy form	Sustainability practices included in the traceability processes	Traceability for sustainability
A	"it is not a traditional coffee, it is a speaking product, communicating to customers additional information that they want to know"	Focus on direct benefits (i.e. more informative content) for customers	Pragmatic legitimacy	Collaboration with NGOs for the provision of facilities and development projects aimed at increasing farmers' independence, with own and sufficient income sources from coffee cultivation	Synergistic
B1, B2	"In addition to the operative benefits that connects to a better monitoring of the chain, we can use both traceability systems (both QR-code and certifications) to better communicate with final costumers that the product incorporates ethical values, in this way the customers' willingness to pay is higher"	Demonstrating the ethical values of the company to customers to charge a higher price	Pragmatic legitimacy	Coffee producers are paid a fair price plus a quality premium Continuous farmer training about sustainable agronomic techniques and about risk prevention	B1: Synergistic B2: Synergistic
C	"it (i.e. the technology) allows us to track the localization of the truck to assure quality. For us quality means a transportation in the right time, in line with the costumer request"	Focus on direct benefits (i.e. quality and service level) for customers	Pragmatic legitimacy	The GPS tracking system allows monitoring parameters like temperature and humidity in the storage. The timely indication of critical values in these parameters can support food waste prevention	Complementary
D	"Despite at that time there were several certifications, they were all at the expenses of the producers . . . Instead our proprietary certification does not create any extra expenses for the farmers"	Promotion of farmers' well-being justifies *ad hoc* certification effort	Moral legitimacy	100% of farmers are audited. Farmers' continuous development and sustainability: Training on good agricultural practices, incentives and rewards systems, continuous monitoring, social initiatives. A higher price is paid to guarantee an adequate income	Synergistic

(continued)

Table 6.
Legitimacy-seeking purposes driving the implementation of traceability and sustainability

Case	Most significant quotation on legitimacy-seeking purposes	First level coding	Second level coding: Legitimacy form	Sustainability practices included in the traceability processes	Traceability for sustainability
E	"We have to put quality at the first place, this is what customers expect from a specialty coffee, that is, good quality"	Sustainability and quality are taken for granted by customers	Cognitive legitimacy	All the sustainability initiatives are required to first-tier suppliers. No standard certification schemes are adopted because they are not compatible with company E's quality standards	Disconnected
F1, F2	CERTIFICATION (F1): "we wanted to go further than only certifications, it has been a good start for a couple of years but we need to be able to respond to what farmers need and so to develop our own responsible sourcing program" QR CODE (F2): "The more you can target the information that you communicate to individuals, the better the identification of consumers with the actual farmers . . . That means moving to data collection to story-telling"	F1: Promotion of farmers' well-being justify ad-hoc traceability effort / F2: Focus on direct benefits (i.e. storytelling) for customers	F1: Moral legitimacy / F2: Pragmatic legitimacy	Cross-sectoral partnerships with NGOs and certification bodies to reach the farmers and implement development initiatives: Improve farmers' welfare, transfer of entrepreneurial skills / Sustainable initiatives differ depending on the different challenges of the specific geographical or social context	F1: Synergistic / F2: Complementary
G	"The certified coffee supply chain has clear labels which might trigger customers' interest. The percentage of certified coffee is however low, because generally the market does not pay the cost of certification"	Demonstrating the ethical values of the company if "the market pays the cost"	Pragmatic legitimacy	Cross-sectoral partnership with NGOs and certification bodies to reach the farmers and implement development initiatives. Other initiatives are delegated to the trader	Disconnected

Table 6.

levels of information along the SC and not necessarily for sustainability purposes. This will be further analysed in the following section.

Discussion RQ1: relationship between traceability and sustainability. The cross-case analysis allowed us to identify certain commonalities in the cases under study regarding the implementation of TfS purposes or not. In line with Garcia-Torres *et al.* (2019), companies need to develop specific skills for TfS and in our study evidence showed how companies implement varied TS according to their capabilities and interests, aiming at obtaining multiple benefits, including sustainability. However, companies also explained that they do not necessarily manage traceability and sustainability together, as traceability is mainly required by law and regulation compliance, whereas sustainability is driven by company values and commitment.

