

Business ethics beyond legal compliance: an empirical analysis of the Italian PFAS case

Relatore / Advisor:
Prof.ssa MARINA NICOLI

Tesi di Laurea Magistrale di /
Master of Science thesis by:
GIULIA ISABELLA GALIMBERTI
matricola n. / student ID no 3160274

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INTRODUCTION

One of the most intricate matters in contemporary business ethics concerns corporate responsibility when firms produce or use substances whose potential risks are not yet fully regulated but may entail negative consequences for stakeholders. This issue is influenced by eventual internal knowledge the manufacturer company may not have disclosed to authorities and leads to questioning whether corporate responsibility can be reduced to mere compliance with the existing laws, or, rather, if transparency obligations and preventative conduct before legal obligations should be required.

Per- and polyfluoroalkyl (PFAS) manufacturers represent one of the most significant examples of this issue. These substances have been commercialised and widely employed for their resistance to water, oils, heat and chemical degradation, entering industrial processes and everyday consumer products. While their peculiar resistance made PFAS commercially valuable, their properties also made these substances extremely persistent in the environment, leading to their accumulation in ecosystems and biological organisms. Additionally, PFAS are known to be toxic to human health, and this has led to increased regulatory attention over the last decade. A smaller but important body of research has examined corporate conduct in the United States, especially through the DuPont case, where internal documents and litigation revealed how knowledge of PFAS-related risks preceded public disclosure and regulatory action. In the managerial business ethics literature, given its exceptionality and recent evolution, the Italian PFAS case is less developed and constitutes a research gap. More specifically, the available literature already proposes analyses regarding environmental and public health theories, but the recent evolutions and judicial findings create a research gap concerning historical corporate conduct.

The aim of this thesis is to actively contribute to the research on corporate responsibility and business ethics by examining the Italian PFAS case, which is recent and still evolving, traversing into a broader European sectoral pattern. More specifically, the research investigates how corporate opacity under weak or delayed regulation can

undermine responsibility beyond legal compliance, and how stakeholder pressure emerges once PFAS-related risks become publicly visible. Considering that most of the available literature on PFAS considering business ethics and stakeholder theory is U.S.-centric, due to the resonance and industrial relevance of the DuPont case, this thesis constitutes an addition, focusing on building empirical research on a less studied area over a more recent evolution of the PFAS industrial controversy.

The empirical analysis involves a documentary analysis that reconstructs the evolution of the Italian PFAS case through publicly available institutional, parliamentary, judicial and journalistic sources, with a primary focus on the Miteni case in Veneto and a comparative reference to Piedmont. Second, it involves interviews with researchers, advocacy actors, public water utilities and institutional stakeholders who had some experience of the PFAS industrial issue and its environmental consequences. Third, it completes the triangulation through an online survey that investigates stakeholder responses and CSR expectations from consumers.

The literature review of this thesis includes three chapters. Chapter 1 introduces the business ethics framework, focusing on responsibility beyond legal compliance, information asymmetry, CSR, stakeholder theory, reputation and environmental externalities. Chapter 2 reviews the PFAS literature, including applications, persistence, health concerns, regulation and stakeholder responses. Chapter 3 reconstructs the historical development of PFAS production and corporate conduct, with particular attention to the DuPont case and to the Italian research gap. The empirical research revolves around the last four chapters. Chapter 4 defines the purpose, research question and hypotheses. Chapter 5 explains the research design and methodology. Chapter 6 presents the results of the documentary analysis, interviews and survey. Finally, Chapter 7 discusses the findings considering the theoretical framework, assesses the hypotheses and outlines the limitations and future research opportunities.

LITERATURE REVIEW

1. BUSINESS ETHICS AND CORPORATE SOCIAL RESPONSIBILITY

1.1 Introduction

Business ethics is the study of the moral principles, standards and values that emerge in business settings and requires cooperation between disciplines such as economics and social sciences. Thus, business ethics analyses the moral implications of economic activity and the corporate responsibilities that derive from business activity. It examines all the ethical elements that make business legitimate, such as trust, honesty, fairness, responsibility to stakeholders and respect for the limits within which the pursuit of profit can be considered socially acceptable (Chadwick, 2012).

David George Surdam, in its book “Business Ethics from Antiquity to the 19th Century” (2020), refers to business ethics as an “*ever-changing, vibrant corpus of beliefs, customs, and laws*”. Business ethics has emerged as an academic subject in the last decades, and, as Surdam explains, economics and ethics are closely intertwined because “*economic relations are grounded on moral foundations*.” The author believes that profit can be pursued ethically and the market, within its resource allocation mechanisms, constitutes a social institution that functions well only when all actors respect some moral conditions. One of the basic principles of business ethics, as seen through the history of commerce, is what journalist Jane Jacobs describes as “shun force”: “*When violence or intimidation enters a transaction, it ceases to be trade in any serious moral sense*” (Jacobs, 1992, cited in Surdam, 2020). Additionally, a transaction may appear formally voluntary, but if it exploits fraud, concealment, or superior information to impose risks that the other party cannot properly assess in advance, then the considered transaction is morally illegitimate.

Business ethics also refers to the lack of information manipulation, where a truly legitimate business relationship requires that parties can decide based on sufficient and unbiased information (Surdam, 2020). Surdam also adds that fraudsters threaten

the whole market by reducing trust, and trust is a structural condition of the business. Surdam recognises this insight when he observes that honesty and integrity are lubricants in an economic engine. They reduce transaction costs, make exchanges easier, and allow cooperation among strangers. Their absence corrodes the moral foundation on which markets depend. When there is no trust, actors must invest resources in monitoring and enforcement, with a very high economic and social cost (Reder, 1979, cited in Surdam, 2020).

1.2 Ethical duties beyond legal compliance

“Every civilization has created or used “externalized morals” to maintain acceptable behavior in the marketplace”, whether it constituted simple peer pressure or formal systems such as *lex mercatoria*, it testifies that, historically, communities resorted to regulation, as reminder of what constitutes “right” behaviour, as well as a threat of punishment (Friedman and McNeill, 2013, cited in Surdam, 2020). The law provides a minimum standard of acceptable conduct. This raises a more difficult question: can compliance with the law be considered sufficient, or do they need intrinsic moral judgment? As Surdam (2020) explains, all enterprises require a moral infrastructure. Indeed, the very infrastructure of markets (receipts, accounts, contracts) was historically designed to signal trustworthiness and to make fraud socially disgraceful. Much economic backwardness can be explained by a lack of trust (Arrow, 1972, as cited in Surdam, 2020). But this infrastructure breaks down when actors only obey the law out of fear of detection, and a culture of economic deterrence results in a weak morality.

Fort (2008) provides a taxonomy of corporate trustworthiness that is of particular service, distinguishing three orders of trust: “Hard Trust”, “Real Trust”, and “Good Trust”. The first, “Hard Trust”, denotes the lowest level, in which companies act ethically primarily to avoid legal sanction and harm to their reputation, thus ethical conduct is pursued chiefly from fear of legal penalty or injury to reputation. The second, “Real Trust”, is founded on the prudential and pragmatic view that honesty and goodwill may,

over time, prove commercial advantages. The last category, “Good Trust”, is reserved for those economic agents who behave morally as moral conduct belongs to their very manner of being in economic life (Fort, 2008, cited in Surdam, 2020). Fort argues that executives whose behaviour remains within the registers of Hard Trust and Real Trust have not yet understood the higher moral aspirations from which true trustworthiness and moral excellence proceed. Fort’s taxonomy is of particular value precisely because it discloses the insufficiency of a merely formal conception of compliance, since firms can formally follow the rules and still fall short of trustworthiness in any fuller moral sense. The register of Hard Trust pertains to companies that act only under the pressure of legal compulsion, or where reputational injury threatens to become commercially inconvenient, but the avoidance of sanctions is not equivalent to affirmative steps to avoid foreseeable harm. On the other hand, the ethically responsible company acts morally even if the sanction is not certain, avoiding taking advantage of its superior knowledge or technical capacities against stakeholders.

Concerning the purpose of firms and the extent of managerial responsibility, Milton Friedman, through its well-known formulation, offers perhaps one of the clearest perspectives: according to his theory, the corporate executive is the agent of the shareholders and her responsibility is to *“conduct the business in accordance with their desires, which generally will be to make as much money as possible while conforming to the basic rules of the society both those embodied in law and those embodied in ethical custom”* (Friedman, 1970, as cited in Surdam, 2020). However, this position represents a relatively narrow conception of corporate responsibility, as Friedman’s thesis represents the principle of shareholder primacy. From his perspective, corporate social responsibility is meaningful only if it is aligned with the pursuit of profit or mandated by law. Social objectives should be sought through the political process, not through managerial decisions that use shareholders’ resources. On the contrary, Friedman argues that business executives engaging in social responsibility are acting

dangerously, committing a “suicidal impulse”, as this may reinforce the idea that maximising profits for shareholders is inherently immoral.

While shareholder primacy suggests that the firm should be focused on maximising shareholder value, stakeholder theory suggests that the firm should be focused on the interests of all stakeholders (Parmar et al., 2010). Stakeholder theory was developed in response to the shortcomings of Friedman’s shareholder-based model, and much of the intellectual architecture of stakeholder theory was pioneered by R. Edward Freeman, who argued that managerial capitalism, with its singular focus on fiduciary duties to shareholders, did not provide a sufficiently broad framework for corporate governance. For Freeman, all those who have a stake in the enterprise, suppliers, customers, employees, stockholders, or the local community, all stand in a fiduciary relationship with the firm, and none of these groups ought to be treated merely as a means to corporate ends. Then, Freeman argues that balanced relationships among stakeholders are therefore a condition for the firm’s own continued legitimacy (Freeman, 1984; Freeman, 2011, cited in Surdam, 2020). Freeman’s theory regards long-term survival of a firm, and it argues that a company that disregards workers, ecosystems, local communities, public institutions, consumers or future generations secures short-term advantage at the cost of weakening the very conditions that make its activity acceptable. Thus, the maximisation of shareholder value should be balanced against the legitimate claims of stakeholders involved or affected by business decisions.

According to French, in “The Corporation as a Moral Person” (1979), firms can be considered as moral agents, because they are equipped with internal decision-making structures that allow them to act intentionally. If this is so, firms should be held morally accountable for the consequences of their actions, required to comply with regulations and make restitution to communities, and corporate harm, rather than being treated as the accidental result of individual choices, may arise from repeated and structured decisions embedded within the organisation itself.

Corporate accountability also involves differentiating between legal responsibility and moral responsibility. A company can technically obey the law but act irresponsibly by taking advantage of regulatory loopholes, delayed disclosure, weak standards, or scientific uncertainty to continue profitable but risky activities. Business ethics is especially important when positive law has not yet caught up with the need to protect stakeholders. Also, accountability means being liable for the consequences of organisational action, which does not only mean responding ex post with litigation or compensation, but also preventing potential damages, disclosing relevant information, cooperating with regulators, remediating harms and modifying business practices when they produce disproportionate risks (Surdam, 2020).

On the other hand, it is important to note that Surdam clarifies that companies may proactively favour regulation for unethical reasons: *“Businesspeople often complain about regulation, but they often seek self-serving legislation that is anti-competitive, provides subsidies for them, or uses the government as a “stamp of approval.” Some businesspeople seem to adhere to the idea that capitalism is good...for the other person”* (Surdam, 2020).

1.3 Information asymmetry and duty of disclosure

Information asymmetry is one of the most relevant issues for business ethics. Hayek (1945) observed that *“practically every individual has some advantage over all others in that he possesses unique information of which beneficial use might be made, but of which use can be made only if the decisions depending on it are left to him”* (Hayek, 1945, cited in Surdam, 2020). For Hayek, the dispersal of knowledge across society is a condition of economic efficiency: no central authority can replicate the distributed wisdom embedded in individual actors' experience and observation.

Surdam (2020) further notes, following Hayek, that gaining advantage from superior knowledge is sometimes seen as dishonest, precisely because markets presuppose a degree of epistemic transparency. The informational advantage can be unfair when it

alters the conditions of the transaction. In an ordinary market, superior information can be a legitimate source of entrepreneurship and innovation: every company has superior skills and know-how compared to consumers. However, asymmetry becomes morally problematic if it concerns essential risks to the security of people and ecosystems that other stakeholders should be aware of. It is in these cases that the duty of disclosure becomes an ethical duty, because if a company knows better than regulators or stakeholders the risks associated with its products or production processes, its moral responsibility cannot be minimal. In this case, the company should not make selective disclosures or promote strategic uncertainty or misleading communications that prevent stakeholders from protecting themselves or participating in the regulatory process.

Severe information asymmetries between firms and stakeholders regarding the health and environmental consequences of manufacturing and products enable firms to exploit market imperfections to increase profits. This is particularly relevant in sectors of high scientific complexity, where risks are often delayed, invisible, technically complex to understand, and stakeholders depend only on the quality of the information shared by the company (Zalta et al., 2021).

1.4 Corporate Social Responsibility: beyond philanthropy and compliance

According to Ledgerwood and Broadhurst (2000), the concept of business ethics involves a variety of sub-topics which are reflected in several approaches to the subject. It should be regarded from three dimensions: an *international dimension*, with a focus on multinational corporations (MNCs) and their businesses across nations. A *national dimension* targeting firms operating in a distinct country, focusing on both internal relations in the corporation among workers and managers, and external relations with stakeholders, together with compliance with local laws. Lastly, a *meta-ethical dimension* orbiting around philosophy, economic and political theory, and sociology to determine what is ethical in business. This dimension constitutes a theoretical component of evolving Corporate Social Responsibility frameworks. While

a firm may respect international and national laws expressing minimal ethical requirements, a growing spontaneous transparency and attention to several stakeholders is increasingly expected to protect a firm's reputation.

Corporate Social Responsibility (CSR) consists of actions not legally required by national and international laws but intended to benefit stakeholders other than the firms (Vogel, 2005). According to Ledgerwood and Broadhurst (2000), a three-dimensional framework, CSR may fall into the third category. Some scholars suggest that firms should not only comply with regulations but also include ameliorating serious social and environmental issues among their main responsibilities if resources are sufficient (Zalta et al., 2021).

The definition separates CSR from compliance because a company is not socially responsible just because it complies with current legislation. Not only that, CSR does not coincide with philanthropy or reputational management, because donations and voluntary codes are insufficient if they do not affect the real impacts of the core business. Modern CSR must cover all business processes, and in high-risk industries, this means adopting precautionary standards, investing in safer alternatives, protecting workers, ensuring transparency to consumers, and working with public authorities. Therefore, CSR and corporate accountability, both necessary conditions for business ethics, are distinct because CSR concerns what the company chooses to do voluntarily beyond the law, while corporate accountability concerns the mechanisms through which the company is called to answer for the consequences of its actions.

1.5 Litigation, reputation and the “newspaper test”

According to Frankel (2006), the relationship between trust and law can be described with the expression "*trust but verify*": the law upholds trust and promises verification, but morality also requires self-control, which consists in the ability not to abuse the trust of others even where opportunism would be possible. Dishonesty can be

contained by three factors: the moral self-control of the individual, the sanctions of the market, and the intervention of the law through litigation and settlements.

Surdam (2020), drawing on the work of social scientist Dan Ariely, identifies a “fudge factor” in human ethical behaviour: the tendency to rationalise minor deceptions to preserve a self-image of honesty.

Ethical issues can be addressed by businesses with varying degrees of moral maturity (Surdam, 2020):

- I. In the first level, attention is paid only to the possible negative consequences of misconduct, and ethical behaviour arises only from the fear of sanction: *"if I act unethically, I might get in trouble and have to pay a fine, suffer public embarrassment, or go to jail"*. The "newspaper test" belongs to this first level, which invites us to ask ourselves whether a certain decision would cause embarrassment if reported publicly to the press. This test consists of a rudimentary form of business ethics because it measures the ethics of action only based on its public exposure.
- II. In the second level, the company asks itself, *"If I act unethically, I may or may not benefit or profit"*, the evaluation becomes more strategic, and the economic convenience of the misconduct is evaluated.
- III. In the third level, the company considers the true impact of its conduct on the subjects involved: *"if I act unethically, I affect other people in various ways"*. It is in this step that business ethics goes beyond the simple management of legal or reputational risk and becomes a genuine attention to stakeholders.

1.6 Environmental business ethics and externalisation of harm

Environmental business ethics consists of a sub-category of business ethics. Given the assumption that business activity “shapes the world we live in, sometimes for good and sometimes for ill”, businesses handling hazardous substances must be evaluated both on profitability and moral obligations to stakeholders such as employees,

customers, communities, and future generations (Zalta et al., 2021). When firms manufacture substances whose risks are technically complex and not immediately visible to consumers, workers, or communities, trust depends heavily on the integrity of internal testing, disclosure practices, and communication with regulators. The concealment or selective disclosure of toxicological findings does not merely raise a compliance problem; it undermines the informational trust on which legitimate market exchange and public regulation depend.

Corporate accountability also concerns the issue of externalities: according to Coase (1960) many conflicts between businesses and third parties can be read as problems of social cost; therefore, situations in which one subject imposes costs on others. According to this model, in the presence of well-defined property rights and zero transaction costs, the parties could negotiate an efficient solution regardless of the initial allocation of rights (Coase, 1960, in Surdam, 2020).

Environmental externalities occur when the consequences of a market activity affect third parties outside the transaction. They may be positive or negative, but pollution is the paradigmatic case of a negative *externality*, since its social and ecological costs are not fully internalised by the producer. Business ethics dictates that companies have a moral obligation to internalise these costs, ensuring accountability for their ecological footprint rather than passing the burden onto society. Thus, a negative externality and the externalisation of harm occur when firms privatise profits and socialise costs, making communities absorb the health, environmental, and financial damages of the firm (Harris & Roach, 2017).

In a robust accountability model, the company should not only intervene after litigation and public scandal, but should take preventive measures, finance monitoring, and promptly communicate risks, contribute to remediation and assume responsibilities proportionate to the damage generated. An interesting application of the internalisation of environmental costs to realign costs and profits is the "polluter pays principle".

According to the Grantham Research Institute on Climate Change and the Environment (2022), the Polluter Pays Principle (PPP) addresses this imbalance by requiring the polluter to bear the costs of prevention, control and restoration. This principle prevents the company from withholding the economic benefits of risky production by passing on the costs to stakeholders and the ecosystem.

1.7 Summary of relevant theory

Table 1: Key theoretical arguments linking business ethics, corporate accountability, CSR, and environmental responsibility. Author's own elaboration.

Theory	Main arguments
<i>Business activity is not morally neutral</i> (Chadwick, 2012; Surdam, 2020)	Firms must be assessed through trust, honesty, fairness and voluntary exchange, not only profit.
<i>Legal compliance is only a minimum threshold</i> (Fort, 2008; Surdam, 2020)	A firm may obey the law and still act irresponsibly when regulation is weak or delayed.
<i>Corporate responsibility extends beyond shareholders</i> (Friedman, 1970; Freeman, 1984; Freeman, 2011)	Stakeholder theory expands responsibility to all affected parties, including communities and future generations.
<i>The firm can be treated as a moral agent</i> (French, 1979)	Corporate harms can result from organisational policies, routines and omissions, not only individual choices.
<i>Information asymmetry creates ethical duties</i> (Hayek, 1945; Surdam, 2020; Zalta et al., 2021)	Superior technical knowledge creates duties of disclosure, especially in complex risk sectors.
<i>CSR must go beyond philanthropy</i> (Lledgerwood & Broadhurst, 2000; Vogel, 2005)	Genuine CSR must affect the core business through transparency, precaution and safer practices.
<i>Environmental harm is a problem of externalised costs</i> (Coase, 1960; Harris & Roach, 2017)	Pollution is a negative externality when firms privatise profits while society bears the costs.
<i>The Polluter Pays Principle translates ethics into accountability</i> (Grantham Research Institute, 2022)	Polluters should bear the costs of prevention, monitoring and remediation.

1.8 Conclusion

Business *ethics* indicates that the legitimacy of the company does not depend only on *legal compliance*, but also on *trust, honesty, fairness and responsibility*. The transition from *shareholder primacy* to *stakeholder theory* expands responsibility towards all *stakeholders*, including *communities, ecosystems and future generations*.

Often the damage is delayed, invisible and technically complex, especially from an environmental business ethics point of view. For this reason, mere compliance with the law may be insufficient. The Polluter Pays Principle reinforces this approach because it translates the ethical duty not to externalise damage into a criterion of responsibility: those who generate pollution must bear the costs of prevention, control, monitoring and restoration, avoiding that financial profiles are privatised while environmental and health costs are socialised.

Business ethics, therefore, imposes duties of transparency, precaution, disclosure, and avoidance of deception. It does not rely on formal compliance with the regulations, but if the regulation is delayed, proactive action by the company is necessary. Only a CSR oriented towards prevention and transparency can be consistent with a robust conception of business ethics.

2. PFAS INDUSTRY, REGULATION, AND STAKEHOLDER RESPONSES

2.1 Introduction

Per- and polyfluoroalkyl substances (PFAS) are a broad family of synthetic chemicals used across industrial and consumer applications. PFAS are made of carbon-fluorine bonds, making them extremely durable, but also contributing to their persistence in the environment, leading to their widespread classification as “Forever Chemicals” (OECD, 2021; Tran et al., 2025; Lendewig et al., 2025). Commercially relevant PFAS can be divided into two groups based on whether they are made of polymeric or non-polymeric substances and whether they are long or short-chain substances: long-chain compounds, such as PFOA and PFOS, are attracting regulatory attention, while the second group includes compounds such as GenX (OECD, 2021). Short-chain substitutes have often been introduced after long-chain restrictions, but the literature warns that substitution does not necessarily eliminate environmental and health concerns (Buck et al., 2011; Brennan et al., 2021).

