Vulnerability to and Acceptability of Different Types of Sludge

Leonhard K. Lades [a*], Margaret Samahita[b], Lucie Martin[c], Cass R. Sunstein[d], and Martin Baekgaard[e]

[a]Economics and Behavioural Science Centre, University of Stirling, Stirling, UK, FK9 4LA. Visiting Professor in Environmental Policy, University College Dublin.
https://orcid.org/0000-0002-3114-0781

[b]UCD School of Economics, University College Dublin, Belfield, Dublin, Ireland.

[c]Economic and Social Research Institute, Dublin, Ireland.

[d]Harvard Law School, Harvard, Cambridge, 02138, Massachusetts, United States

[e]Department of Political Science, Aarhus University, Denmark.

Abstract

Sludge is one of the most important yet underappreciated problems in modern society. Examples of sludge include unnecessarily complex paperwork requirements, hard-to-navigate documents and websites, long waiting time, and unfriendly or confusing staff interactions. However, little is known about whether some people are more vulnerable to and less accepting of some types of sludge than others. Drawing on data from a nationally representative survey with 1,591 participants from Ireland, we show that people report being particularly vulnerable to outdated websites with broken links, unfriendly staff interactions, complex documents laden with jargon, and hard-to-navigate websites. These are also the types of sludge that are least acceptable. Less vulnerability is reported to long waiting times and requirements about having to provide private information. We find only minor differences in sludge perceptions depending on whether the sludge emerges in the public or the private sector. Moreover, people with poor mental health report being more vulnerable to and less accepting of sludge. Self-reported administrative literacy is related to less reported vulnerability, and the tendency to procrastinate and a lack of time and mental energy predict more reported vulnerability to sludge. Administrative literacy and a lack of mental energy also predict acceptability of sludge.

Keywords: Sludge; Administrative Burden; Inequality; Vulnerability; Acceptability

Introduction

Sludge describes unnecessary frictions that prevent people from achieving their goals (Mills, 2023; Newall, 2023; Sunstein, 2021; Thaler, 2018). Examples of sludge include overly complex paperwork requirements, confusing websites, contractual terms that are hidden or challenging to understand, difficulties in cancelling membership fees, and excessive or unexplained waiting times (NSW Behavioural Insights Unit, 2024). These frictions can reduce adoption rates of policies and programmes (Bearson & Sunstein, 2023) and can reduce the quality of service delivery and user experience. Sludge can also have detrimental effects on people's experiences, including a sense of frustration and indignity (Sunstein, 2021). Sludge and administrative burdens are pervasive in public and private settings (Herd & Moynihan, 2019) and increasingly receive worldwide interest as governments and international organisations aim to understand how to identify and reduce sludge to improve processes (NSW Behavioural Insights Unit, 2024; OECD, 2024; OIRA, 2024).

Despite that interest, we are currently missing a comprehensive understanding of what makes people more or less vulnerable to different types of sludge. Research on administrative burdens shows that some groups (usually vulnerable populations such as those in poor health or with low incomes) are more affected than others by behavioural frictions when seeking access to government benefits (Christensen et al., 2020; Halling & Baekgaard, 2024; Heinrich, 2016; Herd et al., 2023; Martin, 2024; Sunstein, 2020). But behavioural and psychological factors that may compound this inequality are less well-understood. For example, time or cognitive scarcity (Christensen et al., 2020; Mullainathan & Shafir, 2013), present bias (Laibson, 1997), or an absence of skills like administrative literacy (Döring, 2021; Masood & Azfar Nisar, 2021) may all increase vulnerability to sludge.

We also have a very limited understanding of how acceptable people view different types of sludge to be. While there is a large and growing literature on the acceptability of nudges (e.g., Sunstein, 2016), little is known about when and why sludge is seen as acceptable or not. To some extent we can rely here on the emerging literature on tolerance of administrative burdens, which shows that people differ in their attitudes towards frictions in government policies such as social welfare benefits, and that both political beliefs and personal experiences with benefits affect tolerance (Baekgaard et al., 2025; Halling et al., 2023). But this research remains preliminary, and because sludge and administrative burden are not quite the same (see below), more research on sludge acceptability is needed.

Most existing work on vulnerability to and acceptability of sludge and administrative burden comes from policy case studies in specific contexts (Halling & Baekgaard, 2024; Herd & Moynihan, 2019). Hence, there is little opportunity to compare sludge vulnerability and acceptability across contexts. It may be the case that people are more vulnerable to and less accepting of some types of sludge than others, but we have limited data about that. The data we have comes from comparisons of administrative experiences across domains such as tax, retirement, government benefits, bills, etc. (Martin et al., 2024) and comparisons of burden tolerance across public sector domains such as income supports, health insurance, passport renewals, and small business licensing (Baekgaard et al., 2025). However, these studies do not compare different types of sludge (e.g., complex paperwork vs. confusing websites) and there

are no comparisons between public and private sector sludge. For example, sludge encountered in the public sector when dealing with the government might be seen as less acceptable than sludge encountered when dealing with a private company in the private sector. Or some people might be more vulnerable to sludge related to complex paperwork than to long wating times and having to deal with unpleasant staff members. We know that sludge is often harmful and assume that people usually dislike sludge, but we do not know what types of sludge are more or less harmful and disliked, if this depends on the context, and for whom.

Our study is the first to measure and compare sludge vulnerability and acceptability across different types and contexts of sludge. To do so, we rely on a nationally representative survey from Ireland. Using 20 experimentally varied sludge scenarios, we test what factors predict people's self-reported vulnerability to different types and contexts of sludge, and how acceptable they think this sludge is, based on a range of potential factors (e.g., socio-economic and behavioural).