There are cases leveraging on forms of *Advanced TS* (Cases B2 and F1) for implementing sustainability in the coffee countries of origin, guaranteed by third-party certification entities which prove the origin and guarantee that sustainable practices are carried out by the certified producers (Kuit and Waarts, 2014; DeFries *et al.*, 2017). The three most popular certification schemes in the coffee industry with dedicated traceability solutions are Fairtrade system (managed by FLOCERT) and the so-called "Chain of Custody" for Rainforest Alliance and Utz. The respective third parties (i.e. Fairtrade, Rainforest Alliance and Utz) guarantee that sustainable practices are carried out by the certified producers (Kuit and Waarts, 2014; DeFries *et al.*, 2017), as for Cases B and F1. This type of relationship between traceability and sustainability is also present in Cases A and B1 that adopt instead an *Integrated TS* connected to a technological solution. For instance, Case A, one of the smallest companies in the sample, adopts a blockchain system. This technology ensures transparency and traceability, as several authors explained (Rainero and Modarelli, 2021; Rana *et al.*, 2021; Saberi *et al.*, 2019; Kittichotsatsawat *et al.*, 2021), and brings information depth at its utmost. In these two cases, traceability appears to be *synergistic* with sustainability. Instead, Case D holds no third-party certifications because managers believe that the certification schemes for the coffee industry are overly focused on quality. Hence, they developed a proprietary certification scheme (*Advanced TS*) that appears to be *synergistic* with sustainability too, given the specific focus they put on sustainability and the extension of virtuous sustainable practices to farmers, similar to the case exemplified in Alvarez *et al.* (2010).

P1. In the coffee SC, a synergistic relationship between traceability and sustainability is developed by companies implementing an Advanced (certification based) TS with sustainability purposes in mind.

P1a. In the coffee SC, a synergistic relationship between traceability and sustainability is developed by smaller companies implementing Integrated TS able to reach higher levels of depth.

Case G adopts a different approach. The company develops sustainability activities in almost all the countries where traders source from, adopting a multiple stakeholder approach (Alvarez *et al.*, 2010) collaborating with NGOs, other roasters, local communities as well as traders. However, the company is not able to link its efforts of sustainability with traceability. Committed to sustainability, Case G prefers to carry out these initiatives without linking them to direct purchases, counting on spill-over effects that over time will spread best practices within the country of origin. Traceability and sustainability are not related also in other cases, allegedly because certain supply chain tiers are not concerned with either sustainability or traceability, or both. Case E, one of the smallest companies in the sample, adopted a *Simple documental TS* without a clear interest in sustainability; they mentioned that their business is not in charge of ensuring traceability, because their supplier or customer is responsible for it. In these two specific cases, traceability appears to be *disconnected* from traceability.

Furthermore, we could observe that the relationship between traceability and sustainability for these cases might also be influenced by volumes purchased and company size. As for volume, the largest company in our sample, which purchases up to four million bags (Case G), has a *disconnected* relationship between traceability and sustainability because of the complexities of tracing back upstream to many producers spread around the world. Whereas for Case E, being a smaller company – compared to other players in the same supply chain – and given the small volume of green coffee purchased, it requires traceability and sustainability from the player with higher relational power in the chain: the trader.

> *P2.* In the coffee SC, a disconnected relationship between traceability and sustainability occurs when the company is not able to integrate sustainability with traceability, thus not having the means for making claims of sustainability in its SC tier, due to company size and product volume.

Additionally, two cases *with Integrated TS* approach traceability with an intent that is indirectly related to sustainability. Case C, for example, recognizes that a traceability system with GPS fosters sustainability, as the system can monitor conditions related to coffee quality and preservation (e.g. humidity and temperature), thus contributing to the identification of situations that could lead to food waste. Similarly, Case F2 with a QR code on the packaging allows to share with customers the sustainable initiatives implemented with farmers, although this was not the main reason why they decided to invest in this traceability system. In Cases C and F2, traceability can complement the achievement of certain sustainability objectives and thus support: (1) the reduction of food waste by tracking some key parameters connected to food preservation in real time; and (2) the creation of customer awareness about the value of sustainability initiatives for coffee farmers. In these cases, traceability solutions can, therefore, be considered *complementary* to sustainability.