2.2 Environmental persistence and bioaccumulation

Biomonitoring and public environmental research regarding PFAS has developed especially since the early 2000s, after 3M had decided to abandon the production of compounds containing PFOS to avoid further reputational risks. To date, it is now known that PFAS are widespread contaminants globally, as they have been widely used in industrial and consumer products. In fact, a great environmental persistence of PFAS has been discovered, along with bioaccumulation capacity and the ability to travel great distances and pollute different ecosystems. They can attach to soils, vegetation, sediments, and waters, and their persistence is unique, with estimated half-lives reaching 90 years. PFAS were identified in rivers, groundwater, wastewater, sediment, rain, snow, air, and biosolids, with high concentrations around production plants, firefighting sites, military bases, and wastewater treatment plants. Long-chain compounds (PFOA and PFOS) are the most found PFAS compounds (Tran et al., 2025; Kim et al., 2007; Olsen et al., 2017). Longer chains show higher persistence

rates; thus, most phase-outs in the developed world are realised through a shift towards shorter-chain PFAS (Conder et al., 2008). The persistence of PFAS in the environment stems from decades of uncontrolled production and consumption globally.

PFAS can be detectable in blood, liver, kidneys, eggs, plasma, breast milk, and umbilical cord blood, indicating bioaccumulation, maternal transfer, and early-life exposure pathways (Verreault et al., 2005; Sharpe et al., 2010; Su et al., 2023; Xu et al., 2023).

2.3 Health concerns: human exposure and toxicology

According to Tran et al (2025), extensive public research on human exposure and toxicological studies has been conducted since the 2000s, with a dramatic rise after the 2010s. Occupationally exposed workers, highly exposed residents living near PFAS manufacturing, and general population cohorts are the most studied populations (Abunada et al., 2020; Ricolfi et al., 2024).

PFAS exhibit long biological half-lives in humans. Short-chain PFAS, while eliminated more rapidly, remain persistent and highly mobile, contributing to continuous exposure. (Rosato et al., 2024; Olsen et al., 2007; Olsen et al., 2012). Sex, age, occupation, diet, water source and proximity to contaminated sites may influence serum concentrations, with females typically exhibiting lower serum concentrations and shorter half-lives of major PFAS than males (Jain et al., 2022).

The International Agency for Research on Cancer (IARC) Working Group conducted a cancer risk evaluation of both PFOA and PFOS, establishing that PFOA is *carcinogenic* to humans (assigned to Group 1), as it provokes immunosuppression and epigenetic alterations in exposed humans and animals, leading to a higher probability of developing kidney and testicular cancer, and PFOS is *possibly carcinogenic* to humans (assigned to Group 2B), as effects in exposed humans were not sufficiently robust in showing causal associations with different cancer types (IARC, n.d.; Zahm, 2024). Beyond these outcomes, the literature reports suggestive associations with

heterogeneous evidence between PFAS exposure and a range of reproductive, metabolic, endocrine, and neurodevelopmental effects (Cohen et al., 2020; Blake & Fenton, 2020).

2.4 Ongoing contamination

A study by Ackerman Grunfeld et al. (2024) analysing PFAS concentration data for more than 45,000 samples from surface water and groundwater discovered that, in a substantial fraction of samples, PFAS concentrations exceeded threshold values (EU drinking water limit of 100 ng/L).

In the United States, extensive historical production and widespread use in various applications have led to contamination across the country when remediation is not present, and throughout biomonitoring programs, PFAS have been detected in blood samples of over 99% of the U.S. population (Lewis et al., 2015). By the end of 2025, more than 9,500 locations in the United States will have documented PFAS contamination. (EWG, 2025).

In Europe, the *European Environmental Agency* provided the first continent-wide synthesis of PFAS monitoring data based on national reporting, mostly analysing groundwater and surface water contamination in the 2010-2022 period. To date, current monitoring practices focus on a narrow subset of PFAS whose selection is largely driven by regulatory requirements concerning analytical feasibility (EEA, 2024a). However, the Forever Pollution Project has detected 23,000 known PFAS contamination sites between 2003 and 2023, and 232 industrial PFAS users: the study detected hotspots, where PFAS concentration detected surpassed 10,000 ng/L, located around the production facilities, such as the 3M industrial site in Zwijndrecht (Antwerp, Belgium), the Chemours production facility in Dordrecht (Netherlands), the ex-Miteni site in Trissino (Veneto, Italy) and the ex-Solvay site in Spinetta Marengo (Piedmont, Italy) (Dagorn et al., 2023).

2.5 Regulatory responses

PFAS regulation has developed unevenly across jurisdictions and time periods. While, at the global level, the Stockholm Convention on Persistent Organic Pollutants (POPs) constitutes the most important collaborative international policy, with over 150 countries participating (Stockholm Convention, 2024), differences in regulatory frameworks, contradictions in PFAS definition, different levels of public awareness, and contrasting economic interests led to inconsistencies in global policies. It needs to be underlined that the Convention banned PFOS in 2009 and PFOA in 2019. However, a crucial topic regards preventing regrettable substitutions in transitioning from PFAS-based products, especially concerning shorter-chain PFAS, where research efforts are ongoing. Unfortunately, the current risk-based regulatory approach delays restrictions until extensive adverse effects in humans and ecosystems are observed, delaying proactive prevention (Lendewig et al., 2025).

2.5.1 Regulatory action in the United States

In the United States, early federal action relied heavily on voluntary phase-outs and compound-specific measures. By the late 1990s, the EPA (U.S. Environmental Protection Agency) was notified by 3M about the persistence and toxicity of PFOS and assisted the firm in phasing out PFAS in 2002. Following voluntary industry action, federal regulatory activity intensified. The EPA implemented a series of federal measures under the Toxic Substances Control Act (TSCA) during the early 2000s. PFOA was explicitly monitored and restricted under the 2010/2015 PFOA Stewardship Program (EPA, 2006; Tran et al., 2025). The official phase-out date for PFOA was established at the end of 2013 (EPA, 2015). In 2016, the EPA issued a non-enforceable lifetime Health Advisory for PFOA and PFOS in drinking water (EPA, 2016). In 2019, the National Defence Authorisation Act, imposing mandatory reporting obligations for substances known to cause serious health and environmental risks, added 173 PFAS to the Toxics Release Inventory (TRI) (EPA, 2020). In 2024, the Agency finalised a National Primary Drinking Water Regulation (NPDWR) for six PFAS, establishing

legally enforceable maximum contaminant levels (MCL) in tap water. Public water systems are required to conduct initial monitoring for the regulated PFAS by 2027 and to disclose measured concentrations to the public (EPA, 2024).

2.5.2 Regulatory action in the European Union

In 2006, the European Union banned the use of PFOS in industrial and consumer applications and restricted the use of PFOA, and, in general, placed known long-chain substances under regulatory attention, under the REACH regulation dated 2017. In 2019, these substances passed under the Persistent Organic Pollutants (POPs) Regulation (EFSA, 2020). The Water Framework Directive (WFD), which regulates the monitoring of PFAS, requires member states to monitor surface waters for a limited number of PFAS, especially long-chain pollutants, and adds binding environmental quality standards (EEA, 2024). The revised EU Drinking Water Directive (DWD) 2020/2184 (EU, 2020), adopted in 2020, will become fully applicable in January 2026 (European Commission, 2023).

The European Chemicals Agency (ECHA) proposed in 2023 a restriction under the REACH framework aimed at banning the production of thousands of PFAS compounds. In fact, it argues that it is possible to allow limited and temporary exceptions only for essential and non-substitutable applications (Lendewig et al., 2025). At the national level, individual EU Member States have adopted stricter national regulations to address local contamination sites and public health emergencies, with examples including Italy, Sweden and Denmark. In particular, Italy ratified a decree-law in April 2025 that sets a more restrictive limit of 20 ng/L for four main PFAS molecules (Senate of the Republic, 2025).

2.6 Applications in industrial and consumer products

PFAS are widespread across industrial and consumer markets thanks to their physical and chemical properties, showing a great resistance to oils and water, high pressures, extreme temperatures, and chemical degradation. At least 15 sectors are using these

substances in some stages of their products and processes, with more than 200 applications both in commercial and industrial products (Glüge et al., 2020). Therefore, the huge amounts and various uses lead to difficulties in policy making, given the practical and economic interests at risk (ECHA, 2024). According to an assessment conducted by the International Chemical Secretariat (ChemSec), twelve companies account for the majority of PFAS manufacturing worldwide: 3M, AGC, Archroma, Arkema, BASF, Bayer, Chemours, Daikin, Dongyue, Honeywell, Merck Group, and Solvay (ChemSec, 2023b). One of the biggest manufacturers of fluorochemicals in the past, including several legacy PFAS that are currently heavily regulated or phased out, is 3M, and the company has declared its goal to completely stop producing PFAS by the end of 2025 in response to growing legal liabilities and regulatory pressure. Chemours, a spin-off from DuPont, remains a major supplier of fluoropolymers, while large European chemical groups such as BASF, Bayer, Arkema, and Solvay continue to maintain extensive PFAS portfolios for performance materials and industrial uses (ChemSec, 2023a; Brennan et al., 2021).

PFAS revenues are economically significant, but several studies argue that the social, health and remediation costs associated with contamination may substantially exceed industry revenues. The global market size for PFAS accounts for a modest share (0.5%) of the overall global chemical market, but the associated costs of remediating their public health and environmental impacts would substantially outweigh industry revenues. In fact, while PFAS-related activities generate profits of around USD 4 billion, the societal costs linked to contamination and toxic effects are much higher, reaching €16 trillion per year (ChemSec, 2023a). Regulation has drastically changed production patterns at the market level. In jurisdictions with stricter regulations, the industry has moved more toward short-chain PFAS (EPA, 2021).

A recent review of the literature identified 107 PFAS across 15 product categories in 1,040 consumer products. The same chemical properties that made PFAS attractive to industry, namely resistance, durability, and performance, also facilitated their

commercial success in products such as non-stick cookware, water-repellent textiles, and food packaging.

As shown in **Table 2**, in the textile sector, PFAS can be applied to nearly all fabric substrates to provide resistance to stains, water, oil, fire-repellency, and anti-adhesive properties (Dewapriya et al., 2023). Additionally, PFAS can be found in the cosmetics and personal care sectors and in paper and cardboard applications (Bose, 2024; Lendewig et al., 2025). PFAS are essential in producing firefighting foams for fuel-based fires (Alazaiza et al., 2021; Glüge et al., 2020), and they play a critical role in industrial and military applications, aviation, aerospace, automotive, in the electronics and energy sectors to produce batteries and semiconductors, and, lastly, in the medical industry. (Bose, 2024).

Table 2: PFAS-related consumer product categories and examples of products that may contain PFAS. The author’s own elaboration from cited sources.

Product category	PFAS-related function	Product examples
Textiles and apparel	Water repellence, stain resistance, performance finishes	Rain jackets, outdoor trousers, stain-resistant sofas or carpets
Cookware	Non-stick performance, heat resistance	Non-stick frying pans, saucepans, baking trays, waffle makers
Food packaging	Grease-resistant and barrier coatings	Fast-food wrappers, pizza boxes, microwave popcorn bags, takeaway paper containers
Cosmetics	Long wear, water resistance, smooth texture	Foundation, mascara, lipstick, eyeliner
Personal care / hygiene products	Surface and barrier functions	Sanitary pads, tampons, dental floss, disposable diapers
Treated household goods	Specialty performance treatment	Upholstery sprays, stain-resistant carpets, treated tablecloths, waterproof mattress protectors
Toys and children's products	Water repellence, stain resistance	Waterproof school backpacks, school uniforms, treated baby bottles, stain-resistant play mats, coated children’s outerwear

Consumers usually cannot detect the presence of PFAS through ordinary product use, and the literature repeatedly notes important gaps in knowledge, product testing, and

exposure assessment for consumer goods (Dewapriya et al., 2023; Glüge et al., 2020). Recent corporate disclosures show that several major consumer-facing firms, such as H&M, IKEA, L'Oréal, Patagonia, and McDonald's, are now phasing out PFAS or publicly committing to phase out PFAS, often in response to mounting regulatory and market pressure, as portrayed in **Table 3** (H&M Group, 2024; IKEA, 2025; L'Oréal, 2024; Patagonia, 2025; McDonald's, 2025).

Table 3: PFAS-related consumer product categories and selected firms actively phasing out PFAS use. Author's own elaboration from cited sources.

Product category	Firm	Phase-out efforts
Apparel and home textiles	H&M Group	<i>"Proactive elimination of hazardous chemicals, such as PFAS and DMF, which we have already phased out ahead of regulatory mandates."</i> (H&M Hennes & Mauritz AB, 2025)
Home textiles & cookware	IKEA	<i>"By 2026, PFAS will no longer be used in our cookware and bakeware range."</i> (Inter IKEA Group, 2025)
Cosmetics	L'Oréal	<i>"Today, more than 99% of the relevant portfolio has been reformulated without PFAS, and we will reach 100% by the end of 2024, well ahead of regulatory deadlines."</i> (L'Oréal, 2024)
Outdoor & waterproof apparel	Patagonia	<i>"For the Spring 2025 season and beyond, 100% of our new products are made without intentionally added PFAS."</i> (Patagonia, 2025)
Fast-food packaging	McDonald's	<i>"We are committed to removing all intentionally added fluorinated compounds from our guest packaging materials globally."</i> (McDonald's Corp., 2025)

According to recent research, the Greenpeace Detox campaign has transformed the use of PFAS in textiles from an internal technical issue to a public problem of corporate responsibility: pressure from consumers and NGOs has prompted many brands to introduce transparency and phase-out commitments. According to Greenpeace, 80 brands have joined the Detox Commitment, and 72% say they have eliminated PFAS from their products. However, the outdoor sector has remained more resilient, arguing that PFAS are necessary for performance and durability, while some PFAS-free brands show that alternatives exist, at least for many uses. The main limitation remains the

complexity of the supply chain: brands often do not fully control the substances used by suppliers (Cousins et al., 2019).

2.7 Comparative note: Hexavalent chromium industrial case

Over the course of business history, several substances that were revealed to be toxic after decades of widespread industrial and commercial use have been produced, similarly to the PFAS case. Examples include tobacco, asbestos, lead, chlorofluorocarbons (CFCs), and hexavalent chromium (Cr(VI)). Evidence of harm emerged gradually, and public recognition was delayed in ways that were closely connected to asymmetries of information and the legal mediation of scientific knowledge.

The case of hexavalent chromium contamination in Hinkley, California, is particularly similar to the PFAS's industrial history. Hexavalent chromium (Cr(VI)) has drawn more scientific and regulatory attention because of its negative effects on human health and ability to contaminate soil and water sources, it is one of the most common heavy metals in the chemical, metallurgical, and textile industries and its compounds are commonly used to improve material strength and corrosion resistance (Guertin et al., 2005). However, hexavalent chromium is a controversial contaminant, proven to cause cancer in humans and animals when inhaled (CalEPA, 2015). In Hinkley, chromium(VI) contamination originated from unlined evaporation ponds associated with the industrial production at PG&E (Pacific Gas and Electric) natural gas compressor station in the town. Chromium(VI) compounds were used between 1952 and 1966 at the facility to inhibit corrosion in cooling towers, but contaminated wastewater was discharged into the ponds, leaking into the underlying groundwater system (Banks, 2003) and local communities were informed by PG&E only in 1987 of the widespread contamination (Heath, 2013). Hinkley residents filed a class action lawsuit against PG&E (*Anderson et al. v Pacific Gas and Electric*) alleging contamination of tap water with chromium(VI), and U.S.-based paralegal Erin Brockovich accused PG&E after noticing extensive unexplained health issues among residents in the contaminated town (Banks, 2003).

Evidence of concealed and manipulated scientific evidence emerged during the legal battle: a 1987 study by Zhang et al. found a strong positive correlation between cancer in humans and exposure to hexavalent chromium, but later revised under controversial circumstances while PG&E consultants were involved. In fact, while working with PG&E, ChemRisk updated its research under the name of the Chinese researcher, despite his objection, in the *Journal of Occupational and Environmental Medicine*, denying any link between cancer and chromium(VI) (Zhang et al., 1997; Waldman, 2006). Egilman (2006), in the commentary “*Corporate Corruption of Science: The Case of Chromium(VI)*”, referred to this happening by focusing on how the reviewed study persuaded California health representatives to delay updating MCL for drinking water (CalEPA, 2015). A 2001 Chromate Toxicity Review Committee, citing the Zhang article and its 1997 version, negatively affected the case against PG&E, and, in 2006, PG&E settled for USD 300 million, and the lawsuit obliged the firm to phase out chromium(VI) production and provide cleanup and community support measures, which continued afterwards. (CalEPA, 2015).

2.8 Stakeholder responses to PFAS: survey-based research

The way in which consumers perceive the risks related to PFAS in consumer products is interesting for this research as stakeholders of PFAS manufacturers and users. The latter must know the importance of their consumers' perception in order to quantify reputational damage and consider responding to the demand for transparency. It is interesting to assess how concern varies across social groups and translates or not into support for PFAS-free alternatives and a greater willingness to take on part of the replacement costs (Kemper et al., 2024; Rihn et al., 2024).

The literature examined, almost exclusively based on statistically significant surveys, shows that there has been a greater environmental sensitivity in recent years in consumer markets. Furthermore, where exposure to PFAS is widespread and included in the daily routine, therefore largely invisible to consumers, environmental risk is difficult to be perceived unless it is detected by greater public awareness. Public

awareness is low and uneven and depends on proximity to contamination or the perception of personal vulnerability to a general environmental concern; however, the data suggest that where there is clear information and valid alternatives, consumers are willing to value PFAS-free products, prompting companies to gradually reduce their production. It is unclear whether the push from consumer markets depends on visibility of the presence of PFAS in some better-known products and higher income segments (Kemper et al., 2024; Rihn et al., 2024). Berthold et al. (2023), in their survey-based study, shows that almost half of respondents have never heard of PFAS and that awareness of product exposure remains rather inconsistent. The study shows that the strongest predictor of PFAS awareness is knowledge of community contamination. The US-based study argues that having clearer mainstream communication and product labelling would help consumers understand the frequency of exposure and change behaviour towards greener alternatives.

The survey-based study by Kemper et al. (2024), based in New Zealand, shows how consumer concern about PFAS is not evenly distributed either between products or between social groups, showing that knowledge about PFAS and concern about PFAS do not overlap perfectly. Some groups report higher perceived knowledge, while others express greater concern, also suggesting significant differences in gender, age, and other psychodemographic variables. In fact, the study by Kemper et al., confirmed by previous research on environmental risks, shows that women tend to report a greater perception of vulnerability and greater concern about health risks. The New Zealand study shows that men tend to report a greater perception of knowledge, but less concern than women, showing how risk is subject to social and personal interpretation (Kemper et al., 2024). The work of Menegatto et al. (2022; 2023) on PFAS-contaminated communities in the Orange Area of Veneto indicates that parenting and maternal concern are relevant factors: in fact, uncertainty, limited access to biomonitoring and concern for children's health have shaped strong psychological distress and activism among parents, especially mothers (Menegatto et al., 2022;

Menegatto et al., 2023). Therefore, concern about PFAS is often mediated by children's perception of vulnerability, reproductive health, and daily exposure pathways such as water and household consumption.

The role of education is more ambiguous. Higher education is generally associated with a greater awareness of environmental issues, but not necessarily with increased concern. Kemper et al. (2024) are particularly useful here because they show that psycho-demographic characteristics influence knowledge and concern about PFAS differently, rather than in a simple linear sequence. The effects of age are equally mixed. Some studies suggest that younger people are more attentive to environmental issues in general, while older people may attach more importance to direct health consequences (Kemper et al., 2024; Rihn et al., 2024).

Concern about PFAS can translate into support for alternatives, but this translation depends on the product category and the perceived trade-offs between performance and safety. The study by Rihn et al. (2024), a US survey of disposable tableware, found that PFAS-treated products are considered slightly better in terms of practical quality such as resistance to fats and water, while plant-based alternatives are considered better for health and the environment, with perceptions influenced by age, education and prior knowledge. Hence, consumers weigh the environmental and health benefits against the expected losses in convenience or performance (Rihn et al., 2024). More recent studies by the same research team find that "PFAS-free" and "plant-based" framing is more acceptable to consumers than technical labels, and that even short information can change the acceptance of alternatives (Rihn et al., 2026).

2.9 Conclusion

PFAS are now widely recognised as a global environmental threat, but regulation still lags the scale of contamination. Although the US and EU have recently moved toward stricter and more enforceable rules, governance remains slower than the spread of pollution because PFAS regulation is evidence-heavy and industrial uses are

embedded across many sectors. Three key tensions will shape future governance: regrettable substitution with short-chain PFAS, the relocation of production to less regulated regions, and the continued externalisation of massive contamination costs onto society rather than producers. These tensions connect the scientific PFAS literature to the ethical framework developed above: when risks are persistent, delayed and difficult to detect, corporate responsibility cannot be limited to waiting for a binding legal prohibition.

3. HISTORY OF PFAS PRODUCTION AND CORPORATE CONDUCT

3.1 Introduction

This chapter reviews the historical literature on how PFAS hazards became known internally before becoming publicly recognised. Historical evidence suggests that PFAS manufacturers had already gained internal knowledge of the health and environmental dangers of these substances decades before these risks were recognised in the public health literature and reached affected communities. The DuPont and 3M cases are especially relevant because internal documents released through litigation suggest that manufacturers possessed significant information about PFAS persistence, toxicity and contamination pathways decades before these risks became widely recognised in public health literature and regulation (Gaber et al., 2023). The Italian Miteni case is then read as a European case in which similar themes of opacity, delayed recognition and forced accountability appear in a different legal and institutional context.

3.2 1930s-1940s: PFAS discovery and early use

PFAS have been used since the 1940s, employed in household products such as non-stick coating on cookware and utensils, but also in stain-resistant textiles (Bose, 2024). Per- and polyfluoroalkyl substances were discovered during the 1930s when Thomas Midgley Jr. and Charles Kettering at General Motors developed Freon®, a non-flammable refrigerant. This led to Dr Roy Plunkett, a chemist for DuPont, unintentionally discovering polytetrafluoroethylene (PTFE), as the halogenated refrigerating gas had polymerised into a waxy non-stick powder. PTFE was commercialised by DuPont under the trademark Teflon™ (Science History Institute, n.d.; Pitt, 2025). In the same period, Joseph A. Simon developed the electrofluorochemical (ECF) process to synthesise perfluorinated compounds, which consists of applying electricity to replace hydrogen atoms with fluorine. This facilitated the large-scale production of these substances, and 3M Company began producing stable fluorochemicals (Tran et al., 2025).