> *P3.* In the coffee SC, traceability can complement sustainability in companies that implement TS for monitoring product characteristics and for sharing information with other actors in the SC.

RQ2: legitimacy-seeking purposes for the adoption of traceability for sustainability
In order to answer the second research question, our analysis identified the pragmatic form of legitimacy to be the most common way to attain the validation from consumers in the cases under study, as also reported by Ellram and Golicic (2016). Companies, indeed, attempt to demonstrate the value of their products and processes with *Advanced or Integrated TS*, using different levels of technology and certifications, to reach consumer expectations and communicate them in a practical and efficient manner and, in turn, influence a conscious decision-making as Rainero and Modarelli (2021) analysed. Additionally, companies implement *Advanced or Integrated TS* in order to mitigate the risk of affecting their own reputation, if suppliers do not comply (Mejías *et al.*, 2019). As observed in Table 6, companies A, B, C, F2 and G are driven by *pragmatic* legitimacy, since they interpret TS not as a way to collect information that can trigger or favour the implementation of sustainability practices, but as a tool to narrate their stories to the final customers (as Aagerup *et al.*, 2019 studied), while developing different types of relationship between traceability and sustainability.

Discussion RQ2: legitimacy-seeking in the coffee supply chain. The idea of providing a direct benefit to customers in the coffee SC is associated with demonstrating accountability for specific sustainability initiatives and this way meeting societal and market expectations with a *pragmatic* approach. For instance, in Case B, traceability is *synergistic* with sustainability and their stakeholders' expectations correspond to the inclusion of ethical values, so that, in the words of the Head of Marketing and Sales "the customers' willingness to pay" is higher

and thus sustainability becomes the key performance dimension to gain and maintain market legitimacy in a *pragmatic* manner, as exemplified also by Longoni and Luzzini (2016). Other examples of *pragmatic* approaches are Cases C and F2 that consistently combine their *complementary* approach to traceability and sustainability, and *pragmatic* legitimacy seeking. Interestingly, these two cases aim at supporting their sustainability practices with their TS, and they both do it in a practical, efficient form. An interesting case of legitimacy-seeking in a *pragmatic* form is Case G. Although this company reports being committed to sustainability, it also manages traceability in a *disconnected* way, because of the difficulty to trace sustainability practices due to large volumes and a fragmented supply base. Thus, the company implements sustainability initiatives and counts on spill-over effects in the upstream chain.

P4. For companies in the coffee SC, a pragmatic legitimacy seeking form does not determine the type of relationship between traceability and sustainability, other contingent factors can be considered as influential.

P4a. When pursuing legitimacy with a pragmatic form, the high product volume and the high fragmentation of the supply base lead to a disconnected relationship between traceability and sustainability.

P4b. Pursuing legitimacy with a pragmatic form and setting quality as the priority objective lead to a complementary relationship between traceability and sustainability.

P4c. Pursuing legitimacy with a pragmatic form for meeting customer sustainability expectations leads to a synergistic relationship between traceability and sustainability

In another approach, two companies stand out for adopting either a proprietary certification scheme (Case D) or a specific investment in *ad hoc* initiatives that go beyond the initiatives connected to standard certification schemes (Case F1). Both cases embody more sustainable and "fairer" requirements for all coffee SC partners, thus gaining *moral* legitimacy by doing "the right thing". These two cases (D and F1) adopt traceability as part of a committed company sustainability culture. They believe their actions will impact transformation and sustainable development, they have a clear belief in generating positive impact. Case D developed a proprietary certification scheme, grounded on ethics, social sustainability, economic and environmental sustainability. This is validated by an international registrar and classification society. Instead, Case F1 adopts a standard certification, i.e. Utz – Rainforest Alliance. In addition to Utz, some extra initiatives are put into place directly in the coffee-producing countries. Hence, in these cases, this *moral* legitimacy-seeking form has led the companies to go beyond the standards, thus allowing to create a *synergistic* long-lasting relationship between traceability and sustainability.

P5. For companies in the coffee SC, a moral legitimacy-seeking form leads to a synergistic relationship between traceability and sustainability.

Finally, the *cognitive* form of legitimacy-seeking is observed in Case E which works intensively to convince its customers to relate its brand with high-quality performance. This company does not intend to extend its already gained legitimacy to sustainability because it is convinced that its differentiation value relies exclusively on quality. Case E adopted a *Simple TS* in order to protect some "taken for granted assumptions" that customers have about them. As Case E's owner explained: "We have to put quality first, this is what customers expect from a specialty, good quality coffee". Hence, in this case, the relationship

between traceability and sustainability is *disconnected* because traceability is not intended for sustainability, but for quality objectives.

Our findings led to a series of research propositions depicted in Figure 2 in a comprehensive framework as explained in the previous paragraphs.

Conclusions

This study aims at identifying the TS implemented along the coffee SC, at studying the type of relationship between the TS implemented and sustainability and at investigating how the implementation of TfS responds to legitimacy-seeking purposes. Grounded in legitimacy theory and with the analysis of nine cases in the coffee SC, this study identified the TS implemented, deriving three types of TfS. Moreover, we investigated the impact of the three different legitimacy-seeking forms (i.e. pragmatic, moral and cognitive) on the choice of the different types of TfS.

Research contributions

With the present work, we contribute to the literature by identifying three types of TfS adopted in the global coffee SC, along with their corresponding levels of information breadth and depth. Thus, extending research by including companies in different SC tiers, the different elements of traceability and the technology adopted.

In particular, our study contributes to three main streams in the literature. First, we contribute to the debate regarding the relationship between traceability and sustainability (e.g. Garcia-Torres *et al.*, 2019) by characterizing three types of relationships: disconnected, complementary and synergistic; these are influenced by the company size, volume and product type and the legitimacy-seeking form. The approaches adopted in the coffee SC are mixed, from real sustainability "believers" spreading their moral values in a synergistic way to pragmatic companies acting mainly for communication purposes. Alternatively, legitimacy can be pursued in a cognitive form when highlighting the product quality as a competitive advantage, with no necessary connection with sustainability.
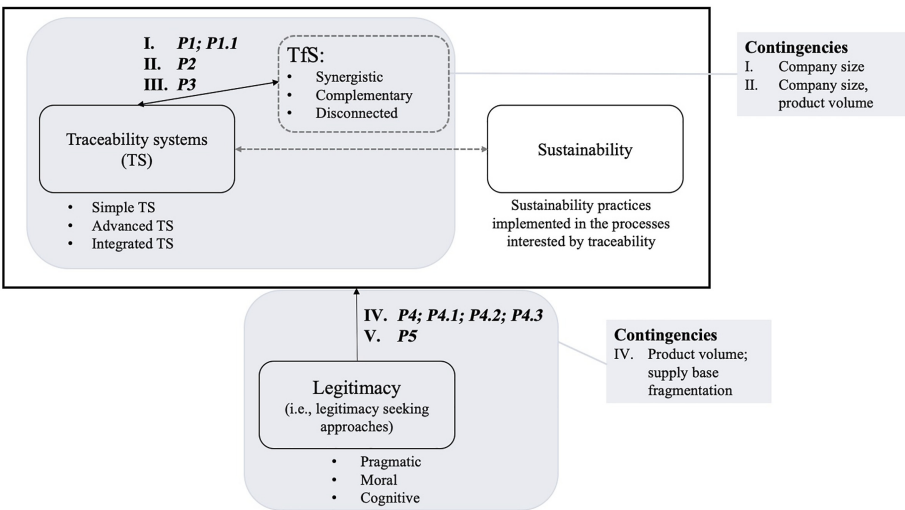
Figure 2.
Comprehensive framework with research propositions

A second contribution regards this study is grounded on legitimacy theory for explaining the legitimacy-seeking forms for implementing traceability and sustainability in a global commodity SC. In this vein, we are also contributing to the literature on legitimacy theory, as Ellram and Golicic (2016) did for transportation practices, and in particular, we extend the approach to analyse the role of traceability practices for sustainability purposes.