3.3 1950s-1980s: Internal knowledge, contamination and concealment

Starting from the 1950s to the end of the century, 3M and DuPont dominated the industrial production of PFAS in the U.S., and advances in polymer processing and surface-coating technologies facilitated the diffusion of fluoropolymer-based products into consumer markets thanks to their unique properties. In the following period, PFOA and PFOS, two types of fluorinated surfactants, were synthesised (Pitt, 2025). During the second half of the 20th century, PFAS rapidly expanded into industrial, military, and consumer applications due to their perceived low toxicity and apparent chemical stability (Tran et al., 2025).

3.3.1 DuPont: industrial adoption of PFOA and early contamination pathways

The historical literature on DuPont and 3M suggests that scientific evidence of PFAS-related hazards emerged internally long before it was publicly consolidated. Company-sponsored studies from the 1960s onwards reported adverse health effects in laboratory animals, persistence concerns and worker exposure. During this period, little information was made public on the toxicity of PFAS, but during the lawsuit, internal documents emerged, showing that DuPont scientists were aware of contamination levels and effects (Gaber et al., 2023).

DuPont, formerly known as E.I. du Pont de Nemours and Company, is an American multinational chemical company founded in 1802 in Delaware, well-known for its main inventions, including nylon, neoprene, Lycra, Freon, and Teflon. DuPont began purchasing perfluorooctanoic acid (PFOA, internally referred to as C8) from 3M and using it at its Washington Works site in Parkesburg, West Virginia, in 1951 to produce Teflon (Barry et al., 2013). Internal documentation provided evidence that the company was aware of the hazardous character of PFOA and the necessity to correctly dispose of the contaminated waste. Despite knowing the toxic nature of C8, DuPont circumvented regular chemical waste disposal and buried waste in the Ohio River or into the ocean (Lerner, 2015). By the 1980s, DuPont had purchased land near the plant to locate its Dry Run Landfill, where contaminated sludge had been deposited by the

1990s. Concealed internal testing revealed high PFOA concentrations in groundwater and surface water close to the landfill (Gaber et al., 2023).

According to Gaber et al. (2023), starting from 1935, DuPont introduced the in-company toxicological facility “Haskell Laboratory of Industrial Toxicology”, which later played an important role in testing the effects of the company’s chemical products. Between the mid-1950s and mid-1960s, studies inquired into the potential hazards of Fluon (PTFE, Teflon) and plastic resins (Sherwood, 1955). Several company-sponsored toxicological studies conducted from the early 1960s onward revealed several adverse health effects in laboratory animals. In 1962, it was made clear that PTFE and resins were persistent in nature and could possibly cause health dangers (Zapp, 1962). Internal records cited in the literature indicate that DuPont knew about PFOA toxicity, worker exposure and environmental persistence by the 1970s and 1980s (Cox, 2000).

In 1978, liver damage was confirmed by testing employees through an internal study funded by the company, and, in 1981, children born to exposed pregnant female employees showed eye and facial abnormalities, later confirmed by studies (Snyder et al., 1979; DuPont, 1981). In 1989, DuPont detected a significantly high incidence of kidney cancer among employees (Cox, 2000). DuPont and 3M actively shared medical and epidemiological information, finding similar results and coordinating research on health damages (Raines et al., 1981). By the 1990s, internal knowledge hid long-term health risks. DuPont Labs found a clear link between PFOA and testicular cancer in rats (Smith, 1990), and both DuPont and 3M were aware of the persistence in human tissues of the substance (Boone et al., 1994).

Most studies were kept confidential, reframed or not communicated to affected workers, communities or regulators. Internal records consistently showed managerial concerns regarding potential legal and reputational damages linked to disclosure. Internal communication materials at DuPont selectively reassured employees while

omitting toxicological risks. After findings on birth defects, DuPont reassigned female employees away from PFOA-contaminated areas without notifying staff members of the real risks revealed by health findings. According to Gaber et al. (2023), internal document reconstruction confirmed that there was evidence that in 1991, DuPont insisted that no EPA notification was warranted, to highlight the regulatory void. From a business ethics perspective, the key issue is not only whether companies violated specific legal provisions at a given moment, but whether they used superior knowledge to delay disclosure and avoid costly preventive action.

3.4 1990s-2000s: Litigation as forced transparency, DuPont

In the late 1990s, 3M reported to the EPA that PFOS had been found in human blood, persisted in the environment, and had negative effects on lab animals (EPA, 2000). These findings contributed to the decision by 3M to phase out PFOS-based products between 2000 and 2002 (3M, 1998), marking a turning point in PFAS governance.

3.4.1 Litigation as the turning point: Tennant and Leach v DuPont

Litigation became the mechanism through which hidden industrial knowledge was translated into institutional investigation and public evidence. The environmental contamination associated with the Washington Works facility emerged through a civil litigation case. In 1998, environmental lawyer Robert Billot represented a Parkersburg (West Virginia) farmer, Wilbur Tennant, filing a federal lawsuit against DuPont, accusing the firm of releasing toxic chemicals causing abnormal mortality among cattle (Rich, 2016). In 2001, the first lawsuit ended in a settlement, as subsequent legal discovery revealed that PFOA had contaminated DuPont's Dry Run Creek waters, affecting Tennant's farm (Rich, 2016). Extensive internal documentation was released during the litigation, revealing the contamination pathways linking landfill disposal to surrounding land and waterways. Additionally, Billot found several documents produced in internal laboratories linking C8 with a list of health consequences for both animals and humans (Rich, 2016). Thus, it was evident that not just cattle, but also human beings living nearby had been exposed to PFOA.

The subsequent class action lawsuit, *Leach et al. v. E.I. du Pont de Nemours and Co.*, was filed in 2004 by residents living near the plant. The settlement, together with providing compensation, created a medical monitoring program for exposed residents, water treatment obligations and the independent C8 Science Panel, to assess whether there were probable links between PFOA exposure and specific illnesses in the community (C8 Science Panel, 2008).

3.4.2 The C8 Health Project and the public consolidation of evidence

The C8 Health Project represented the first large-scale epidemiology study with 69,030 people participating in it and providing blood samples and detailed health histories between 2005 and 2006 (Steenland et al., 2009). Empirical evidence from the published Panel showed elevated PFAS concentrations in local communities compared to those of former residents. These epidemiological studies created a causal chain linking PFOA emissions and environmental transport to accumulation in human blood, demonstrating DuPont's responsibility in chemical pollution.

The project collected blood samples and health histories from more than 69,000 participants, generating probable link findings between PFOA exposure and several diseases, including kidney cancer, testicular cancer, thyroid disease, ulcerative colitis, hypercholesterolemia and pregnancy-induced hypertension (Steenland et al., 2009; Barry et al., 2013; C8 Science Panel, 2012).

In 2005, the U.S. Environmental Protection Agency filed enforcement actions against DuPont for neglecting to disclose internal data regarding PFOA's health risks under the Toxic Substances Control Act. According to the EPA, the company had information about the toxicity of the substance but failed to disclose it as required by law. The case was settled for USD 16.45 million, which at the time was the highest civil penalty allowed by U.S. environmental law (EPA, 2005). Meaningful accountability did not arise primarily from voluntary corporate disclosure, but from legal pressure that forced information into the public domain.

3.5 2010s-2020s: From the U.S. to Europe

From the 2010s to today, the industrial and environmental history of PFAS has evolved from a series of largely localised contamination issues into a major transnational environmental and public health concern.

In the U.S., in the early 2010s, DuPont ceased the use of PFOA in its facilities. The C8 Science Panel findings generated from the Washington Works case prompted further studies and investigations contributing to regulating PFOA levels in drinking water and advancing the research on the health effects of PFAS. In 2023, 3M agreed to pay a USD 10.3 billion settlement to U.S. public water systems to resolve thousands of lawsuits alleging PFAS contamination, and Chemours, DuPont, and Corteva, the other main PFAS manufacturers, reached a preliminary agreement of USD 1.19 billion for similar claims (Friedman et al., 2023).

Figure 1 indicates the number of publications concerning PFAS over the last 48 years. The regulatory timeline concerning both Europe and the U.S. is deeply analysed in section 1.6.

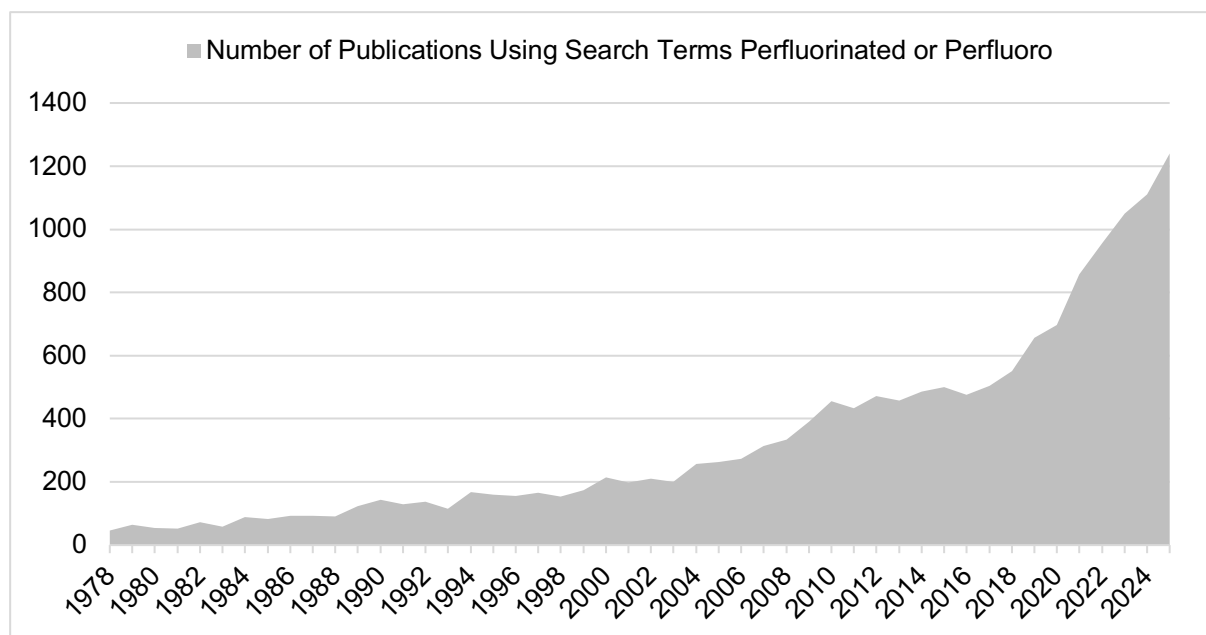


Figure 1: Number of publications using search terms “perfluorinated” or “perfluoro” according to the Google Scholar database (between 1978 and 2025). Author’s own elaboration.

Concerning the public reach of PFAS contamination and consequences, in 2016, Nataniel Rich published the article “The Lawyer Who Became DuPont’s Worst Nightmare” on the New York Times, inspiring the production of the movie “Dark Waters”, released in 2019 (Rich, 2016; Haynes, 2019). In 2025, BBC Panorama aired a documentary on forever chemicals (BBC, 2025). Following the public outreach of the contamination and several expensive legal settlements, 3M announced that it would discontinue PFAS manufacturing by the end of 2025 (3M, 2022).

Europe is the theatre of several legal proceedings regarding PFAS contamination cases. In Italy, the PFAS contamination affecting the Veneto Region, originating in the ex-Miteni PFAS facility, constitutes one of the largest documented cases of PFAS pollution in Europe. According to the World Health Organisation, given the extent of the contamination and the impacts on the local population, the Veneto environmental disaster is the third-largest pollution event worldwide (WHO, 2017).

The Swedish case arose from a 2013 legal action from residents claiming that the water in the cities of Ronneby and Kallinge had been contaminated by PFAS, and ended in a Supreme Court ruling in 2023 in favour of residents (Supreme Court of Sweden, 2023). In the Netherlands, the municipalities around Dordrecht sued Chemours, DuPont, and Corteva over PFAS emissions in the local area in 2018. The Rotterdam Court held Chemours liable for environmental damage in 2023 (Van Campenhout, 2023). In Germany, the contamination emerged due to the firefighting foams used at Spangdahlem Air Base; the local municipalities sued the federal government in 2019 to recover clean-up costs (Rannard, 2022). The Belgian case is one of the most severe in Europe, concerning the 3M’s Zwijndrecht plant near Antwerp, leading to a 2022 settlement in favour of the Flemish Government and payment of €571 million for remediation, although investigations remain ongoing (Cabinet of the Flemish Minister & 3M Belgium, 2022). Finally, the French case, concerning PFAS pollution in the industrial area near Lyon, includes a 2022 criminal complaint, 2024

proceedings by Lyon authorities and a 2026 civil claim by residents, but the case is still ongoing (Mandard, 2026; BHRRC, 2026).

3.6 The PFAS case in Veneto and Piedmont and the Italian research gap

The Miteni case in Veneto is one of the most significant PFAS contamination cases in Europe. The Trissino chemical facility, located in the Vicenza province, has produced PFAS since the 1960s (WHO, 2017; Menegatto et al., 2022). Peruffo (2022) provides a first organic reconstruction of the social history of Miteni through a documentary and activist-oriented chronology published on PFAS.land, a book and an academic article written for the University of Padua (Lanzavecchia et al., 2022). The Miteni case has also been studied for its peculiar location in the industrial area of the Altovicentino district, later referred to as a “high-income sacrifice zone” (Menegatto et al., 2022). It was the product of a long industrial genealogy rooted in the textile and chemical sectors that had shaped the Veneto economy throughout the twentieth century. At the origin of this genealogy stands the Marzotto group, one of the most powerful industrial dynasties of postwar Italy. The chemical site at Trissino originated as Ricerche Marzotto (RiMar) in 1965, a fluorochemical company established by Count Giannino Marzotto that produced PFOA, the same compound DuPont and 3M were producing in the same period (Lanzavecchia et al., 2022).

Miteni had been manufacturing PFOA and other long-chain PFAS, with poor containment and waste management for several decades. Starting from 2006, the PFAS contamination was detected. A study by McLachlan et al. (2007) analysed PFAS presence in major European rivers, noticing that PFOA in the Po River reached 200 ng/L. In 2011, research by the Institute of Water Research of the National Research Centre (IRSA-CNR), commissioned by the Italian Ministry for the Environment, Land, and Sea, revealed heavy contamination in the areas of Vicenza, Padova, and Verona.

In the 2013 CNR-IRSA and Ministry of the Environment conference, dedicated to PFAS in Italian waters, Sara Valsecchi analysed the contamination in the Po basin, with

reference to the Po Delta, the Sacca di Goro and the Bormida-Tanaro-Po system. Subsequently, she reconstructed the distribution of PFAS in the main Italian basins, identifying the fluorochemical plants of Spinetta Marengo, in Piedmont, and Trissino, in Veneto, among the point sources (Valsecchi et al., 2013; 2026).

In 2013, the Veneto Regional Agency for Environmental Protection (ARPAV) traced the main polluting source to the Miteni chemical facility. Emissions released from the Miteni site migrated through the soil, surface water, and groundwater, accumulating in the environment rather than degrading, generating long-lasting pollution in the Veneto Region (Menegatto et al., 2022). In 2016, a regional biomonitoring study was launched on a selected group of inhabitants to assess PFAS blood levels, showing that exposed residents had PFOA blood concentrations eight times higher than in non-exposed people (Ingelido et al., 2018). Liver and kidney cancer mortality among male workers was more than double compared to the regional average (Mastrantonio et al., 2018). Mothers of children residing in contaminated areas emerged as the most active and concerned stakeholders, playing a central role in initiating legal proceedings and organising social mobilisation. Pregnant women represent a significant subpopulation negatively affected by PFAS bioaccumulation, with high PFOA levels in blood causing low birth weight and foetal defects (Stein et al., 2014; Kim et al., 2020). In June 2025, the Vicenza court issued eleven convictions against several ex-Miteni managers and ordered financial settlement and environmental remediation for inhabitants (Legambiente, 2025).

3.7 Research gap

The literature analysed indicates that PFAS contamination is not only a health or environmental problem, but it also raises questions about business ethics and corporate social and environmental responsibility. Companies that produce technically complex substances have information that stakeholders cannot assess on their own. For this reason, basic compliance with current legislation cannot be enough, especially when regulation is decades late. While there have been numerous studies on business

ethics in the DuPont case that took place in the USA, there are no studies on the Italian case. In fact, the Italian PFAS case, especially the one concerning the Miteni case in Veneto, and, residually, the one concerning the Solvay/Syensqo site in Spinetta Marengo in Piedmont, raises the same ethical questions identified in the American case.

Existing PFAS research (**Figure 2**) is strong on toxicology, environmental monitoring, public health and regulation, but less developed on how corporate opacity, delayed disclosure and responsibility avoidance operate under weak regulation in the Italian PFAS case.

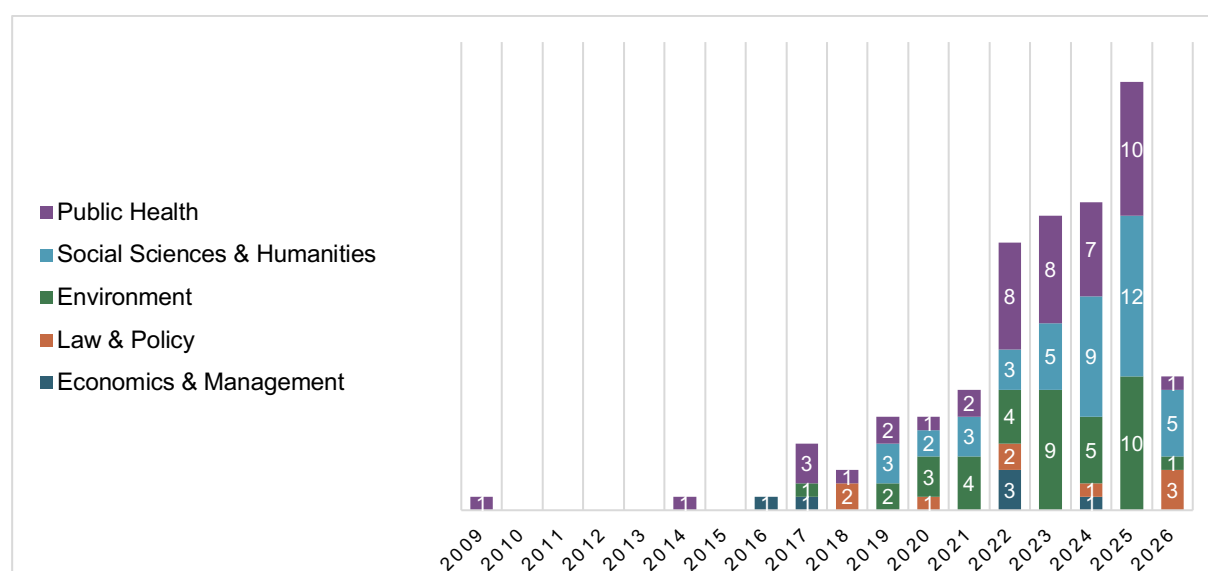


Figure 2: Number of Publications Using Search Terms PFAS with Miteni AND Veneto over time by disciplinary area. Author's own elaboration based on Google Scholar results.

3.8 Conclusion

From early internal studies at 3M and DuPont to the later emergence of evidence through litigation and independent research, accountability came through forced transparency rather than voluntary disclosure. The DuPont case is especially emblematic, since key evidence on PFOA toxicity remained internal for decades and only became public through legal action. The Miteni case in Veneto indicates a similar pattern in Europe, where contamination long preceded public recognition and regulatory action remained reactive.

EMPIRICAL RESEARCH

4. PURPOSE AND RESEARCH QUESTION

The literature review showed that the PFAS contamination problem does not consist only of a scientific, environmental, or regulatory matter. Rather, it may constitute a business ethics and corporate social responsibility issue. PFAS have been extensively employed across industries in both industrial applications and consumer products, thanks to their superior resistance and properties, but their demonstrated environmental and health impacts have emerged only through modern research and legal battles. The argument built by the literature is that companies active in complex and inadequately regulated sectors can retain the economic benefits of production, while delaying the disclosure of risks and passing on the costs of remediation and healthcare to society.

This thesis analyses this mechanism through the Italian PFAS case, focusing primarily on the Veneto PFAS contamination case and, on a residual basis, on the PFAS case in Piedmont linked to the Solvay/Syensqo site in Spinetta Marengo.

The goal is to focus on understanding how corporate opacity in a context of weak or delayed regulation can undermine the ethical responsibility beyond legal compliance. Subsequently, the study examines how the issue is reflected in public responses, testing whether public pressure for CSR emerges mainly when hidden corporate conduct becomes visible.

RQ. How does the Italian PFAS case show that corporate conduct under weak or delayed regulation can challenge responsibility beyond legal compliance and generate stakeholder expectations once PFAS-related risks become visible?

H1. In the Italian PFAS case, weak or delayed legal sanctions were associated with corporate conduct based on minimal compliance, limited disclosure, and delayed corrective action rather than proactive ethical responsibility.

H2. In the Italian PFAS case, information asymmetry contributed to delaying public recognition of harm and limiting early stakeholder pressure.

H3. The visibility of PFAS-related risk translates corporate opacity into stakeholder pressure, increasing consumer concern, CSR expectations, and willingness to pay for PFAS-free alternatives.

5. METHOD

5.1 Research design

This thesis adopts a mixed-methods research design combining documentary analysis, qualitative interviewing, and survey research, leading to a triangulated analysis that emphasises depth, with a focus on recent institutional developments, stakeholder perspectives, and public perceptions, as portrayed in **Figure 3**.

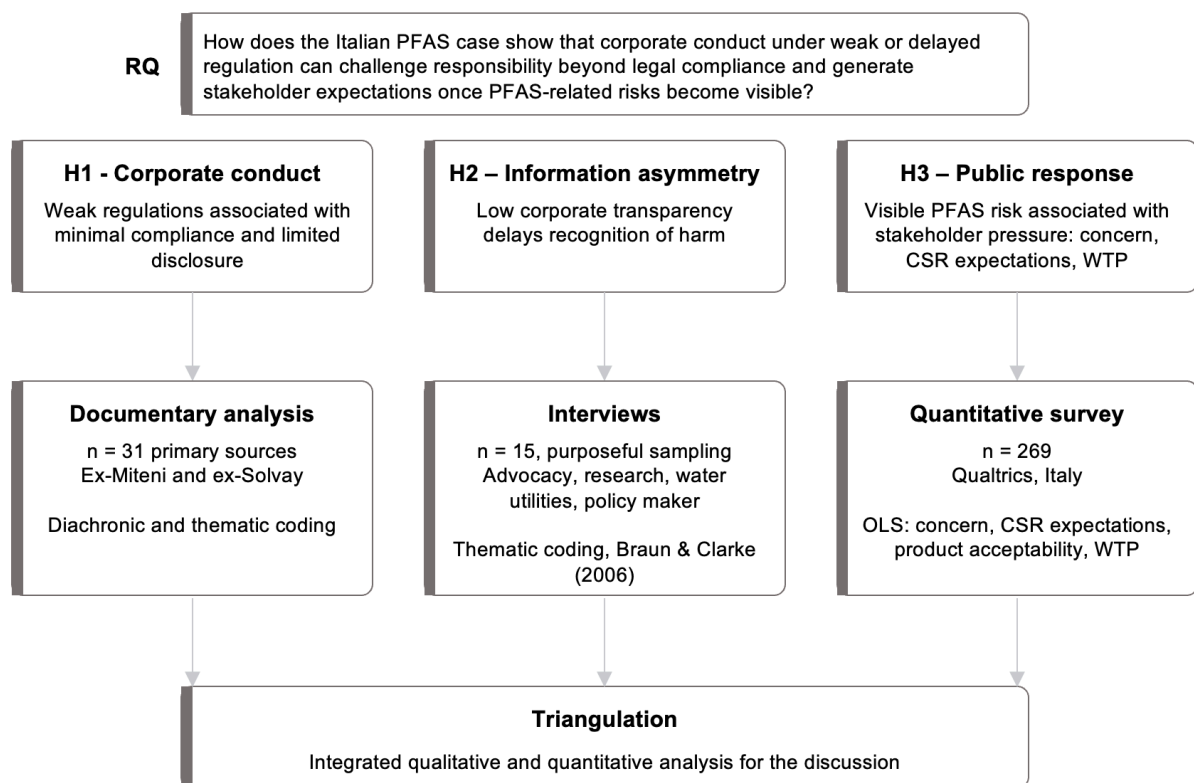


Figure 3: Research design: mixed-methods structure linking research question, hypotheses and empirical components. Author's own elaboration.

Firstly, the research conducted a documentary analysis of publicly available primary sources on PFAS contamination in Italy, with a close focus on the Veneto and

Piedmont regions. The aim is to reconstruct the institutional and regulatory evolution of the PFAS contamination in the area and to analyse the corporate conduct of the local PFAS producer, the ex-Miteni, within the regulatory environment in which it developed.

Secondly, the study conducted semi-structured interviews with key stakeholders, including medical and environmental researchers who have worked on PFAS, environmental policymakers, representatives of public water utilities involved in monitoring and mitigation, and members of activist associations. The aim is to collect perspectives from actors that were involved in environmental regulation or remediation management of substances, including PFAS, to understand the role of regulation, scientific experts, institutions, and advocacy groups.

Lastly, a quantitative survey is employed to investigate consumer responses to the presence of PFAS in everyday consumer products. The survey focuses on awareness, concern, trust, CSR expectations for PFAS manufacturers and users, product acceptability and willingness to pay for safer alternatives.

5.2 Scope

The scope of the study is to provide an empirically grounded analysis of the Italian PFAS case from managerial and social perspectives. The first part centred around the main Italian PFAS case with existing published documentation, active investigations, and a recent first-instance judgment: the Miteni case in the Veneto region. It is therefore the most significant concluded case in the Italian context in which long-term contamination, industrial conduct, judicial proceedings, public mobilisation and regulatory voids interact. The research does not treat the Miteni case as an isolated one but also includes, on a residual and comparative basis, recent developments concerning the Solvay/Syensqo site in Piedmont, to reconstruct the broader Italian pattern of corporate conduct and regulatory response in the PFAS case. Following the publication of major judicial documents of the DuPont case by Gaber et al. (2023) and

the release of the movie “Dark Waters” (Haynes, 2019), it is now possible to examine whether the regulatory and governance mechanisms and corporate behaviours in the U.S. case can be compared to those in the Italian case, extending the research within the Italian setting. The documentary reconstruction follows the development of the PFAS issue from its earlier concealed twentieth-century origins to the most recent publicly available institutional and judicial materials as of June 2026.

On the other hand, the survey captures present-day public awareness, concern, and willingness to pay in relation to PFAS in consumer products for a selected population.

5.3 Methodological limitations

The first limitation of this research consists of the fact that the body of documentation consists only of public sources, especially regarding the PFAS case in Italy. Internal company documents, confidential technical-scientific advice and procedural documents not yet published may exist but have not been available for this research. Secondly, the documentary analysis is limited to the Miteni case in Veneto, as it is the only case in Italy with almost complete availability of procedural documents, unlike the PFAS case in Piedmont.

The survey, on the other hand, is geographically concentrated in Lombardy (83.3% of the sample), thus not easily generalizable to the entire Italian population, and relies on non-probability snowball sampling. The snowball sampling may introduce self-selection bias toward more educated, environmentally literate respondents. Finally, the survey is self-reported, thus measures perceptions rather than observed behaviour, at a specific moment and at a specific time, influenced by the wording of the questionnaire itself or previous knowledge.

Thirdly, the interviews were carried out with purposeful sampling and deliberately favouring quality over quantity, thus characterised by limited external validity and partial statistical representativeness of all the actors involved in the PFAS case.

5.4 Ethical considerations

The research was conducted strictly for academic purposes and in accordance with the ethical standards required by Bocconi University guidelines. No sensitive data was collected in any part of the research. Participation in both the interviews and the survey was entirely voluntary. Respondents and participants were informed of the academic nature of the research.

All interview and survey material was reported anonymously for the study, without disclosing identifying details. The decision was taken with the aim of ensuring consistency with the University's ethical standards for research.

Concerning the documentary component, public documents have been analysed solely to reconstruct the general regulatory and industrial context within which the PFAS problem was generated in Italy. The research refrains from attributing any liability not supported by accessible and confirmed public records or recognised academic research.

5.5 Documentary analysis, interviews, survey

5.5.1 Documentary analysis

The documentary component of this study was based on a corpus of publicly available primary sources concerning the PFAS issue in Italy, with particular attention to the two main production sites for perfluorinated compounds. The first is in Trissino Veneto, where Miteni operated until its bankruptcy in 2018, and the second is in Spinetta Marengo, Piedmont and is still managed by Solvay Speciality Polymers Italy S.p.A., now Syensqo (Camera dei Deputati, 2022). The documentary corpus assembled includes 31 primary sources spanning from 1976 to 2026, including regional deliberations and decrees, parliamentary inquiry reports, reports from enforcement agencies, judicial materials at multiple levels, and journalistic sources used for triangulation.

Academic literature was excluded from the documentary corpus, except when used separately to frame the broader scholarly background. Peruffo's 2022 publications (Lanzavecchia et al., 2022) were used as a starting point for reconstructing the social history of Miteni and to locate original documents, including parliamentary reports, judicial records, regional acts and archival materials. These documents were then coded while preserving a diachronic logic.

Documents were collected through systematic searches of official public repositories, institutional websites (regional portal, parliamentary archives, environmental agency websites, publicly accessible judicial materials). Cross-referencing with the sources enabled the identification of additional materials.

Documents were read and organised chronologically and by type, then analysed qualitatively through thematic coding. The aim was to reconstruct in full the managerial and institutional evolution of the PFAS issue in Italy and to identify recurring themes to compare with the interview findings, as an historical and judicial framework for the following parts of the research.

5.5.2 Interviews

A total of 15 stakeholders were interviewed through semi-structured interviews. Five interviewees consisted of scientific researchers involved in local PFAS examination, four were representatives of public water utilities involved in monitoring and mitigation, four were members of environmental NGOs or advocacy groups, and one interviewee was a public policymaker involved in environmental governance, as portrayed in **Table 4**. For methodological consistency, interviewees are identified by stakeholder category (Environmental Advocacy, Scientific Research, Public Water Utility and Public Policymaker), preserving the analytical focus on stakeholder positions. The codes and macro-themes were developed according to the hybrid approach of Braun and Clarke (2006), first, inductively, starting from the interview data, then deductively organised according to the theoretical framework.

Table 4: Role-based categories of interview sources.

Stakeholder category	Fields	Int.	Analytical contribution
Environmental advocacy	Environmental advocacy organisations and individuals	5	Campaign and regulatory pressure, corporate accountability, community mobilisation, right to know and civic evidence production.
Scientific research	Environmental chemistry Social psychology Public health	5	Scientific evidence and monitoring, regulatory and substitution challenges, public health and risk perception, research gaps and longitudinal evidence, collective ignorance and civic mobilisation.
Public water utilities	Provincial public water utilities	4	Monitoring, treatment, management of water resources. Managing remediation, technical, financial and regulatory consequences of contamination generated upstream
Local policy maker	Municipal environmental institution	1	Local governance, enforcement constraints, visible pollution and public communication.

Interviews were selected through purposeful sampling based on their relevance to the research topic. The interviews were qualitatively analysed through thematic coding and used to integrate the documentary component of the study, to understand the different perspectives of the interviewees to interpret and compare or verify the documentary information collected. The interviews added depth to the qualitative analysis of the documentary reconstruction, highlighting the personal and work perspectives of the actors.

5.5.3 Quantitative research: online survey

The quantitative component of the research consists of an online survey designed with the aim of analysing public responses with respect to the management of the PFAS issue in Italy. The effectiveness of surveys in measuring consumer perspectives has already been proven (Evans & Mathur, 2018). The survey primarily contributes to the H3 assessment, operationalising the consumer-facing dimension of information asymmetry. Since PFAS are invisible in ordinary consumer products and usually not disclosed through labelling, the survey measures public awareness, trust, perceived exposure and associations with concern, corporate responsibility expectations,

support and willingness to pay for PFAS-free alternatives across different demographics. Consumers are treated as downstream stakeholders because they might be exposed to PFAS through everyday use of products without having direct access to scientific knowledge on their potential health and environmental harms.

The survey was administered through Qualtrics between 30 March and 15 April 2026 in its Italian version, since the objective was to analyse the perception of the Italian public, recruiting participants through snowball non-probability sampling through academic networks and personal networks. The sample is not representative of the Italian population. Two respondents under the age of 18 were excluded after data collection; thus, the final sample consisted of $n = 269$ respondents. A Chi-squared test ($\chi^2 = 0.785, p = 0.675$) demonstrated that gender composition is broadly balanced across the three age groups, as reported in the contingency table in Appendix B.

The survey was structured into sections, all reported in Appendix A:

- a. Demographics;
- b. Awareness about PFAS and their industrial production, environmental and health concerns related to PFAS contamination;
- c. Exposure perception;
- d. Trust in research, institutions, companies and environmental associations;
- e. Corporate responsibility required by consumers towards consumer product manufacturers;
- f. Acceptability of PFAS in consumer products;
- g. Willingness to pay for alternatives.

1. Demographic characteristics

Participants were asked about their age group, gender, level of education, employment status, involvement in chemical management, presence of children at home, and region of origin. To allow a more efficient analysis, data was recoded: age groups (18-34 / 35-54 / 55+), gender (female / not female), education (higher, with at least a

bachelor's degree / lower), employment status (employed / student/inactive), chemical sector background (yes/no), and children at home (yes/no). Demographic characteristics results were: 62% female; 65.8% with higher education; 39% with children at home. 83% of respondents live in Lombardy. All data regarding the demographic characteristics of the sample can be found in Appendix B.

2. Awareness about PFAS and their industrial production

Two items were used to indicate respondents' awareness of PFAS and their industrial use, indicating one of three options on a multiple-choice question "Have you ever heard of PFAS?", with possible answers: "No", "I have heard something about them", "I know PFAS very well". Positive answers were redirected to a second question, allowing respondents to indicate their source of knowledge with the possibility of inserting text.

The second item was used to indicate respondents' awareness of the role of the chemical industry in the manufacturing and commercialisation of PFAS, with possible answers: "No", "Yes, but only vaguely", "Yes, in a clear way". Positive answers were redirected into an optional open question asking for further clarification.

3. Trust and exposure perception

The level of trust was assessed through four separate items using 1-5 Likert scales (1 = not at all, 5 = very much), measuring it for institutions, academic researchers, chemical firms, and environmental associations. Exposure perception was measured through a 0-10 scale for the question "How likely do you think PFAS are present in your daily life?" (0 = not very likely, 10 = very likely).

4. Construct operationalisation and measurement

Three composite indexes were constructed from 5-point Likert items (1 = strongly disagree/not at all, 5 = strongly agree/very much) using the unweighted mean of their component items. Internal consistency was assessed using Cronbach's α before index construction, as reported in Appendix B. The Concern Index aggregates three items on health concern, environmental concern, and general concern about PFAS; the

Responsibility Index captures four normative expectations toward companies (disclosure, substitution investment, right to know, ethical non-use); the Product Acceptability Index measures tolerance of PFAS presence across four consumer product categories (non-stick cookware, waterproof jackets, cosmetics, baby products).

5. Willingness to pay for PFAS-free alternatives

WTP was measured through three matrix questions, capturing the willingness to pay for safer alternatives in general and the premium level acceptability (0%, 5% more, 10% more, 20% more) for each consumer product category (non-stick cookware, waterproof jackets, cosmetics, baby products).

Survey responses were quantitatively analysed to identify significant differences in consumer awareness and attitudes. Descriptive statistics were calculated for the main indices, and the Mean (M) and Standard Deviation (SD) were reported together with ANOVAs performed to test significant differences between variables. Three exploratory OLS regression models with HC3 heteroskedasticity-robust standard errors were estimated using the Concern Index, the Responsibility Index, and the Product Acceptability Index as dependent variables. All models included the same set of covariates: age (dummy-coded, reference = 18-34), gender (female vs. not), education (higher vs. lower), employment status (employed vs. student/inactive), chemical sector background (yes vs. no), children at home (yes vs. no), trust variables (trust in institutions, academic researchers, chemical firms, and environmental associations) and perceived PFAS exposure. Model fit is reported as adjusted R^2 for OLS models. Statistical significance for all tests is set at p-value <0.05. Survey data were analysed through Excel-integrated Analysis ToolPak for both descriptive and regression analysis, together with R Commander to perform the robustness checks. The statistical analysis has been structured based on teachings from two Bocconi courses: “*Data Analysis for Managerial Decision Making*” (Di Stefano, 2026) and “*Principles of Business Analytics*” (Venturini, 2025).

6. RESULTS

6.1 Documentary analysis: chronological and thematic analysis

The 31 primary sources were organised into four chronological phases spanning from 1976 to 2026. The thematic analysis resulted in 88 coded segments and 5 macro-themes:

1. Corporate opacity

It captures concealment and liability avoidance in managerial decision-making. In the Miteni case, the documents show a long sequence of internal knowledge of the contamination, reflecting a problem of information asymmetry between the company and the regulators.

2. Legal gaps

It analyses when the absence of chemical-specific rules constitutes a regulatory void, and the timing of scientific research and legal intervention. The topic indicates that contamination develops in a context where specific regulation on PFAS comes late or remains incomplete.

3. Forced accountability

It concerns legal proceedings forcing disclosure and assigning liability. From the 1979 proceedings to the Veneto Regional Administrative Court ruling, up to the convictions in Vicenza in 2025 and the Solvay trial still ongoing, justice operates as a mechanism of forced transparency and late application of the "polluter pays" principle.

4. Environmental negative externalities

It captures the shift of environmental and health costs from polluting firms to public institutions, residents, and public water utilities, documenting how these actors are required to manage contamination after it has already occurred.

5. Stakeholder pressure

It concerns affected stakeholders, civil society, and local communities that request an institutional response and corporate responsibility. The decisive role of Mamme No PFAS, Greenpeace, Legambiente has transformed health data, testimonies and public concern into political and judicial pressure.

Frequency analysis of macro-themes is exposed in **Figure 4**. In this section, the analysis is diachronic; each document is read for its historical position in the evolving industrial narrative.

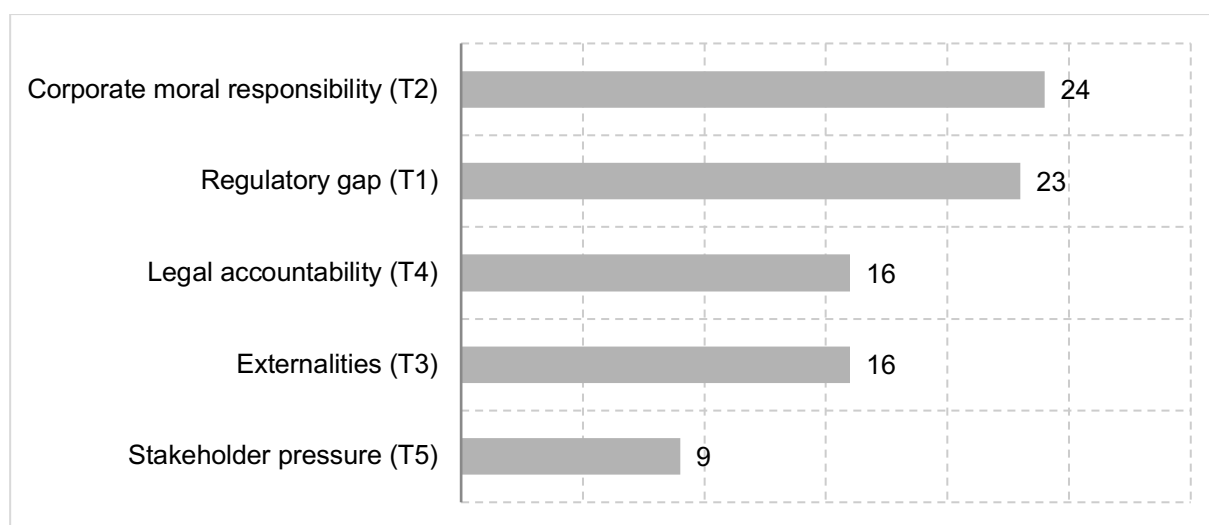


Figure 4: Macro-theme frequency across documents, thematic analysis.

The documentary corpus is overwhelmingly structured around the research for corporate behaviour and regulatory initiatives over the considered period for the PFAS case in Italy.

6.1.1 RiMar, first contamination, and the judicial precedent (1965-1979)

The RiMar chemical plant in Trissino, Veneto, emerged as a first environmental controversy as early as 1977, when residents of nearby communities signalled the presence of yellow tap water, related to the discharge of hydrofluoric acid from the firm itself. The environmental implications of this industrial activity became publicly visible when a local newspaper, the *Giornale di Vicenza*, published an article describing the situation from the civilians' point of view, documenting that military tankers were deployed from the Ederle barracks to supply clean water for residents (*Il Giornale di*

Vicenza, 1977). This episode established that the consequences of the contamination extended beyond the industrial site and entered the ordinary management of essential public services before any regulatory instrument existed to address the issue.

The site was the subject of criminal proceedings related to water contamination in 1979, a foundational document of the entire case. The Vicenza Tribunal's judgment established that the contamination was known to the company management of the RiMar plant, validating the organisational awareness of the situation:

“The wastewater coming from the RIMAR plant and discharged into the Poscola stream, in addition to following the surface course, may percolate and enter the underlying groundwater aquifer, thereby reaching the well-water extraction areas of Creazzo, Monteviale and Sovizzo” (Trib. Vicenza, 1979).

Despite this finding, Count Giannino Marzotto was acquitted by a technicality. The legal settlement addressed contamination at the Trissino site under the criminal law provisions, Articles 439, 440 and 452 of the Italian Criminal Code, as well as the Legge Merli (L. 310/1976) governing industrial discharges, but posing no limits for fluorinated compounds. Despite proven aquifer contamination caused by the firm's management, the normative instruments of 1979 were insufficient to secure conviction in the presence of fluorinated compounds in water for human consumption without positive proof that those substances were dangerous to public health:

“Now, having found that, for the purposes of establishing the offence referred to in Article 440 of the Criminal Code, it is not sufficient to ascertain the presence, in waters intended for human consumption, of substances that are in any case foreign to them, but it is also necessary to demonstrate that such substances are dangerous to public health, it must be observed that, although traces, that is parts per billion, of parachlorobenzotrifluoride, nitrobenzotrifluoride and dinitrobenzotrifluoride, certainly originating from the RIMAR plants, were found, on the other hand, based on the case file, it is not possible to express any

judgment on the possible dangerousness of those substances except in purely hypothetical terms.” (Trib. Vicenza, 1979).

The failure by technicality in the 1979 acquittal constitutes the precedent of impunity that shaped corporate conduct for the following decades at the Trissino site. Contamination was proven, but harm was not legally provable due to the state of toxicological science and the absence of specific regulation. Given that Miteni had been producing fluorinated compounds since the 1960s, the firm was subject to both the Royal Decree 1265/1934, Art. 216¹, which refers to factories producing vapours, gases or other fumes which are unwholesome or which may otherwise be dangerous to the health of the inhabitants and provides definition and obligations (c. 5) of first-class “unhealthy” industries, and Ministerial Decree September 5, 1994², defining an explicit list of first-class “unhealthy” industries in which Miteni is included and is therefore subject to hygienic-sanitary assessment.

6.1.2 M&A activity and corporate ownership transitions (1980s-2000s)

The production and discharge of PFAS (PFOA and PFOS) in the chemical plant in Trissino continued from 1966 (Camera dei Deputati, 2018). From the late 1980s to 2009, the Trissino chemical plant underwent several ownership transitions.

In 1988, RiMar Chimica Spa shares were purchased by Japanese firm Mitsubishi Italia Spa, which created a joint venture with chemical group EniChem Synthesis Spa controlled by Eni, with the establishment of the company Miteni srl (Mit-Eni), 51% owned by Mitsubishi. EniChem Synthesis’s Miteni shares were sold to the Japanese group Mitsubishi Corporation. From 1997 to 2001, Mitsubishi was the owner of 90% of Miteni Spa. In 2009, the chemical group International Chemical Investors Group SE

¹ Cfr. Regio Decreto July 27, 1934 n.1265, *Testo Unico delle Leggi Sanitarie* (TULLSS). Art. 216.