Thirdly, the focus on multiple stages of the coffee SC responds to the call by Mejías *et al.* (2019) and Bashiri *et al.* (2021), who underlined how a multi-stage focus for the implementation of sustainability practices, measurement of sustainability performance, addressing sustainability risks are areas still under-developed, especially for global and complex SC as the coffee chain. Moreover, they identify a traceability management system as one of the best practices for improving the commitment of suppliers to be aligned with sustainable principles. We add to that research by highlighting that this depends also on the strategic importance of sustainability and the legitimacy-seeking approach of the company who is the main proponent of the traceability system.

Interest for managers
Findings in our study are of interest for practitioners as well as for identifying the needs and potentialities of traceability according to their technological capabilities. Moreover, managers can find in our study guidance for the choice of different strategies for TfS depending on their legitimacy-seeking purposes and the different needs to connect traceability with sustainability. Accordingly, this would allow managers to implement further developments, ranging from the possibility to demonstrate their commitment towards a sustainable SC to the feasibility to enhance the use of TS systems to collect data in order to systematically analyse the sustainability impacts. In particular, we believe that managers can benefit from our study by considering three equally important and correlated aspects when evaluating TfS.

First, we suggest considering the role of sustainability in the company strategy and evaluating if (1) sustainability is intended as the main competitive priority addressing a specific market segment with a high willingness to pay with respect to sustainability, (2) sustainability is important but subordinated to other competitive factors or (3) the creation of sustainable value is of equal importance to the creation of economic value.

Second, we believe that managers would benefit from an understanding of the type of legitimacy-seeking approach fitting their needs. In these regards, our findings underline that a pragmatic approach is a non-sufficient condition to obtain a synergistic relationship between traceability and sustainability and thus managers cannot count on traceability solutions to achieve sustainability objectives. A synergistic relationship between traceability and sustainability can be achieved when pragmatic legitimacy-seeking approach is combined with sustainability intended as a key competitive factor to obtain differentiation in the market. When instead a company seeks a moral form of legitimacy and sustainability intended as "doing the right thing" is equally important to economic objectives, our findings suggest that traceability solutions can support sustainability objectives.

Third, by devising three possible relationships between traceability and sustainability, we are pointing out that managers investing in traceability solutions might decide to devote a different amount of resources to include sustainability. In the cases where traceability and sustainability are *synergistic*, Advanced TS are conceived *ad hoc* to achieve sustainability objectives. Managers of companies approaching sustainability as a key strategic goal might find their company fitting with this profile and they might invest a considerable amount of resources in this synergistic direction. As the collection of sustainability information becomes systematic, we see significant potential for companies to measure performance and report reliable data on sustainability performance.

When instead traceability is *complementary* to sustainability, the TS might be intended to satisfy other strategic objectives, such as product quality. In these cases, impact on sustainability comes as a "positive externality" (e.g. monitoring food preservation conditions through real-time TS enables food waste prevention). In these regards, managers of specialty coffee companies, in which product quality is a cornerstone for their strategy, might wish to invest additional resources to let the effects on different dimensions of sustainability emerge clearly.

Finally, when traceability and sustainability are *disconnected*, the reasons for this detachment are to be sought in some contingent factors that deal with company size and product volume, that force the company to rely on a longer SC along which, it is yet too difficult to develop traceability through an integrated or advanced solution.

Future research avenues
Further research on this topic could address the main limitations in this study regarding the specific industrial context and geographical locations, extend the research to a larger sample involving other commodities and other industries or delve into the contingency variables that determine the adoption of certain traceability system and their relationship with sustainability. Moreover, despite the contribution of the paper in investigating different stages of a food commodity SC, there are some limitations triggering future studies connected to the scope of the study. We suggest that future studies might focus on different stages of a single SC, as proposed by Bashiri *et al.* (2021), considering companies that buy and sell from each other, and research could expand the observation to three or more stages in an SC. This scope would enable the investigation of the effects of different legitimacy-seeking purposes across different stages of an SC and the consequent effect on sustainability performances. Along a SC, there is usually the main proponent of a traceability project, involving other SC partners and cascading requirements and constraints with a more or less collaborative approach. Failure to effectively transfer these requirements might be affected by the legitimacy-seeking purpose adopted by the proponent of the traceability project but can also be dependent on a different use of power. In these regards, we believe that new theoretical lenses on the challenge of power balance (e.g. Touboulic *et al.*, 2014) might well integrate our findings on TfS in modern SCs.

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