² Cfr. Decreto Ministeriale September 5, 1994, *Elenco delle industrie insalubri di cui all’art. 216 del testo unico delle leggi sanitarie*, Art. 1.

(ICIG), based in Luxembourg, acquired all Miteni's shares. Miteni spa has been part of the Weylchem group (Camera dei Deputati, 2018).

The circumstances of this acquisition are also documented in the report³ produced on June 13th 2017, by the Carabinieri Environmental Protection Unit (Nucleo Operativo Ecologico, NOE), noticing that it occurred in the same year that CNR-IRSA research was beginning to identify anomalous PFAS concentrations in the Po basin (McLachlan et al. had already flagged the issue in 2007). The acquisition occurred at a symbolic price of one euro through the subsidiary International Chemical Investors IVS.A. (International Chemical Investors Italia 3 Holding Srl) (Camera dei Deputati, 2018).

6.1.3 The ERM Reports (1990s-2009): internal knowledge and concealment.

The most relevant evidentiary thread concerns the sequence of environmental investigation reports commissioned by the subsequent owners of the plant from 1990 to 2009, documented by the report of the Carabinieri of the NOE of 13 June 2017, as mentioned above. The report explains how the Miteni site was identified as the main source of pollution, as it had produced PFAS for decades. It also stated:

“The investigations carried out showed that MITENI, in the years 1990, 1996, 2004, 2008 and 2009, commissioned leading consulting companies in the environmental sector to carry out investigations aimed at assessing the state of pollution of the site and providing possible solutions for the containment of the contamination detected.” (NOE, 2017, p. 2).

In 1990, Miteni commissioned an environmental consulting firm (Ecodeco S.p.A.) to conduct an environmental survey on the Trissino site, detecting widespread contamination of the soil, recommending the flooring and waterproofing of the industrial

³ The information report (June 13th, 2017) was prepared by the NOE of Treviso during the criminal investigations delegated by the Vicenza Juridical Authority directed towards the Miteni S.p.A. in 2017 and transmitted to the Parliamentary Committee of Inquiry (Doc. XXIII, n. 39) approved in 2018, which received and filed it as document no. 2183/1.

courtyard to solve the contamination (NOE, 2017). Therefore, Miteni decided to make changes to the production plant, paving the yards and installing new plants and machinery in the most polluted area. This, according to the NOE, had the consequence, for the remediation that began in 2013, of not effectively displaying the degree of contamination of the soil on which the site was built. In fact, the paving of the construction of machinery did not allow the bodies in charge to understand and effectively address the problem (NOE, 2017).

In 1996, Mitsubishi Corporation commissioned ERM Italia S.p.A., a leading international environmental consulting firm, to conduct an environmental assessment before the acquisition of Miteni. The study found that the ongoing pollution originated from the residues of waste not disposed of or buried on the site by Rimar S.p.A. during the 1970s, when deeper contaminated areas were left untreated, allowing persistent, non-biodegradable compounds to remain and gradually leach into groundwater:

“The flow of groundwater at the south of the Miteni plant still bears the traces of a large contamination that caused the closure of several drinking water sources at the end of the 1970s” (ERM Italia, Phase II Study, Feb 1996, as cited in NOE, 2017, p. 4).

According to the Parliamentary Commission of Inquiry on PFAS pollution in Veneto areas (Doc. XXIII, n. 39, XVII Legislatura, 2018), the legally and ethically decisive finding of the NOE investigation is the corporate conduct that followed its documentation. In fact, subsequent ERM studies were commissioned in 2004, 2008 and 2009 to map contamination. In 2008 and 2009, very high concentrations of PFOA were detected in groundwater and soil samples, confirming the ongoing contamination.

In 2004, the consulting firm suggested that Miteni add a hydraulic barrier to contain the contaminated substances. The parliamentary inquiry dedicates an extensive chapter to the hydrogeological complexity of the Trissino site and the hydraulic barrier. The construction of the barrier was the object of a series of ERM studies from January 2005

to September 2009, under Mitsubishi ownership. This constitutes a material acknowledgement that the contamination was active and spreading and not just “historical”, as Miteni would later claim in 2013. As the parliamentary inquiry states, in 2005, Miteni asked for a permit to build the barrier to the Vicenza authorities without disclosing the groundwater contamination, requesting the closure of some wells to build the hydraulic barrier aimed at stopping the pollution of the aquifer. However, despite the remediation effort, a September 2009 study by ERM Italia denominated “Mitsubishi S.p.A. Groundwater study: Miteni Facility – Trissino”, confirmed that the barrier was not effective in blocking the contamination.

Since the start of the site remediation procedure in 2013, following the IRSA-CNR study of 25 March 2013 and the subsequent communication by Miteni of 23 July 2013 for exceeding contamination threshold concentration, Miteni had never communicated the ERM studies at the services conference. Miteni argued that the groundwater contamination by PFOA detected in 2013 should not be attributed to the firm itself, but rather to the serious 1976 PFAS (BTF) contamination that occurred when the plant was operated by Rimar Chimica. Miteni framed the contamination as “historical”, arguing that some of the substances detected had not been produced since the late 1970s and that there was no ongoing contribution from its current activities. However, the Environmental Characterisation plan of 2013, issued after ARPAV (Veneto Region Environmental Protection Agency) had already identified Miteni as the contamination source, did not fully exclude later contamination events, arguing that a secondary contamination could still have been active (Camera dei Deputati, 2018).

Thus, Mitsubishi Corporation, now of acquiring Miteni shares in 1997, had been in possession of an environmental assessment stating that the PFAS contamination was ongoing and traceable to the site’s historical operations. The NOE report (2017) argued that “*Miteni has never transmitted the aforementioned investigations to date*” and did not inform authorities that, since 1990, it was aware of the pollution. The 2025 criminal trial centred on whether this internal knowledge of contamination could have given rise

to specific legal obligations. As resumed in the Parliamentary Commission of Inquiry report (2018), the legal obligation to disclose the five sets of studies to competent environmental authorities existed under Italian environmental legislation (D.Lgs. 22/1997, D.M. 471/1999, D.Lgs. 152/2006):

“There is no doubt that, in view of the reports, recommendations and data communicated by ERM Italia, Miteni had the legal obligation to carry out the communication of contamination [...]”. (Camera dei Deputati, 2018, p. 12).

The Parliamentary Commission reported that the consulting firm had already informed Miteni of the D.Lgs 152/2006 requiring proactive reporting of contaminated sites to authorities, even in case of historical contaminations that may cause ongoing risks.

Then, resuming the argumentations in the NOE report (2017), the Commission provided a possible explanation for the concealment of Miteni contamination, at the time the firm was owned by Mitsubishi:

“Probably, the only reason for this behaviour should be found in the company's desire to hide the pollution of the industrial site and the underlying aquifer. Otherwise, the obligation to provide information would have imposed on the company the burden of incurring substantial expenses both for the removal and disposal of the contaminated soil and for the dismantling of part of the production plant.” (NOE, 2017, p. 3; Camera dei Deputati, 2018, p. 12).

The 2022 parliamentary inquiry report verbalizes that, in 2017, emails from November 2008 were found, demonstrating that Mitsubishi asked ERM for an estimate of the costs for the dismantling and remediation of the Miteni site, before the 2009 sale to ICIG, and costs were estimated around 5.5-6.5 million euros to demolish the plant and 12-18 million euros to recover the area, less than 25 million euros in a second estimation. According to the commission, the recovery could not have been carried out without demolishing the entire factory, and these evaluations were not communicated

to public bodies, a clear indication of the fact that the top management, aware of Miteni's conditions, had wanted to inquire about the costs of the remediation of the site:

“In this context, Mitsubishi, evidently, [...] preferred to sell the shares of Miteni to International Chemical Investors Italia 3 Holding srl [...] which presented itself to institutional operators as a new subject, allegedly, completely unaware of the situation of serious pollution in which the industrial site found itself. [...] The sale took place [...] at the symbolic price of 1 euro, against a market value of the company [...] believed to be 15 million euros [...]” (Camera dei Deputati, 2022, p. 25).

The parliamentary inquiry claims that Mitsubishi sold Miteni's shares to ICIG to avoid paying for the remediation of the site. However, it is also investigated the possibility that the new buyer was aware of the environmental situation, as some of the same individuals already linked to the previous ownership would remain in the company's board of directors. (Camera dei Deputati, 2022).

6.1.4 Public emergence of PFAS contamination and regulatory response (2013-2018)

As previously mentioned, the IRSA-CNR report identified Miteni as the PFAS contamination source in 2013, later confirmed by ARPAV in relation to residents in the “red area” (v. Literature Review section). The Veneto Region issued a DGR n. 168 on Feb 20th, 2014, on health protection for the population exposed and a drinking water monitoring plan (DGR. 1874/2014) (Regione Veneto, 2014a; 2014b). Only in 2017 did the Region set the first binding limits with the DGR. 1590/2017 (Regione Veneto, 2017).

However, in July 2014, the authorities issued a renewed Integrated Environmental Authorisation (AIA) allowing Miteni to continue its PFAS production operations until the bankruptcy of 2018, only interrupting the production of long-chain PFAS considering the REACH EU restriction on PFOA since 2020. (Regione Veneto, 2014c).

In 2016, the Report of the PFAS Technical Commission certified significant bioaccumulation in the "exposed" populations and very high concentrations of PFOA in Miteni's workers. The Commission also recognises the possible pathologies associated with the bioaccumulation of PFAS, finding a higher incidence in the exposed population (Regione Veneto, 2016). Yet, national binding limits for PFAS in drinking water would only arrive with D.Lgs. 18/2023, in force from January 2026.

In 2018, a subsequent DGR. 691/2018 updated the surveillance plan for the exposed population (Regione Veneto, 2018). This decree, involving public expenditure on surveillance, was adopted the same year that Miteni declared bankruptcy.

6.1.5 Investigative reconstructions and parliamentary inquiries (from 2017)

In 2017, the Environmental Protection Unit (NOE) produced the official reconstruction of Miteni's corporate conduct before the judicial trial, as ordered by the Vicenza Judicial Authority. The report was prepared by the judicial police with the assistance of two ARPAV technicians and found that contamination studies were never communicated to the authorities, preventing them from resolving the problem proactively, causing institutional paralysis and environmental damage (NOE, 2017).

A crucial point for the investigations was the discovery of documents, dated from 2001 to 2016, attesting that the workers had PFOA values at dangerously high levels, and, according to the company's doctor, at "the highest levels ever recorded". These data had always been sent to the competent authorities, but were presented as negligible, diminishing their seriousness. The most exposed workers had PFOA levels of up to millions of ng/L (Camera dei Deputati, 2017).

While PFAS were not included in the tables attached to the Legislative Decree no. 152/2006 about environmental crimes, the managers of Miteni were still listed in the register of suspects for the crime of environmental pollution (Art. 452-bis of the Italian Criminal Code), since pollution was proven. The Italian Judicial Authority, intending to prove the adverse effects of PFAS, relied on several experts, including Prof. Fletcher

from London School of Hygiene and Tropical Medicine, with previous experience in the "DuPont" trial in Ohio (Camera dei Deputati, 2018).

In 2017, the parliamentary commission of inquiry produced the first report on PFAS pollution in Veneto, followed by updates in 2018 and 2022 (Camera dei Deputati, 2017, 2018, 2022). The reports marked the first systematic national engagement with the PFAS issue, reconstructing the sequence of the contamination since the 1960s. Civil society actors, including Mamme No PFAS (Mothers Against PFAS), Greenpeace, and Legambiente, were included in the commission hearings.

6.1.6 Bankruptcy and the India controversy (2018)

The parliamentary commission of inquiry established in 2018 produced a report in 2022 and included further analysis on the circumstances of the Miteni bankruptcy. This bankruptcy was declared by the Vicenza tribunal on November 9th, 2018.

The bankruptcy trustee of Miteni reported to the commission of inquiry that, despite assets being adequate for a voluntary liquidation, Miteni requested its bankruptcy, since the firm would not be able to bear the costs deriving from the remediation of the site. Additionally, ICI Italia 3 Holding, the sole shareholder of Miteni, has declared itself willing to manage and upgrade the hydraulic barrier at its own expense, but only as a party not responsible for the contamination. The public receivables for environmental damage, claimed by the Ministry of the Environment, the Veneto Region and other public bodies, for about 150 million euros, were not admitted to the bankruptcy liabilities. Environmental damage will be defined in the criminal proceedings before the Vicenza Court of Assizes. During the *decommissioning* proceeding, the vendible plants were sold to Viva Life Sciences Private Limited, an Indian company, for 4.6 million euros. Approximately one thousand tons of chemicals were sold and taken out of the plant to be transferred to India starting in 2020 (Camera dei Deputati, 2022).

Laxmi Organic Industries' new plant in Lote Parshuram, Maharashtra, provided industrial continuity in another regulatory context, allowing PFAS production to

continue and relocating environmental risk, where there was a race to the bottom in environmental protection. During a crucial period when the European Union was discussing broader restrictions on PFAS, PFAS were not yet fully recognised under regulatory standards in India (Liva et al., 2025). According to the Guardian article (2025), “*Laxmi’s strategy explicitly spelt out the goal to ‘capture [the] market share of Miteni’ and become a leader in the production of Pfas and fluorochemicals.*” This article exposed the controversy and generated local and political protests in India from 2026 (Faulkner, 2025).

6.1.7 Judicial accountability and legal reckoning (2019 - 2026)

In 2019, the investigations of the prosecutor's office at the court of Vicenza were closed pursuant to Article 415-bis of the Code of Criminal Procedure against suspects and the indictment was requested in July 2019.

With judgment no. 896 of May 6th, 2024, the Veneto Regional Administrative Court (T.A.R.) confirmed the liability of Mitsubishi Corporation in PFAS contamination, rejecting the appeals and obliging the multinational to pay the costs of remediation of the Miteni site in Trissino (T.A.R. Veneto, 2024).

With a judgment of the Court of Vicenza, Labour Section, no. 251/2025 of May 13th, 2025, the first death of a former Miteni worker was recognised as linked to occupational exposure to PFAS (Court of Vicenza, 2025a). Subsequently, on June 26th, 2025, the Vicenza Court of Assizes pronounced the first instance verdict, convicting eleven former Miteni managers of intentional environmental disaster and deliberate water poisoning, receiving the highest sentences possible. In fact, the verdict established harsher rulings than those requested by the prosecution. This case led, for the first time, to company executives being held liable for industrial chemical contamination. The judgment holds that the environmental disaster was *intentional*, explicitly rejecting the defence argument that the absence of specific PFAS legislation at the time of the acts constituted a legal shield. In particular, the absence of regulations does not

absolve the actors who have knowingly caused damage, precisely because the disclosure obligations under environmental law have existed all the time. The complete reasoning of the court provides the most authoritative institutional narrative of the regulatory gap across the 1965-2018 period. Compensation is ordered for 314 civil parties, including the Ministry of the Environment, the Veneto Region, individual citizens, environmental associations and water service providers (Court of Vicenza, 2025). 26 appeals were filed in May 2026, and the appeal proceedings are still ongoing (Regione Veneto, 2026).

6.1.8 The Piemonte comparator: the ex-Solvay case (Syensqo)

The 2022 parliamentary investigation report has explicitly constructed a national comparative framework between the Miteni case and the Solvay Speciality Polymers Italy S.p.A. (today Syensqo) plant in Spinetta Marengo, in the province of Alessandria, in Piedmont. Including this example in the documentary results allows the author to verify whether the business conduct model identified in Veneto may reflect a broader pattern of how the fluorochemical industry has managed environmental risk in the absence of binding regulation.

The 2022 report of the parliamentary commission of inquiry dedicates a specific chapter to the chronological and judicial analysis of the ex-Solvay case (Camera dei Deputati, 2022, pp. 46-55). PFAS contamination in the Piedmont region originated and is a direct consequence of the production of PFAS carried out by the local Solvay plant. The Solvay Group is a multinational company operating in the chemical sector, based in Brussels. In 2002, Solvay acquired the industrial plants of Spinetta Marengo from Montedison (Ausimont). Solvay has been a producer and user of PFAS since the 1990s, and it is the only PFAS producer still active in Italy as of 2026, even though it is currently subject to remediation procedures. It is interesting to note that Solvay has collaborated with Miteni to produce the short-chain PFAS named cC_6O_4 .

Even before the opening of the criminal proceedings in Vicenza, the factory in the province of Alessandria had already been the subject of legal proceedings. First, the Court of Assizes of Alessandria's first-instance 2015 judgment led to the conviction of several top managers connected to the site, due to an intense hexavalent chromium contamination of surface and groundwater, charged with an unnamed culpable environmental disaster with permanent effects. This finding was later confirmed by the Court of Cassation in 2020 (Corte d'Assise di Alessandria, 2015; Corte di Cassazione, 2020).

Concerning PFAS contamination, according to the Commission's final report:

“As was the case for the Miteni site in Trissino, the Solvay site in Spinetta Marengo also represents a significant source of contamination for both groundwater and surface water.” (Camera dei Deputati, p. 51-2022).

According to the 2022 Commission report, the cC_6O_4 contaminant, which, now, is manufactured by Solvay, has been found at high concentration in the Po River, distant 230 km from Spinetta Marengo. Thus, the contamination of local groundwater and surface water has been the subject of scientific research and civic mobilisation, especially contesting the substitution of long-chain PFAS with short-chain substances, still leading to contamination and bioaccumulation.

In 2025, the Piedmont Region presented the first results of a biomonitoring carried out on the population of the contaminated area (Regione Piemonte, 2025a). In the meantime, criminal proceedings are underway in 2026 against former Solvay executives for culpable environmental disaster, with the trial resuming before the Court of Alessandria (RaiNews, 2026). Civic organisations continue to call for the site's remediation, while institutions push for further sustainability measures. (Regione Piemonte, 2025b, 2026).

6.2 Interview analysis: thematic coding

This section summarises the thematic analysis of semi-structured interviews with stakeholders who are involved in or influenced by PFAS contamination in Italy. Interviews are organised into role-based analytical categories.

The thematic coding generated 274 evidence segments. **Figure 5** summarises the distribution of the evidence codified in the identified six macro-themes: regulatory gap, corporate responsibility, externalities, stakeholder pressure, scientific knowledge timing, and consumer trust and firm reputation.

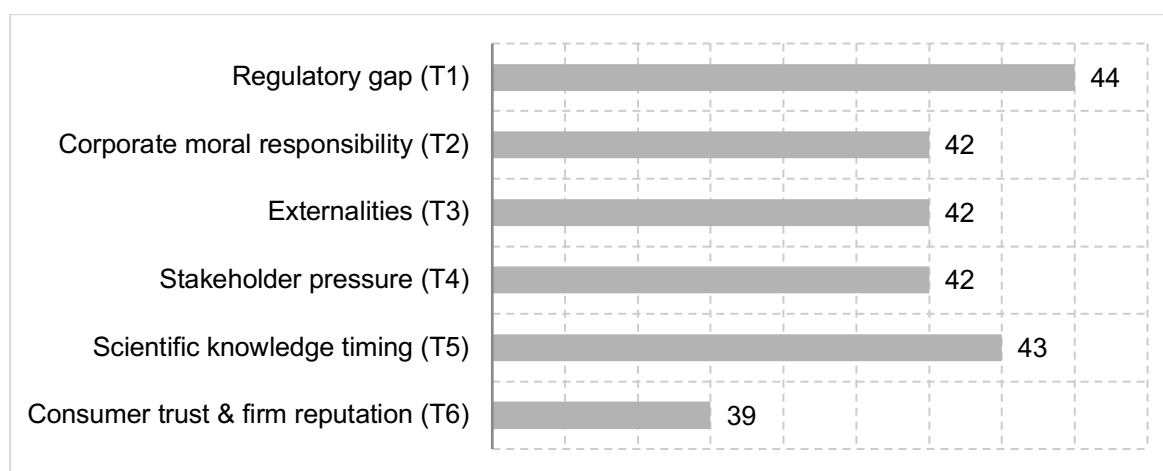


Figure 5: Coded interview segments by macro-theme.

The strongest concentration of interview evidence concerns externalisation of harm, thus environmental negative externalities, consistently with the research question, since interviews mainly highlighted the cost externalisation to public society and institutions of the corporate concealment and regulatory delay concerning the Miteni case, and, in general, PFAS regulation.

T1. Regulatory gap. The first macro-theme concerns the information and time gap that allows corporate misconduct under conditions of information asymmetry, which is the regulatory gap, due to the delay in the regulation of industrial conduct.

There is convergence among respondents involved in environmental research and advocacy in describing a wide time window between the accumulation of scientific

evidence and the regulatory process, during which production, and therefore contamination, may continue unhindered. Contamination becomes manageable only when monitoring and research technologies make substances visible and politically relevant.

As one scientific research interviewee, involved in PFAS monitoring in Italy since the late 2000s, explained:

"The regulatory process is very slow: it can take 10-15 years to regulate a substance [...] In the meantime, the industry can change it." (Scientific Research Interviewee 1)

Information asymmetry is riskier precisely because of the time gap between internal corporate research and disclosure, while regulators and communities do not have the necessary information to request protection, given the very long decay times of PFAS, which lead to a disproportionate social cost of pollution.

Respondents involved in environmental advocacy groups linked this delay to the presence of non-public data, while respondents from the affected communities referred to an information gap between households and local health professionals. Researchers in the Social Psychology field defined the initial phase of the Veneto case as a condition of "*collective ignorance*", in which citizens and even health professionals lacked shared categories to understand the contamination.

"At the local and European level, however, no one could give a name for the consequences of these contaminants with certainty." (Scientific Research Interviewee 2)

Secondly, the substance-by-substance regulatory logic, which has governed the regulation of PFAS both at the national and European levels, presents considerable criticalities. This creates a structural incentive for companies to modify a molecule that

may have a toxicological profile like that of the substituted substance, instead of fostering broader, truly preventative innovation.

"You just have to modify the molecule slightly, and it is no longer the same regulated substance." (Scientific Research Interviewee 1)

"The new substances [...] often have similar characteristics [...] they risk being banned again, and the cycle begins again. (Public Water Utility Interviewee 1)

T2. Corporate moral responsibility. The second macro-theme addresses the conduct of companies producing or using PFAS in Italy beyond legal compliance, with a focus on the Miteni case in Veneto.

Concerning internal corporate knowledge of PFAS-related risks and the failure to disclose this information, converging interview evidence indicates that internal monitoring and technical data were available before public recognition of the contamination, while disclosure to public authorities and affected communities remained delayed or incomplete.

"In the financial statements before 2013, there was an item relating to the strengthening of the hydraulic barrier [...] there was awareness of a problem before it was publicly stated." (Environmental Advocacy Interviewee 1)

Several respondents also associated corporate opacity with prior knowledge and avoidance of responsibility. Recalling internal biomonitoring, the interviewees from the scientific and health area defined a complete corporate ignorance of the risks as implausible. Respondents engaged in environmental advocacy interpreted the ongoing changes in ownership and bankruptcy as mechanisms to reduce liability exposure.

"If a company is sold or goes bankrupt, it becomes difficult to identify the responsible party [...] The corporate separation strategy is a tool to reduce legal exposure." (Environmental Advocacy Interviewee 1)

It is pointed out that, even in the absence of complete toxicological certainty, the very existence of contamination should have been sufficient to give rise to doubts and duties of precaution.

“You may not have known how large it was, how toxic it was, or what effects it would have in the long run, but you did know that you were unloading something dangerous.” (Environmental Advocacy Interviewee 2)

A sub-theme concerns the alleged indispensability of PFAS. Among the interviewees, experts in the medical-scientific and environmental advocacy areas observed how the industry presents PFAS as necessary for the energy transition, for strategic sectors such as semiconductors and batteries, or for medical technologies. However, this narrative, though legitimate for essential uses, which are an absolute minority of all uses, should not apply to all commercial uses. Therefore, it is shown how completely liberalising their use, through the probable "regrettable substitution" with short-chain substances, equally polluting, can be linked to unethical conduct, as it lacks precautionary logic towards consumers and residents. One environmental advocacy interviewee described that strong industrial pressure to frame PFAS as essential may be rooted in prevailing economic interests over environmental and public health protection.

T3. Externalisation. The third theme concerns negative environmental externalities and cost externalisation towards public society and healthcare. Respondents described PFAS contamination as a process by which costs are transferred from polluting companies to public institutions and public water utilities.

Several public water utility interviewees described initial resistance from industrial actors when voluntary discharge monitoring was proposed, especially when monitoring was perceived as intrusive or reputationally risky. Voluntary industrial participation in monitoring depends largely on the existence of binding regulatory obligations, but, in

the absence of such obligations, participation may be declined or resisted, and polluting companies may refuse to internalise externalisation costs.

*"These costs [...] then inevitably end up in the bill and therefore on the users themselves, who in fact find themselves paying for pollution caused by others, with respect to which to date it has not yet really been remedied at source."
(Public Water Utility Interviewee 1)*

"If something is found, it is a useful alert to know well before a regulatory obligation intervenes. With smaller companies, it's much harder [...] often they don't want to pay what they already owe." (Public Water Utility Interviewee 2)

*"For us, the main focus remains linked to the areas and production contexts."
(Public Water Utility Interviewee 3)*

One local government interviewee explained that identifying the source of pollution is often complex because water governance involves overlapping competencies and multiple institutional actors:

"It is not easy to identify the real responsibilities, trace the origins of the problems and then intervene. [...] Identifying the person responsible for pollution phenomena is very complex." (Local Environmental Policymaker Interviewee 1)

This difficulty was confirmed by public water utility interviewees, who noted that contamination detected today often originates from events that occurred many years earlier, making precise attribution difficult.

A further public water utility interviewee, discussing PFAS water treatment, explained that specific treatment systems had been introduced in response to industrial and territorial risk factors, but stressed that the key question is not only technological feasibility but long-term economic sustainability. Treatment technologies require high investments to treat contamination, putting huge pressure on drinking water providers

that need to earn trust from the public. Thus, a public water utility interviewee noted how the regulations often focused downstream on final treatment, but legal enforcement on upstream industrial discharge of polluting substances was not as easy to regulate.

The same interviewee noted that administrative sanctions of limited value may have little deterrent effect when compared with the scale of environmental harm. In such cases, compensation alone may be insufficient, because the environmental and financial costs ultimately fall on the broader community.

T4. Stakeholder pressure. The fourth macro-theme concerns reputational consequences and stakeholder pressure. Environmental advocacy interviewees, community-based advocacy actors and scientific researchers all confirmed that civic activism played a central role in driving the policy changes that eventually occurred. The 2017 protest in Trissino, prompted by environmental activism groups such as Mamme No PFAS and Greenpeace, involved about ten thousand participants in the contaminated area, and has been identified in multiple interviews as the turning point that prompted the Veneto region to introduce drinking water limits and emergency filtration measures.

Researchers interviewed in the field of social psychology described this activism as an example of grassroots mobilisation by minority groups, capable of progressively affecting regulatory and political structures that would otherwise be resistant to change. According to this reading, the mothers (Mamme No PFAS) involved in the protest would have taken on the role of "*epistemic citizens*", building autonomous skills through the study of scientific literature and international epidemiological research.

According to some interviewees, the community investments made over time by the original industrial group, particularly the Marzotto industries, would have helped to generate cultural deference and reduce public scrutiny. Some Environmental Advocacy respondents also noted that criticising the company could be perceived as a criticism

of the territory itself. Several respondents belonging to the Scientific Research category showed a divergence in risk perception. Actors with economic ties to the contaminated area tended to downplay the problem or avoid public involvement, while parents of young children were more likely to mobilise for health reasons.

T5. Scientific knowledge timing. The fifth macro-theme concerns the conditions that determine who produces scientific knowledge on PFAS and who can access it. Respondents said public research is often fragmented and underfunded, while industry retains privileged access to the toxicological and technical data needed to assess risk independently.

“We have decided, without dedicated funding, to start researching these compounds independently.” (Scientific Research Interviewee 1)

An interviewee from the Scientific Research category described the discovery of Veneto contamination as also linked to the availability of new instrumentation. Other scientific respondents confirmed the absence, in Italy, of a longitudinal study comparable to the C8 Health Project, despite the scale of exposure.

Some public water utility interviewees noted that monitoring PFAS can be challenging and depends on costs and requires specific techniques that are different from those used for other compounds. Each pollutant needs its own technique to be checked, but if the industry does not disclose its existence and scientific research does not assess its toxicity in advance, nobody is going to prompt for inspection:

“If I don't look for a certain substance, I'll never find it.” (Public Water Utility Interviewee 2)

Additionally, as noted by an interviewee, the information asymmetry does not depend only on scientific uncertainty, but also on industrial control over access to toxicological data:

"Companies say that substitutes are less dangerous, but without access to raw data, it is difficult to make an independent assessment." (Scientific Research Interviewee).

T6. Consumer trust and firm reputation. The sixth macro-theme concerns the consumer-facing dimension of information asymmetry. Respondents described PFAS exposure through everyday products as largely invisible, especially outside directly contaminated areas. Some respondents from the Environmental Advocacy and Scientific Research categories described a big geographic difference in public awareness: high in directly contaminated areas, weaker or normalised elsewhere.

"It is high in Veneto and Piedmont [...] it is much lower in Tuscany and in Lombardy." (Environmental Advocacy Interviewee 1)

"The substance is odourless, imperceptible; it escapes the senses." (Scientific Research Interviewee 2)

This invisibility extends along the supply chain and reaches the final products. A Scientific Research respondent pointed out that downstream PFAS user firms may themselves be unaware that they are using inputs containing PFAS.

"Those who use these substances in consumer products may not be even aware of their presence in production processes." (Scientific Research Interviewee)

This is fundamental for firms that produce textiles, cosmetics, food packaging, pans, and tools that prevent oil and water from sticking to surfaces and garments. These firms may be unaware of the real health, environmental, and reputational risks of PFAS in their products. A crucial example was provided by an Environmental Advocacy Interviewee who presented the example of fluorinated waxes consumer-facing firms and their reputational consequences linked to the PFAS producers' supply chain.

The interviewee refers to the case of the famous Norwegian firm “Swix”, which used to have a partnership with Miteni, since they used to produce their ski wax using perfluorinated products. When the Miteni controversy arose, the health conditions of workers and the local population in Veneto were made public and shocked the Norwegian public opinion, outraged by the working conditions of the Italian manufacturers of one of the most iconic products for a winter sport. To handle the potential reputation damage, Swix’s top management decided to publicly apologise on Dagbladet, the national newspaper⁴:

“Swix officially distanced itself from Miteni and declared that, if it had known how that substance was produced and how toxic it was, it would never have worked with that supplier.” (Environmental Advocacy Interviewee 3)

“This is brand new information from us. I do not want to take them lightly, but they don't even allow us to act against Miteni since they went bankrupt. However, there is no doubt that this was completely unacceptable. If we had this information, we would have immediately terminated the relationship with the firm” (Åge Skinstad, Swix’s CEO, in Dagbladet, 2019, trad. It. PFAS.land)

A similar logic emerges in relation to various consumer products: to prevent backlash due to growing consumer awareness, "no PFAS" labels are increasingly used on products, but interviews indicate how corporate communication on the phase-out can risk being ambiguous:

“Saying 'PFOA-free' or 'PFOS-free' does not necessarily mean PFAS-free.”
(Environmental Advocacy Interviewee 3)

⁴ Dagbladet. (2019). *Skrekkfabrikken som lagde norsk skismøring* [La fabbrica dell'orrore che produceva sciolina norvegese]. Dagbladet. Trad. it. consultata su PFAS.land. Original article: <https://www.dagbladet.no/sport/skrekkfabrikken-som-lagde-norsk-skismoring/71808355> [accessed April 2026].

The lack of clear PFAS labelling was described by multiple respondents as a key limitation to informed choice. One scientific respondent noted:

"The problem is that we still cannot legally get companies to declare the presence of PFAS on the label, so that everyone can choose." (Scientific Research Interviewee)

In this perspective, the right to know represents the consumer-facing dimension of information asymmetry: opacity does not stop at the production site but continues along the supply chain to the end consumer. This confirms that reputational damage, when it emerges, does not work as a simple market corrective, but as a social response to conduct perceived as opaque and irresponsible.

This last macro-theme links interviews to the survey section, given the rising reputational pressure on consumer-facing firms and the rising concern for PFAS when risk becomes visible and linked to everyday products.

6.3 Survey results: descriptive and multivariate analysis

6.3.1 Involvement in the chemical industry is the main predictor of awareness

More than half of respondents never heard of PFAS before (52.0%), while others knew some vague information (37.9%), and a small percentage were fully aware of the existence of PFAS (10.0%); thus, only 156 of $n = 269$ respondents reported having some kind of awareness about PFAS. Most respondents who answered positively to the awareness-related question reported having heard about PFAS from the Internet and social media, while a few of them learned from scientific sources or the working environment (**Figure 6**).

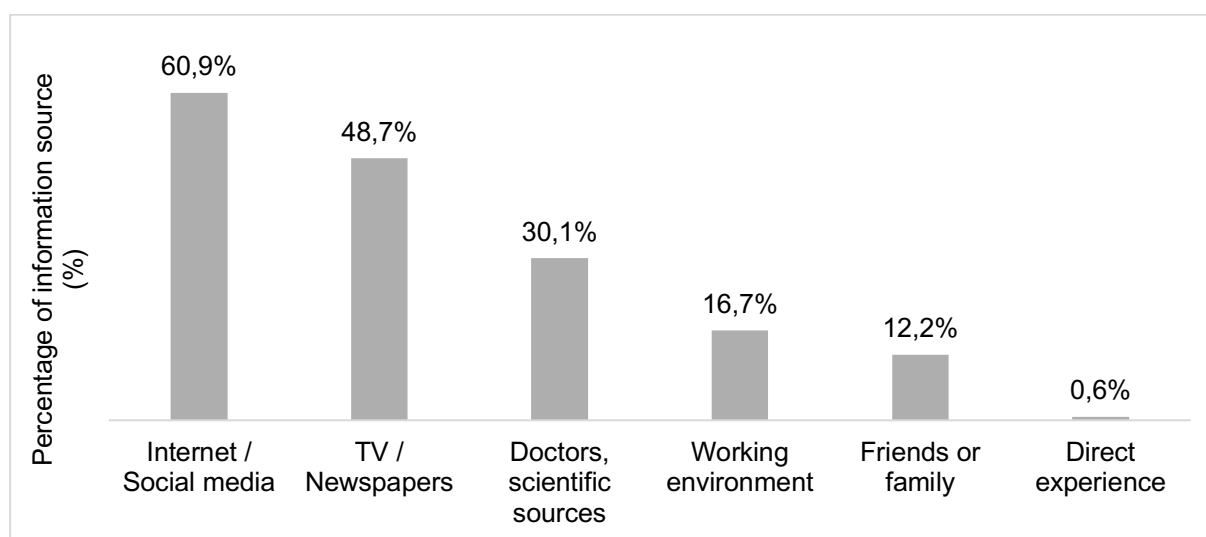


Figure 6: PFAS information sources among respondents already aware of PFAS. Multiple answers were allowed; percentages are calculated on respondents who had already heard of PFAS ($n = 156$).

ANOVA performed on the awareness level of respondents relative to demographic variables (age, gender, education, employment, involvement in chemical management, presence of children at home), reported a statistical difference between means only for respondents involved in the chemical industry ($M = 2,10$) compared to those not involved ($M = 1,35$) ($F = 7,924$, $p = 0,005$). Evidence of self-reported awareness about PFAS association with age, gender, education, employment or presence of children at home was not found. Thus, the doughnut charts in **Figure 7** show that involvement in the chemical industry is the main predictor of high awareness

of PFAS in the sample: 40% of respondents with experience in chemical management report high awareness, compared to 7% among those without such a background.

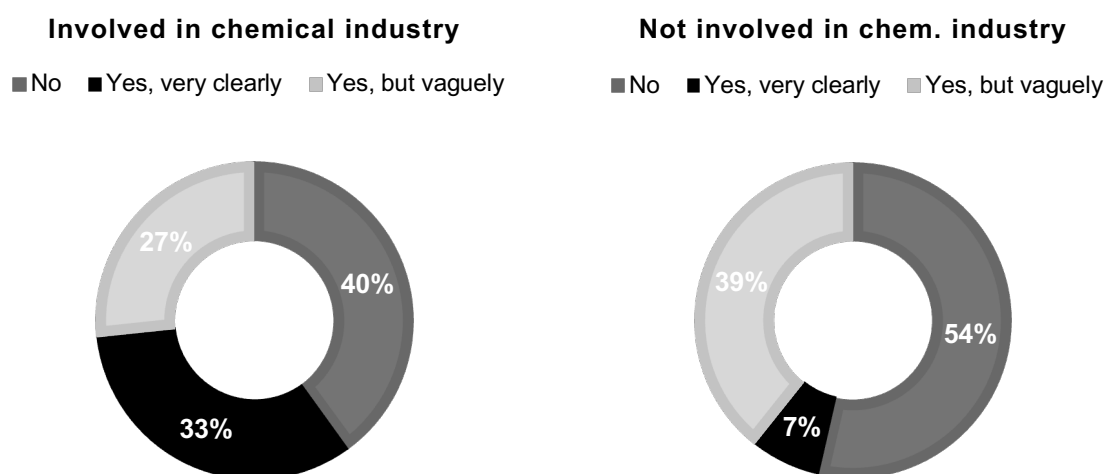


Figure 7: PFAS Awareness Index (“Have you ever heard of PFAS production and diffusion?”) by respondents’ involvement in the chemical industry.

The concentration of knowledge in the groups closest to the industry confirms that knowledge of PFAS risk remains asymmetrically distributed. Open answers confirmed that PFAS awareness is often connected to professional, educational or territorial exposure, given that respondents who reported having heard of PFAS through scientific or work-related sources were more likely to provide exhaustive reasons for their knowledge. **Table 5** reports a selection of relevant answers.

Table 5: Open-ended answers about PFAS awareness (study, work and prior awareness)

Category	Selected answers
University students or professors	<i>“I studied PFAS for their chemical structures and later explored water contamination caused by PFAS in Veneto.”</i> (Student, 18-34, female, Veneto resident)
	<i>“I took courses during my degree in industrial chemistry in which polyfluoroalkyl substances were discussed both from the point of view of their industrial applications and their impact as pollutants.”</i> (Student, 18-34, male, Emilia-Romagna resident)
	<i>“I teach chemistry at university, so I know the compounds under this name.”</i> (Employed, 55+, male, Lombardy resident)

Worked in chemical industry	<i>"I know the details, the issues and the consequences." "I carry out control analyses on PFAS."</i> (Employed, 35-54, female, Lombardy resident)
	<i>"They are compounds created by chemical industries. For purely profit-related reasons, industries tend to deny their dangerousness."</i> (Employed, 55+, female, Lombardy resident)
	<i>"Eliminating PFAS is difficult"</i> (Employed, 55+, female, Lombardy resident)
	<i>"They are risky and dangerous"</i> (Employed, 55+, female, Lombardy resident)
Exposition or independent research	<i>"They were widely used in the past for waterproof textiles"</i> (Employed, 55+, male, Lombardy resident)
	<i>"PFAS are used extensively by the chemical industry"</i> (Employed, 18-34, female, Veneto resident)
	<i>"They were widely used in the past to waterproof textiles or for coatings."</i> (Employed, 18-34, female, Emilia-Romagna resident)
	<i>"Introduction of a drinking water limit and phenomena linked to carcinogenic effects."</i> (Employed, 35-54, male, Lombardy resident)
	<i>"Forever chemicals, the chemical industry has produced PFAS for decades because of their non-stick and water-repellent properties. Manufacturing companies are accused of polluting the environment, as in the well-known Veneto case, while allegedly knowing for a long time about the persistence of these substances and their potential health risks."</i> (Employed, 35-54, male, Lombardy resident)

6.3.2 Trust mechanisms

Trust mechanisms are represented in the heatmap in **Table 6**. Trust in research, which is higher in all groups, indicates significant differences by age ($p = 0.001$), because it is on average higher among 18-34-year-olds and lower among the older. The presence of young children at home is also statistically significant, showing less trust in science than those who do not have children at home ($p < 0.001$). Regarding trust in institutions, there is a slight significant difference in age ($p = 0.038$) and in the presence of children in the home ($p = 0.02$), with the youngest and childless showing slightly higher levels of institutional trust. Confidence in chemical companies is lowest in all groups, but varies significantly by gender ($p = 0.035$), with women more confident than men. Finally, trust in environmental associations is medium-high and indicates weakly significant differences by gender ($p = 0.02$) and almost not

significant by level of education ($p = 0.05$). Trust in environmental associations will be a key predictor in multivariate analysis.

Table 6: Heatmap of average trust level by PFAS information source by demographic group⁵

Trust	Research	Institutions	Chem. firms	Environ. advocacy	Likert
18-34	4,21	3,34	2,50	3,16	5,0
35-54	3,83	3,13	2,32	3,18	4,6
55+	3,79	3,00	2,30	3,23	4,2
Female	3,95	3,25	2,48	3,28	3,8
Not female	3,95	3,03	2,21	3,04	3,4
Lower education	3,85	3,09	2,45	3,36	3,0
Higher education	4,01	3,20	2,34	3,10	2,6
Employed	3,92	3,12	2,41	3,16	2,2
Student / Inactive	4,00	3,23	2,32	3,24	1,8
Involved in chem	4,07	2,83	2,40	3,13	1,4
Not involved in chem	3,94	3,21	2,37	3,20	1,0
Children at home = Yes	3,65	3,02	2,32	3,14	
Children at home = No	4,15	3,26	2,41	3,22	

6.3.3 Descriptive analysis: Concern, CSR expectations, Product Acceptability

Descriptive statistics for main indexes are shown in **Table 7**:

Table 7: Concern Index, Responsibility Index, Product Acceptability Index, main descriptive statistics (Likert 1-5)

Main indices (obtained from items averages)	M	SD	Min	Q1	Median	Q3	Max
Concern Index	3,52	0,83	1,00	3,00	3,67	4,00	5,00
Responsibility Index	4,51	0,61	2,50	4,00	4,75	5,00	5,00
Product Acceptability Index	1,64	0,63	1,00	1,25	1,50	2,00	5,00

⁵ Trust was measured on a 1-5 Likert scale, where higher values indicate greater trust. Bold values indicate trust dimensions for which within-group differences are statistically significant according to ANOVA tests. The heatmap indicates that academic research is the most trusted source across demographic groups, while chemical firms receive the lowest trust scores.

The results in **Table 8** for the Concern Index indicate that the concern for PFAS is medium to high, especially for accumulation in drinking water and difficulty in eliminating from the environment.

Table 8: Concern Index items and respective Means (M) and Standard deviations (SD) (Likert 1-5)

How concerned are you about the following statements about the characteristics of PFAS?	M	SD
PFAS accumulate in the blood and organs and can have harmful effects on the health of adults and children	3,52	0,91
PFAS accumulate in drinking water and are difficult to eliminate from the environment	3,68	0,86
In general, how worried are you about PFAS?	3,38	0,90
Cronbach's Alpha		0,92

In contrast, the acceptability of PFAS in consumer products is very low, especially for products intended for children and cosmetics, as shown in **Table 9**. Waterproof jackets are relatively more accepted.

Table 9: Product Acceptability Index items and respective Means (M) and Standard deviations (SD) (Likert 1-5)

How acceptable would it be to you if PFAS was contained in the following products?	M	SD
Non-stick frying pans	1,67	0,85
Rainproof water jacket	2,22	0,94
Cosmetics (i.e., mascara, cream, shampoo)	1,44	0,71
Baby products (i.e., plastic toys, backpacks, baby bottles)	1,22	0,61
Cronbach's Alpha		0,82

Women show less acceptability than men in all categories, especially for cosmetics and baby products. Respondents 18-34 are more tolerant, while groups 35-54 and 55+ show more marked rejection, as shown in **Figure 8**. When PFAS risk is linked to everyday products, respondents express concern, strong expectations of transparency and low tolerance towards their presence in consumer goods.

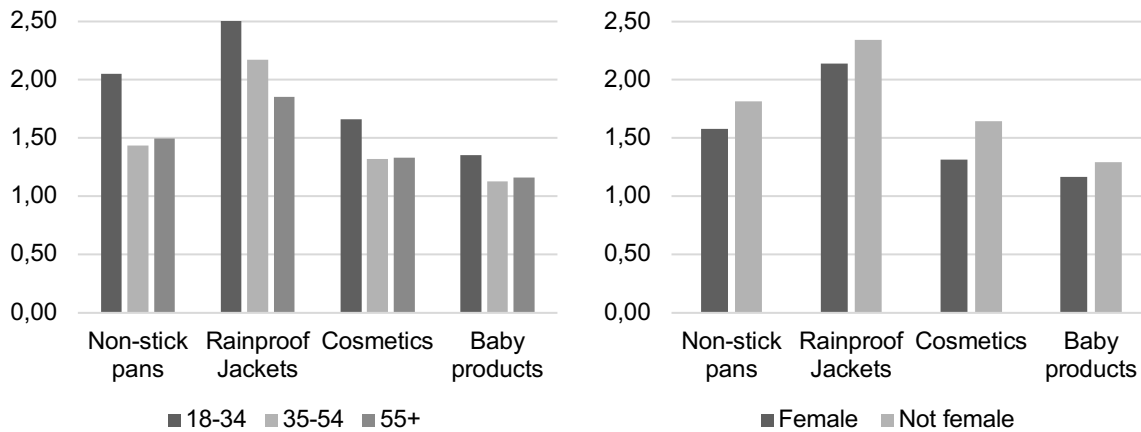


Figure 8: Product Acceptability Index by age group and gender (1-5 Likert, lower values indicate lower tolerance for PFAS in consumer products).

6.3.4 Multivariate analysis: Concern, CSR expectations, Product Acceptability

The multivariate model in **Table 10** (**Tables B.4, B.5, B.6** in Appendix B) indicates that perceived contamination and trust in environmental activism are the most consistent predictors of concern and responsibility (CSR) expectations, whereas product acceptability is mainly associated with age, gender, and trust in environmental activism. The perception of the daily presence of PFAS is the strongest continuous predictor of Concern ($\beta = 0.39, p < 0.001$ in the Concern Index). The perceived proximity to risk generates involvement. This result recalls the Veneto case, where contamination has become socially visible through biomonitoring, favouring the mobilisation of the most exposed stakeholders. The same variable is also significant for the Responsibility Index ($\beta = 0.19, p < 0.001$), confirming that the attribution of corporate moral responsibility is not an abstract preference, but depends on the perception of personal exposure. Those who bear the costs of business conduct are more likely to ask for accountability when they become aware of the risk. The most significant result on trust concerns the different credibility of information sources. Trust in environmental activism is a statistically significant predictor of concern ($\beta = 0.23, p < 0.001$) and attribution of responsibility ($\beta = 0.13, p < 0.01$). In contrast, trust in the chemical industry does not independently predict any of the dependent variables.

Table 10: OLS regression results with HC3 robust standard errors for Concern Index, Responsibility Index, and Product Acceptability Index

Characteristic	Concern Index (OLS)			Responsibility Index (OLS)			Product Acceptability (OLS)		
n (observations)	269			269			269		
R ²	0,29			0,22			0,20		
	β ⁶	p-value		β	p-value		β	p-value	
Age									
18-34 (ref)	---	---	---	---	---	---	---	---	---
35-54	0,23	0,07601		0,32	0,00185	**	-0,39	0,00036	***
55+	0,18	0,14715		0,16	0,09293		-0,43	0,00003	***
Gender									
Not female (ref)	---	---	---	---	---	---	---	---	---
Female	0,03	0,71648		0,15	0,03417	*	-0,20	0,00906	**
Education									
Lower education (ref)	---	---	---	---	---	---	---	---	---
Higher education	-0,10	0,30932		-0,08	0,30879		0,10	0,24602	
Employment									
Student / Inactive (ref)	---	---	---	---	---	---	---	---	---
Employed	0,01	0,89769		0,03	0,76639		-0,12	0,19394	
Chem_mgmt									
No (ref)	---	---	---	---	---	---	---	---	---
Yes	-0,18	0,22062		-0,11	0,31342		-0,06	0,59902	
Child_home									
No (ref)	---	---	---	---	---	---	---	---	---
Yes	-0,07	0,54406		0,05	0,52715		0,10	0,28820	
Numeric predictors (continuous)									
Contamination perception	0,39	0,00000	***	0,19	0,00000	***	-0,04	0,36414	
Trust in researchers	0,07	0,31397		0,04	0,41819		-0,02	0,68323	
Trust in institutions	-0,03	0,66758		0,00	0,97161		0,02	0,73663	
Trust in PFAS Industry	-0,04	0,48369		-0,08	0,05713		0,07	0,09994	
Trust in environm. activism	0,23	0,00003	***	0,13	0,00242	**	-0,15	0,00065	***

The gender effect on the attribution of responsibility ($\beta = 0.15$, $p < 0.03$ for women) is also consistent with qualitative and documentary evidence, where civic mobilisation was strongly led by mothers and women concerned about their children's health.

⁶ β : non-standardized coefficient, 95% CI = $\beta \pm 1.96 \cdot \text{SE}$. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The 35-54 and 55+ groups report lower product acceptability than the 18-34 group ($\beta = -0.39, p < 0.001$; $\beta = -0.43, p < 0.001$). This is consistent with higher risk aversion and lower tolerance of uncertainty among older consumers.

6.3.5 Willingness to pay is linked to age and gender

The willingness to pay for PFAS-free alternatives varies significantly between product categories, as shown in **Table 11**. The highest value is observed for dental floss, followed by children's products and non-stick pans. Availability is lower for cosmetics and especially for waterproof jackets. The results suggest that respondents are more willing to incur an additional cost when the product is perceived as close to the body or linked to vulnerable individuals.

Table 11: Average willingness to pay for PFAS-free alternatives by product category (%)

How much more would you be willing to pay at most for a PFAS-free version of the following products? (%)	M	SD
Non-stick frying pans	12,57	5,49
Cosmetics (i.e., mascara, cream, shampoo)	11,69	6,36
Rainproof water jacket	9,68	5,91
Baby products (i.e., plastic toys, backpacks, baby bottles)	13,14	6,61
Dental floss	14,02	6,51

Figure 9 indicates that older respondents have a greater willingness to pay for PFAS-free alternatives, which is significant for cosmetics ($p < 0.001$), waterproof jackets ($p < 0.001$), children's products ($p = 0.012$), and dental floss ($p < 0.001$). Gender differences are significant for non-stick pans ($p = 0.032$), cosmetics ($p < 0.001$) and dental floss ($p = 0.012$), which are not significant for the other products. On average, women are more willing to pay a premium for PFAS-free alternatives, especially in products more related to personal care.

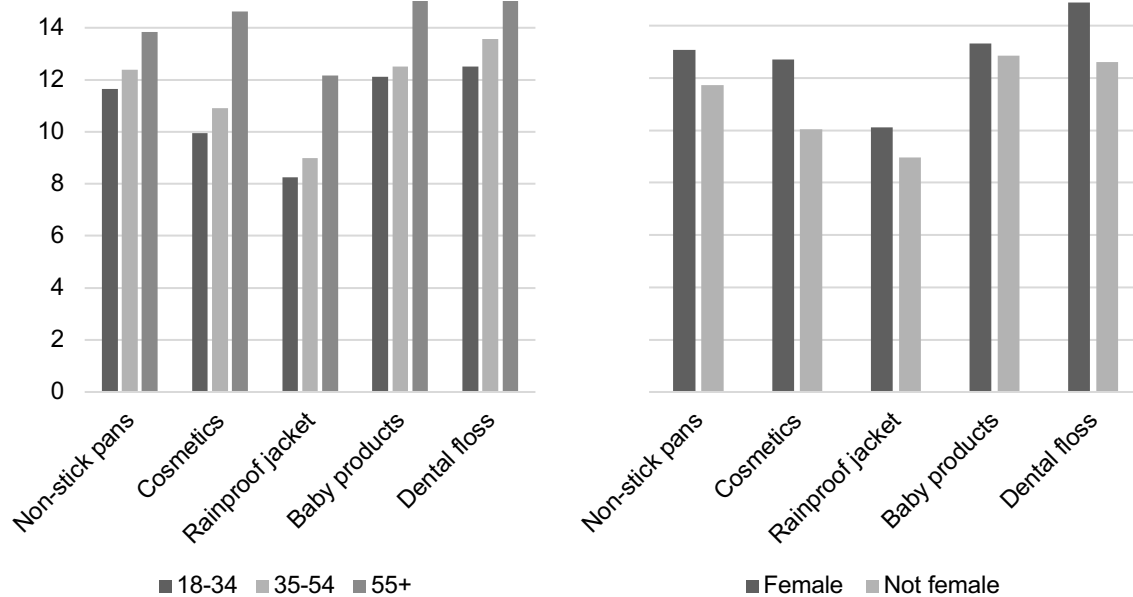


Figure 9: Willingness to pay for PFAS-free alternatives by age group and gender (%)

7. DISCUSSION

This research analysed the Italian case of PFAS production as a problem of business ethics and corporate responsibility. The research question asked how the Italian case showed how corporate conduct under weak or delayed regulations can challenge responsibility beyond legal compliance and generate stakeholder expectations once PFAS-related risks become visible.

From the triangulation of the results, it emerges that, in the Italian PFAS case, corporate responsibility is assessed in relation to damage incurred before the regulation's intervention. The ethically relevant profile concerns how the company has managed its information advantage in a context marked by scientific uncertainty and a regulatory vacuum, and, from this perspective, the case highlights a mechanism of misalignment between benefits and costs. It is not a simple violation of a positive norm, but the progressive transfer of social costs to the stakeholders involved, local communities and public institutions, in the face of a privatisation of profits. The results are supported by the literature on business ethics, allowing a broader theoretical interpretation: in fact, the market cannot be considered a morally neutral institution, since its functioning presupposes trust, transparency and correct distribution of business risk. Surdam (2020) and Fort (2008) have already observed that economic trust cannot be reduced to the fear of sanctions, since a company can formally comply with current law, but at the same time, act unethically, taking advantage of legal loopholes, information asymmetries, regulatory delays or incomplete regulation. This consideration is particularly relevant in the PFAS case, both in the DuPont and in the Italian case, since these substances are technically complex and "invisible" to ordinary stakeholders in the absence of specialised monitoring tools. In fact, the producer's information advantage concerned information relevant to the protection of stakeholders, therefore of workers and the community, showing how the ethical problem lies in the use of superior knowledge. Simple compliance with the law,

therefore, did not constitute fully ethical behaviour, as there was an information asymmetry between the company and regulators.

Another possible alternative interpretation would be that the conduct of companies in the Italian PFAS case has been influenced, at least in part, by real scientific uncertainty. In fact, for a long time, the risks associated with PFAS have remained difficult to detect, and this uncertainty may help explain some of the regulatory lag and some forms of limited corrective intervention. However, this explanation is only partially convincing: in the Miteni case, documentary evidence indicates that relevant information on contamination and the need for containment measures was available before the full public emergence of the problem, but was not promptly communicated to the competent authorities or stakeholders involved.

The H1 hypothesis (*Weak regulations are associated with minimal compliance and limited disclosure*) is mainly supported by documentary analysis. In fact, the public documents concerning the Miteni case reconstruct a distance between technical knowledge of contamination and health consequences and disclosure to the authorities with consequent regulation, as demonstrated by the first judgment concerning the pollution caused by Ri.Mar in the 1970s and the environmental studies commissioned between the 1990s and 2000s for the construction of the hydraulic barrier. It therefore appears to be a long-term industrial process developed in a context where prevention obligations were already present, even if they did not specifically concern those substances, generating a legal loophole that seemed to exempt Miteni from legal obligations. However, the 2025 first instance ruling (Court of Vicenza, 2025), which is not yet final, rejects the idea that the absence of specific regulation on a substance still unknown to the law should result in a total exemption from corporate liability, arguing that the choice to wait for the formal obligation is not ethically neutral if accompanied by clear awareness of the damage committed. This confirms the distinction between legal and moral responsibility, within the framework of the theories set out in Chapter 1: the firm can be seen as a moral agent acting through organised decision-making

structures. The evidence of the Italian PFAS case shows how, in the absence of legal obligations and reputational needs, companies can adopt minimum and insufficient levels of business ethics. Surdam (2020) shows that the law is a minimum threshold, but not a sufficient criterion of ethical responsibility. Fort (2008)'s notion of "Hard Trust" shows the difference between behaviour motivated by fear of sanction and proactive ethical behaviour. Corporate conduct reveals a sequence of decisions on how to manage contamination, business continuity, corrective measures and possible institutional communication, as demonstrated by Miteni's attempt to attribute responsibility for the damage solely to the previous company, Ri.Mar, postponing liability to a time when contamination did not constitute environmental damage punishable by law if the substance had not been previously classified as polluting and toxic by regulatory authorities. Empirically, minimal or delayed conduct allowed the damage to continue and costs to be passed on to stakeholders, violating a robust model of accountability.

The H2 hypothesis concerning information asymmetry (*Low corporate transparency delays recognition of harm*) is supported by documents and interviews. Information asymmetry has contributed to delaying public recognition of damage and limiting stakeholder pressure in the early stages. In the Veneto case, the contamination was technically complex and "invisible" to the senses, and, without targeted monitoring, the risk remained difficult to translate into accountability. The interviews describe the situation as one of "collective ignorance" that affected all stakeholders, from citizens to health professionals and institutions, consistent with the literature on PFAS, which describes how their presence in products and in the ecosystem is hardly recognisable without specific research tools (Glüge et al., 2020). For this hypothesis, the comparison with the DuPont case and the related literature is interesting: in the U.S., the case has brought to light a consistent amount of information that has remained internal to the company for decades regarding scientific evidence of toxicity for PFAS following a litigation process that began in the late 1990s (Gaber et al., 2023). It is interesting to

note that the DuPont case is comparable to the Miteni case and, in some aspects, also to the Solvay case in Piedmont. In fact, responsibility emerges only through legal processes, when knowledge finally leaves the technical-business circuit and translates into information in the public domain, capable of regulating and dealing with the consequences of the damage. Justice operates as a forced transparency device, while the company exploits information asymmetry, and this results in a delayed recognition of damage. This translates into the Italian case, the results of Gaber et al. (2023), who, through the publication of confidential industrial documents, showed that the management of DuPont and 3M knew relevant elements of PFAS toxicity for decades before full public emergence.

The empirical evidence collected supports Hayek's (1945) theory: knowledge is unequally distributed among economic actors, as Miteni (and DuPont) possessed technical information inaccessible to stakeholders, especially in the presence of complex sectors, such as chemicals (Zalta et al., 2021). Surdam (2020) argues that exploiting superior information or manipulating information causes the moral basis of the economic relationship to be lost, and stakeholders can only exert pressure if they have access to sufficient information about the risk (Freeman, 2011). In the PFAS case, verification comes only through public research or litigation, confirming that trust is not enough if it is not accompanied by verification mechanisms (Frankel, 2006). This is consistent with the view proposed in this thesis, since the Italian case indicates several elements of similarity, even in the absence of the same level of internal documentation available, which in fact is considerably lower. The sequence between theoretical knowledge, delayed disclosure, externalisation of costs and subsequent pressure from stakeholders (including justice) indicates that information asymmetry as corporate conduct can lead to a lack of accountability and an externalisation of costs.

The externalisation of damage links the results to the core of corporate environmental ethics because it indicates how the delay in disclosure and regulation produces the transfer of social costs to actors who have not generated the contamination. In this

sense, the public water utilities interviewed are downstream subjects called upon to monitor, filter and invest in treatment technologies with respect to contamination produced upstream by companies that produce or use PFAS. This complements the literature on environmental externalities, according to which pollution represents a paradigmatic form of social cost not internalised by the producer (Harris & Roach, 2017). This is where the Polluter Pays Principle takes on a function of business ethics, because those benefiting economically from a risky activity should bear the costs of prevention and remediation.

The H3 hypothesis concerning public response (*Visible PFAS risk associated with stakeholder pressure*) is supported by triangulating interviews and the survey. In the survey, knowledge of PFAS is low on average, higher among those with links to the chemical sector, specific training courses or territorial exposure. This finding is consistent with Berthold et al. (2023), who found that knowledge of PFAS is inhomogeneous and often linked to proximity to contamination or specific information sources. The low awareness confirms the consumer-facing dimension of information asymmetry. When risk is made understandable to respondents, very high expectations of responsibility emerge; in fact, the Responsibility Index indicates strong agreement on the right of consumers to know if a product contains PFAS, on the obligation to disclose and on the investment in substitution. This result confirms the interpretation of CSR adopted in the thesis, according to which CSR does not coincide with philanthropy or simple reputational communication, but with transparency, precaution, substitution and respect for the right to know. In this sense, the results are consistent with Vogel (2005) and Ledgerwood and Broadhurst (2000), for whom CSR has ethical value only if it bears upon the actual processes of the company. They also confirm Freeman's (2011) stakeholder theory: consumers become downstream stakeholders when they may be exposed to undeclared risks in everyday products and do not have the tools to assess them independently. Perceived contamination is the strongest predictor of the Concern Index and is also significant for the Responsibility Index, so

concern and the demand for responsibility depend on the perception that PFAS are present in daily life, a result consistent with Kemper et al. (2024), which distinguishes between knowledge and concern and shows how concern is influenced by personal perception of risk. It is also consistent with Rihn et al. (2024; 2026), according to which the acceptance of PFAS-free alternatives depends on clear information, product category, and perceived trade-off between safety and performance.

The role of trust completes the answer to H3: trust in research is, on average, the highest, while trust in chemical companies is the lowest. In addition, trust in environmental activism is associated with greater concern, stronger expectations of responsibility and lower acceptability of PFAS in products. This confirms what was observed in the Miteni case, where Mamme No PFAS, Greenpeace and Legambiente have favoured public pressure. The literature by Menegatto et al. (2022; 2023) on Veneto confirms the importance of the family, psychological and civic dimension of mobilisation, especially among parents and mothers exposed to uncertainty about their children's health. The survey also indicates that market pressure is uneven: the willingness to pay for PFAS-free alternatives varies by product, age and gender. Respondents are more willing to pay for products perceived as close to the body or for vulnerable individuals, but it is lower for products associated with technical performance, such as waterproof jackets. These data are linked to the literature on Detox campaigns and the outdoor sector: the replacement of PFAS proceeds more quickly where use appears less essential, while it encounters greater resistance when companies invoke durability and performance (Cousins et al., 2019).

Triangulation is the main strength of the research: the documents reconstruct the historical sequence, the interviews explain the interpretative mechanisms of the stakeholders, and the survey indicates how risk becomes relevant for stakeholders when it enters the everyday space. The answer to the research question is that the Italian case of PFAS demonstrates the limits of a liability based only on legal compliance. In sectors characterised by high technical complexity and potential

damage, the absence of a specific standard increases the ethical responsibility required for the company, because stakeholders cannot protect themselves without access to reliable information. The Miteni case indicates how information asymmetry can work as an organisational advantage, delaying costs, shifting burdens to other players and maintaining production continuity as long as the risk remains barely visible. This advantage is ethically problematic because it privatises the benefits of production and socialises the costs of contamination.

The theoretical contribution of the thesis consists of reading unethical business conduct as a form of organisational power in contexts of incomplete regulation, generalising the PFAS case beyond its chemical specificity. Whenever a company holds material information on persistent risks, which are difficult to observe and distributed to parties outside the market transaction, ethical responsibility cannot be postponed until the law intervenes. By evaluating how the company decides how to deal with uncertainty, how to communicate risk and how to distribute the costs of its business, it is possible to assess business ethics and CSR.

The empirical contribution consists of applying this lens to the Italian case. Veneto and, comparatively, Piedmont represent cases in which, when a company operates with substances whose dangerousness is unknown, ethical responsibility requires that the risk be made known before it becomes litigation or public cost. In this sense, the PFAS case confirms that business ethics becomes necessary precisely when the law comes late.

7.1 Limitations and future research

7.1.1 Limitations

In addition to the methodological limitations already discussed in Chapter 5, this research has some general limitations that must be considered in interpreting the results. First, this research is based on a recent and still evolving case, because the Miteni case will be subject to the appeal process in the coming months, while the

Solvay case is still under scientific and institutional investigation. This implies a limited presence of documents to corroborate the thesis with respect to the extent of the documents published on the DuPont case. The research photographs a regulatory and judicial context that is still evolving, which will certainly evolve in the coming years.

Second, the triangulation between documentary analysis, interviews and surveys strengthens the argument. The documents mainly concern business conduct and institutional response; interviews collect interpretations from qualified stakeholders; The survey measures consumer perceptions. The conclusions must therefore be read as an integrated interpretation of the case, not as a single linear causal model.

Lastly, corporate responsibility is analysed predominantly from the perspective of external stakeholders, public documents, and consumer perceptions. This is consistent with the focus on opacity and accountability, but leaves less room for the internal perspective of companies, including compliance difficulties, supply chain complexity, and the technical challenges of PFAS replacement.

7.1.2 Survey limitations and robustness checks

Survey respondents are concentrated in Lombardy, a region with a higher percentage of respondents with higher education (65.8% with at least a Bachelor's degree) and employment level, especially females (74.8% females employed vs 77.8% of males, net of students), than the average Italian condition, which may overrepresent higher levels of education or environmental sensitivity, thus limiting the external validity.

The fit of the multivariate models is moderate but acceptable for exploratory research based on attitudinal survey data (adjusted R^2 between 0.18 and 0.29), and results should not be interpreted as fully representative of the Italian population. Robust HC3 standard errors were used to increase the robustness of the estimates, but the models remain useful for identifying significant associations rather than causal relationships. Multicollinearity does not appear to be a concern, as all VIF values remain below

conventional warning thresholds, thus estimated coefficients do not overlap (**Table B.8** in Appendix B).

The Concern Index model indicates a non-significant Breusch-Pagan test, thus suggesting no evidence of heteroskedasticity, and a non-significant RESET test, indicating no sign of functional form misspecification. The Responsibility Index model indicates a ceiling effect, the Breusch-Pagan indicate some slight heteroskedasticity, and the RESET test suggests that the linear specification may not capture all variation in perceived responsibility. However, the model remains statistically significant and identifies theoretically coherent predictors. Lastly, the Product Acceptability Index model provides meaningful exploratory evidence, with a successful RESET test and no evidence of heteroskedasticity (**Table B.7** in Appendix B).

The diagnostic plots for Concern Index show only a small number of observations with relatively higher residuals, which is common for survey-based data and does not undermine the overall model interpretation. Similar results are present for the Responsibility Index model and the Product Acceptability Index model, for which some observations with higher leverage are present, but they do not create relevant issues for result interpretation (**Figures B.1, B.2, B.3** in Appendix B).

The models are not intended to provide exhaustive predictions of consumer behaviour, but rather to identify meaningful statistical patterns. In this sense, the regression results offer useful evidence on the factors associated with worry, responsibility attribution, and product acceptability in the context of PFAS in consumer products.

7.1.3 Future research

The focus on the Miteni case allows an in-depth reconstruction of one of the most relevant European cases of PFAS contamination, but limits the automatic extension of the results to other contexts. The comparison with the DuPont case and with the Piedmontese Solvay/Syensqo case allows us to identify recurrent mechanisms, but each case remains influenced by specific institutional, industrial and legal structures.

Future research could adopt a more systematic comparative design between different European cases, including Belgium, the Netherlands, Sweden, France and Germany.

In addition, future studies could also include interviews with manufacturers, users or companies engaged in the phase-out, to compare external demands for responsibility with internal decision-making processes. Future research could also be able to verify whether the mechanism identified in this thesis, i.e. corporate opacity, scientific uncertainty, regulatory delay and externalisation of damage, also occurs in industrial disputes such as asbestos, lead, tobacco, pesticides, hexavalent chromium or microplastics.

7.2 Conclusion

The thesis argues that the Italian PFAS case raises a fundamental business ethics and corporate responsibility problem. Evidence from documents, interviews and survey results indicates that weak or delayed regulation can enable firms to operate with minimal compliance, while risks remain invisible to stakeholders. In such contexts, legal compliance alone is not sufficient to define responsible corporate conduct, especially when information asymmetry between the firm and stakeholders is present. In the Miteni case, documentary evidence and stakeholder interviews indicate that information asymmetry and delayed disclosure contributed to shifting part of the social costs onto communities and institutions. The comparison with the Solvay/Syensqo case suggests that these dynamics may reflect a broader corporate responsibility problem in the management of technically complex industrial substances. Survey results add a consumer-facing dimension to the analysis: while general PFAS awareness remains limited, concern increases when the risk becomes understandable and connected to everyday products. Respondents express strong expectations of corporate transparency and a general low acceptability of PFAS in consumer goods. Willingness to pay for PFAS-free alternatives and acceptability for different product categories depend on age, gender, and trust dynamics, confirming the existing

literature demonstrating that stakeholder pressure emerges once invisible risks become socially visible.

Overall, the thesis contributes to business ethics literature by showing that corporate responsibility cannot be postponed until the law introduces a specific, stricter prohibition, especially in sectors involved in the production of technically complex substances. In these sectors, scientific uncertainty, together with weak regulation and information asymmetry, could lead to a diffuse “race to the bottom” in ethical responsibility. A business ethics approach requires more precaution, transparency and strong cooperation with institutions and stakeholders and internalisation of environmental and social costs. The Italian PFAS case demonstrates that, in order to prevent harmful consequences for stakeholders and an unfair distribution of costs, business ethics becomes most necessary when legal regulation is insufficient, and transparency and cost internalisation are necessary conditions for socially legitimate business conduct.

APPENDIX AND REFERENCES

7.3 Appendix A: Survey questionnaire

Note: The survey was administered in Italian. An English translation is provided below.

Initial message: *Dear participant, I am a student at Bocconi University, and I am carrying out university research on a topic related to the environment, consumers and corporate responsibility. I would be very pleased to know your opinion through this short survey. The questionnaire is anonymous, takes about 7 minutes, and there are no right or wrong answers. Thank you sincerely for your time and attention.*

Section A | Demography

What is your age group? Less than 18 years old; 18-24; 25-34; 35-44; 45-54; 55-64; 65-74; 75+

What gender do you identify with? Woman; Man; Other; I prefer not to answer

What is your highest educational qualification? Elementary or middle school diploma; High school diploma; Bachelor's or Master's degree; Post-graduate (e.g. MBA) / PhD.

Which of these best describes your work situation? Full-time job; Part-time work; Unemployed / Homemaker; Student; Retired.

Do you work or have you worked in chemical companies or related sectors? Yes; No.

Which situation best describes you? I have no children; I have children, but they do not live with me; I have children, and at least one lives with me.

What region do you live in? (Text entry)

Section B | Awareness of PFAS

Have you ever heard of PFAS? I know them well; I know something about it; I have only heard of it; I don't know them.

Where did you hear about it? (Can choose multiple answers) TV / Newspapers; Internet / Social media; Doctors, experts, scientific sources; Friends or relatives; Work environment; More

Have you ever heard of the role of the chemical industry in the production and spread of PFAS? Yes, clearly; Yes, but only vaguely; No

[If you answered "Yes, clearly"] In what sense have you heard about the role of the chemical industry in the production and spread of PFAS? (Optional).

Section C | Concern

[Message] PFAS are chemicals used in several commonly used products, such as non-stick cookware, waterproof fabrics, food packaging, and some cosmetics. They can pollute water and food for many years. Some studies have associated them with negative health effects.

How concerned are you about the following statements about the characteristics of PFAS? (Response scale: 1 = Not at all worried, 2 = Slightly worried, 3 = Somewhat worried, 4 = Very worried, 5 = Totally worried). Claims: PFAS accumulate in the blood and organs and can have harmful effects on the health of adults and children. PFAS accumulate in drinking water and are difficult to eliminate from the environment. In general, how worried are you about PFAS?

How likely do you think PFAS are present in your daily life? (Scale from 0 to 10: 0 = Not very likely, 10 = Very likely)

Section D | Responsibility and transparency

How much do you trust the PFAS pollution information provided by: (Response scale: 1 = Not at all, 2 = Little, 3 = Somewhat, 4 = Very much, 5 = Totally). Sources: Scientists and researchers; Public institutions, Region, Municipality, ARPA, ...; Chemical companies; Environmental associations

How much do you agree with the following statements? (Response scale: 1 = Not at all, 2 = Little, 3 = Somewhat, 4 = Very much, 5 = Totally) Claims: Companies should clearly state the presence of PFAS in their products. Companies should invest in PFAS replacement even when it comes to additional costs. Consumers have the right to know whether a product contains PFAS. A

company that continues to use PFAS without telling consumers is behaving unethically.

Section E | Consumer products and WTP

How acceptable do you think the presence of PFAS in the following products is?

(Response scale: 1 = Not at all acceptable, 2 = Not very acceptable, 3 = Somewhat acceptable, 4 = Very acceptable, 5 = Totally acceptable). Products: Non-stick cookware; Waterproof jackets; Cosmetics, e.g. makeup, creams, shampoos; baby products, e.g., plastic toys, backpacks, bottles.

Would you be willing to pay a higher price for a PFAS-free product? (Response scale: 1 = Not at all, 2 = Little, 3 = Somewhat, 4 = Very much, 5 = Totally).

Would you be willing to give up a product if there is no PFAS-free version? (Response scale: 1 = Not at all, 2 = Little, 3 = Somewhat, 4 = Very much, 5 = Totally).

How much would you be willing to pay EXTRA at most for a PFAS-free version of the following products? (Answer options: 0%, 5% more, 10% more, 15% more, 20% more). Products: Non-stick pan; Shampoo; Waterproof jacket; Backpack for children; Dental floss.

Which of these reasons would push you most to choose a PFAS-free product?

Greater health protection; Lower environmental impact; Greater protection for children and vulnerable individuals; Increased trust in the company; Greater transparency on the label; Other.

Would you like to add a comment/suggestion? (Optional)

7.4 Appendix B: Survey materials

Table B.1: Demographic composition of the survey participants (n = 269)

Characteristics	Category	n	%
Age	18-34	94	34,9
	35-54	94	34,9
	55+	81	30,1
Gender	Not female	102	37,9
	Female	167	62,1
Education	Lower education	92	34,2
	Higher education	177	65,8

Employment status	Employed	170	63,2
	Student / Inactive	99	36,8
Association with chemical sector or similar	No	175	65,1
	Yes	94	34,9
Children at home	No	164	61,0
	Yes	105	39,0

Table B.2: Chi-squared test for gender and age ($\chi^2 = 0.785$, $p = 0.675$).

Gender \ Age	18-34	35-54	55+
<i>Observed counts</i>			
Female	55	60	52
Not female	39	34	29
Total	94	94	81
<i>Expected counts</i>			
Female	58,36	58,36	50,29
Male	35,64	35,64	30,71
<i>Chi-square for each cell</i>			
Female	0,1931	0,0463	0,0584
Male	0,3162	0,0757	0,0956

Table B.3: Construct operationalisation and measurement of indexes.

Index	Items	Scale	Cronbach's α
Concern Index	3 (health concern, environmental concern, general concern)	1-5 Likert	0,910
Responsibility Index	4 (corporate disclosure, substitution, right to know, ethical conduct)	1-5 Likert	0,817
Product Acceptability Index	4 (pans, jackets, cosmetics, baby products)	1-5 Likert	0,816

Table B.4: Concern Index, OLS Regression output from Excel ToolPak.

<i>Regression statistics</i>	
Multiple R	0,540
R square	0,291
Adj R square	0,258
Std error	0,713
Observations	269

	<i>gdl</i>	<i>SQ</i>	<i>MQ</i>	<i>F</i>	<i>F p-value</i>			
Regressione	12	53,50447	4,4587057	8,761967	5,5E-14			
Residuo	256	130,2708	0,5088704					
Totale	268	183,7753						

	<i>Coefficients</i>	<i>Stand Error</i>	<i>Stat t</i>	<i>p-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercetta	1,257	0,312	4,030	0,000	0,643	1,871	0,643	1,871
Age_35_54	0,234	0,131	1,782	0,076	-0,025	0,493	-0,025	0,493
Age_55	0,179	0,123	1,454	0,147	-0,063	0,421	-0,063	0,421
Gen_fem	0,034	0,093	0,364	0,716	-0,149	0,216	-0,149	0,216
Ed_higher	-0,105	0,103	-1,019	0,309	-0,307	0,098	-0,307	0,098
Emp_emp	0,014	0,110	0,129	0,898	-0,202	0,230	-0,202	0,230
Chem_yes	-0,180	0,146	-1,228	0,221	-0,468	0,109	-0,468	0,109
Child_yes	-0,068	0,112	-0,607	0,544	-0,288	0,152	-0,288	0,152
Contamin_perception	0,385	0,052	7,374	0,000	0,282	0,488	0,282	0,488
Trust_research	0,072	0,071	1,009	0,314	-0,069	0,213	-0,069	0,213
Trust_inst	-0,025	0,059	-0,430	0,668	-0,142	0,091	-0,142	0,091
Trust_firm	-0,037	0,052	-0,701	0,484	-0,140	0,066	-0,140	0,066
Trust_ong	0,234	0,055	4,286	0,000	0,126	0,341	0,126	0,341

Table B.5: Responsibility Index, OLS Regression output from Excel ToolPak.

<i>Regression statistics</i>	
Multiple R	0,467
R square	0,218
Adj R square	0,181
Std error	0,548
Observations	269

	<i>gdl</i>	<i>SQ</i>	<i>MQ</i>	<i>F</i>	<i>F p-value</i>
Regressione	12	21,42679	1,785566	5,93963252	4E-09
Residuo	256	76,95843	0,300619		
Totale	268	98,38522			

	<i>Coefficients</i>	<i>Stand Error</i>	<i>Stat t</i>	<i>p-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercetta	3,215	0,240	13,413	0,000	2,743	3,687	2,743	3,687
Age_35_54	0,318	0,101	3,145	0,002	0,119	0,517	0,119	0,517
Age_55	0,159	0,094	1,686	0,093	-0,027	0,345	-0,027	0,345
Gen_fem	0,152	0,071	2,129	0,034	0,011	0,292	0,011	0,292
Ed_higher	-0,081	0,079	-1,020	0,309	-0,236	0,075	-0,236	0,075
Emp_emp	0,025	0,084	0,297	0,766	-0,141	0,191	-0,141	0,191
Chem_yes	-0,114	0,113	-1,010	0,313	-0,335	0,108	-0,335	0,108
Child_yes	0,054	0,086	0,633	0,527	-0,115	0,223	-0,115	0,223

Contamin_perception	0,190	0,040	4,724	0,000	0,111	0,269	0,111	0,269
Trust_research	0,044	0,055	0,811	0,418	-0,064	0,153	-0,064	0,153
Trust_inst	0,002	0,046	0,036	0,972	-0,088	0,091	-0,088	0,091
Trust_firm	-0,077	0,040	-1,911	0,057	-0,156	0,002	-0,156	0,002
Trust_ong	0,129	0,042	3,064	0,002	0,046	0,211	0,046	0,211

Table B.6: Product Acceptability Index, OLS Regression output from Excel ToolPak.

<i>Regression statistics</i>	
Multiple R	0,444
R square	0,197
Adj R square	0,160
Std error	0,579
Observations	269

	<i>gdl</i>	<i>SQ</i>	<i>MQ</i>	<i>F</i>	<i>F p-value</i>
Regressione	12	21,12230472	1,76019	5,244209	6,857E-08
Residuo	256	85,92509305	0,33564		
Totale	268	107,0473978			

	<i>Coefficients</i>	<i>Stand Error</i>	<i>Stat t</i>	<i>p-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercetta	2,500	0,253	9,871	0,000	2,001	2,999	2,001	2,999
Age_35_54	-0,386	0,107	-3,619	0,000	-0,597	-0,176	-0,597	-0,176
Age_55	-0,426	0,100	-4,265	0,000	-0,622	-0,229	-0,622	-0,229
Gen_fem	-0,198	0,075	-2,630	0,009	-0,347	-0,050	-0,347	-0,050
Ed_higher	0,097	0,084	1,163	0,246	-0,067	0,262	-0,067	0,262
Emp_emp	-0,116	0,089	-1,302	0,194	-0,292	0,059	-0,292	0,059
Chem_yes	-0,063	0,119	-0,526	0,599	-0,297	0,172	-0,297	0,172
Child_yes	0,096	0,091	1,064	0,288	-0,082	0,275	-0,082	0,275
Contamin_perception	-0,039	0,042	-0,909	0,364	-0,122	0,045	-0,122	0,045
Trust_research	-0,024	0,058	-0,409	0,683	-0,138	0,090	-0,138	0,090
Trust_inst	0,016	0,048	0,337	0,737	-0,079	0,111	-0,079	0,111
Trust_firm	0,070	0,043	1,651	0,100	-0,014	0,154	-0,014	0,154
Trust_ong	-0,153	0,044	-3,454	0,001	-0,240	-0,066	-0,240	-0,066

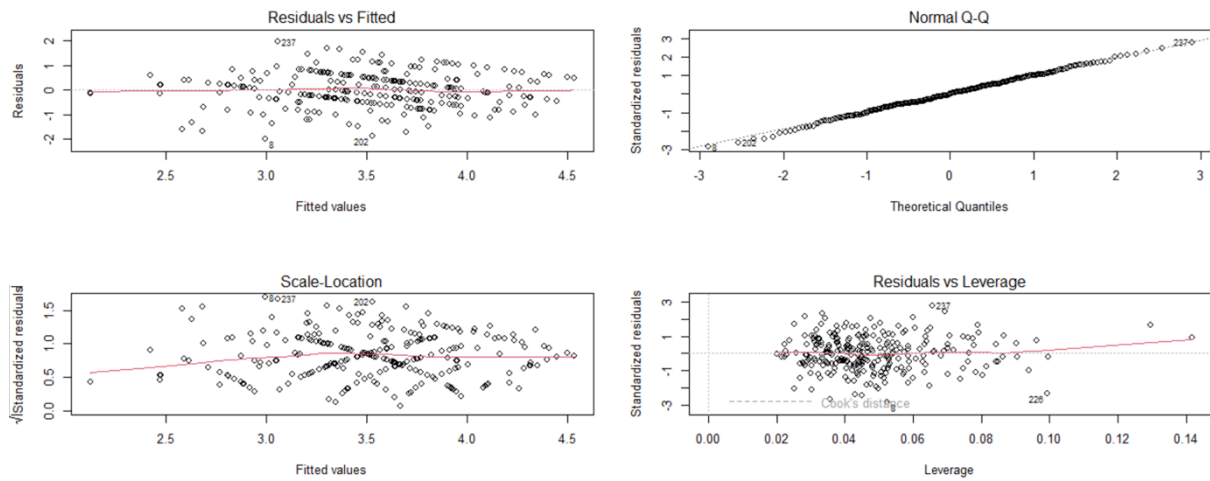


Figure B.1: Concern Index - Basic diagnostic plots (R Commander)

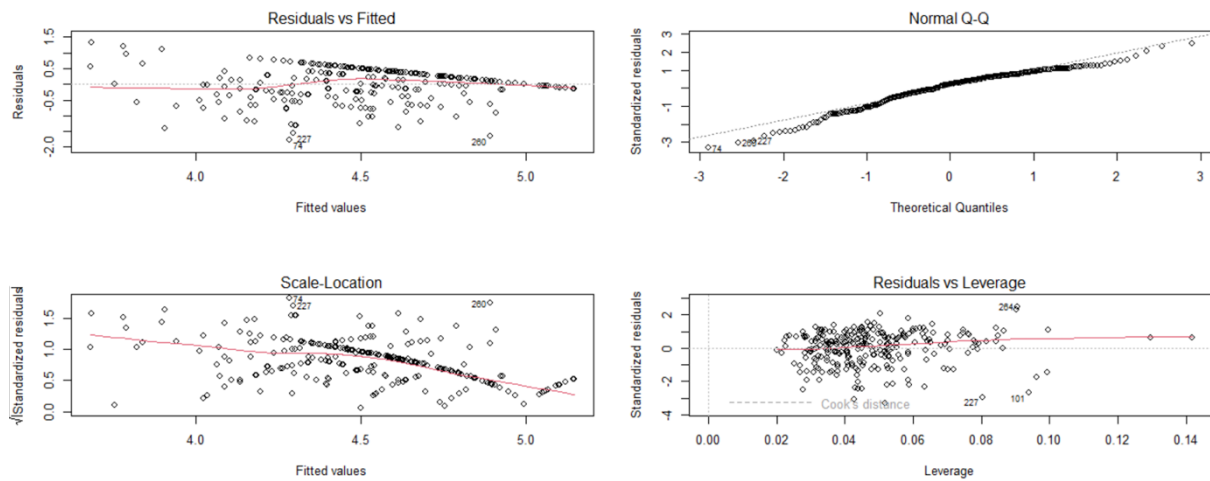


Figure B.2: Responsibility Index - Basic diagnostic plots (R Commander)

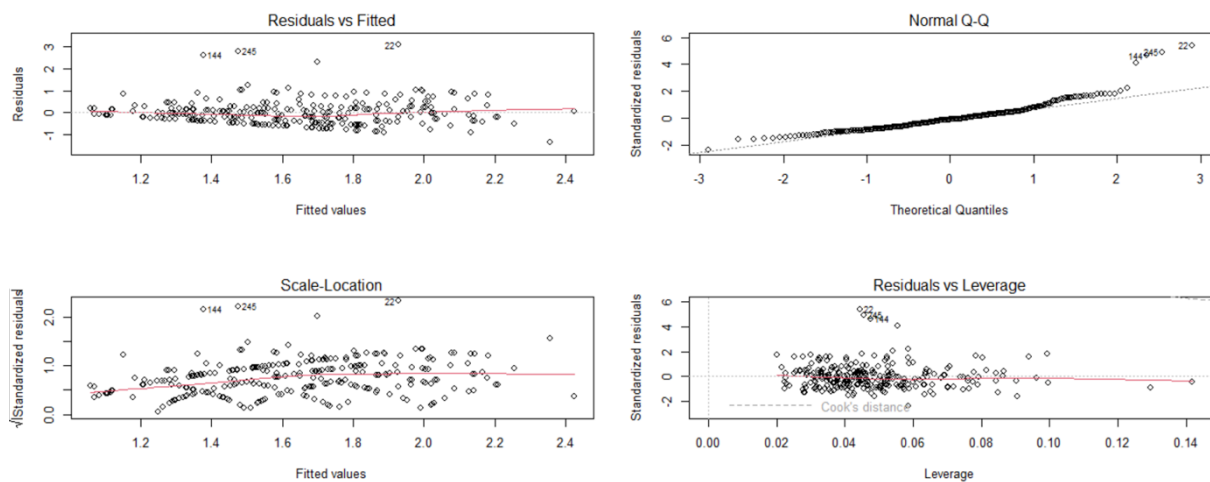


Figure B.3: Product Acceptability Index - Basic diagnostic plots (R Commander)

Table B.7: Diagnostic tests (R Commander)

Model	Concern Index	Responsibility Index	Product Acceptability
Breusch-Pagan BP	12,373	38,321	41,332
p-value	0,416	0,000	0,000
Studentized BP	---	31,449	9,861
p-value	---	0,002	0,628
RESET	0,591	6,715	1,068
p-value	0,554	0,001	0,345

Table B.8: Multicollinearity check. VIF values (R Commander)

Predictor	Concern Index	Responsibility Index	Product Acceptability
Age_35_54	2,0759	2,0759	2,0759
Age_55	1,6807	1,6807	1,6807
Chem_yes	1,1240	1,1240	1,1240
Child_yes	1,5666	1,5666	1,5666
Contamin_perception	1,0844	1,0844	1,0844
Ed_higher	1,2575	1,2575	1,2575
Emp_emp	1,4803	1,4803	1,4803
Gen_fem	1,0717	1,0717	1,0717
Trust_firm	1,1931	1,1931	1,1931
Trust_inst	1,5497	1,5497	1,5497
Trust_ong	1,2372	1,2372	1,2372
Trust_research	1,7265	1,7265	1,7265

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