Analysing vulnerability to and acceptability of different types of sludge is a novel contribution, yet this initial study has certain limitations that suggest important directions for future research. Rather than relying solely on surveys that provide correlational insights, future studies should employ experimental designs to measure causal effects. Instead of relying on self-reported evaluations of sludge, future research should investigate how people actually interact with and navigate real-world sludge. Moreover, rather than focusing exclusively on questions asking people how they would react to an abstract hypothetical task, future research should also examine reactions to concrete sludge that participants have directly experienced. It would also be useful to obtain more clarity about how, when, and what magnitudes matter. For example, waiting time of a specified and moderate amount might be tolerable, more tolerable that exceptionally difficult cancellation processes, but waiting time of a specified and large amount might be intolerable, more intolerable than moderately difficult cancellaton processes.

The paper is structured as follows. Section 2 reviews the nascent literature on measuring sludge and the more mature literature on administrative burden. Section 3 presents the methodology including procedure, participants, measures, and analysis strategy. Section 4 presents the results of the analyses of self-reported vulnerability to sludge and section 5 presents the results of the analyses of acceptability of sludge. Section 6 discusses the findings and concludes with suggestions for future research.

Motivation and literature review

Our study builds on both sludge research from behavioural science and administrative burden research from public administration. The two areas of research are related but also conceptually distinct (Madsen et al., 2022): sludge often refers to excessive or unnecessary behavioural frictions (Sunstein, 2021) and may occur in any context where such frictions make it harder for people to act in their own best interest, including in consumer and business processes such as cancelling online services (Mills et al., 2023). By contrast, administrative burdens refer to the costs that people experience when they interact with government policy implementation, including due to the presence of frictions, in contexts such as obtaining access to social welfare benefits or public healthcare (Moynihan et al., 2015).

The typologies and language used to describe sludge and administrative burdens reflect their overlap and differences: administrative burdens involve *learning* costs (e.g., the effort needed to find out if one is eligible for a welfare programme), *compliance* costs (e.g., the time spent filling out complex forms to prove eligibility), and *psychological* costs (e.g., the associated stress, stigma, or loss of autonomy) (Moynihan et al., 2015), while sludge, allowing for both public and private sector processes, has been said to involve *search* costs (e.g., frictions experienced when looking for options), *evaluation* costs (e.g., frictions experienced when comparing options), *implementation* costs (e.g., frictions experienced when pursuing chosen options), and again *psychological* costs (e.g., from pressure selling or scarcity messaging) (OECD, 2024; Shahab & Lades, 2024). It is evident that the two sets of costs overlap.

This study uses the term "sludge" for internal consistency and because the study covers both private and public sector sludge, but we draw on both literatures to inform the study on potential predictors of sludge vulnerability and acceptability, and on the types of sludge to study.

What makes people vulnerable to sludge?

Socio-economic disadvantage:

A large body of research on administrative burdens and sludge shows that frictions have distributive effects and create higher barriers for groups in society who suffer from poverty, a lack of education, or health problems. Members of such groups are often exposed to processes involving sludge, such as social safety nets, and their lives would also be severely affected if sludge stops them from completing such processes (Christensen et al., 2020; Chudnovsky & Peeters, 2021; Döring & Madsen, 2022; Halling & Baekgaard, 2024; Heinrich, 2016; Martin, 2024; Martin et al., 2024; Sunstein, 2020). Of course it is also true that entrepreneurs, large and small, might be affected by sludge when they are seeking to obtain permits or licenses; sludge can operate as a severe barrier to economic activity and have special and immediate adverse effects on people who are well off, potentially with adverse effects for large numbers of other people.

Groups who face high levels of sludge when interacting with public policy processes include not only entrepreneurs, but also those with low incomes or financial well-being (Bhargava & Manoli, 2015; Holt & Vinopal, 2023; Martin et al., 2024), those in poor physical or mental health (Arulsamy & Delaney, 2022; Bell et al., 2023; Deshpande & Li, 2019; Martin et al., 2024), older people (Moynihan et al., 2015), ethnic or racial minorities (Bell & Jilke, 2024; Ray et al., 2023), and women and gender minorities (Herd & Moynihan, 2025; Martin, 2024).

There are fewer studies on the distributive effects of private sludge, but evidence suggests that older people, those with health issues, and those on low incomes may pay a higher "loyalty penalty" in essential markets (Citizens Advice, 2018), which could be due to higher frictions in switching deals. Evidence also suggests that vulnerable consumers choose worse deals and face higher frictions in markets such as mobile phones and health insurance (Domurat et al., 2021; Jilke, 2015).

Cognitive resources and scarcity:

A potential mechanism contributing to the distributive effects of sludge is cognitive resources. Christensen et al. (2020) argue that those in poor health, experiencing age-related cognitive decline, or living in financial scarcity have constrained cognitive resources as the challenges they face take up most of these resources, which negatively affects these groups' executive functions and therefore their ability to overcome sludge and complete important processes such as obtaining access government benefits (in the same vein, Mullainathan & Shafir, 2013). In sum, people who most need government help may find it disproportionately hard to receive it, because of having fewer cognitive resources available.

Looking beyond distributive aspects and at the broader population, scarcity, understood as not having enough in the way of "bandwidth," can influence decision-making (Mullainathan & Shafir, 2013) and may therefore increase sludge vulnerability. Building on Christensen et al.'s (2020) argument that constrained cognitive resources impede ability to navigate sludge, it may be that vulnerability also increases when people do not have enough mental energy or time to navigate processes involving sludge, processes that by definition are energy- or time-consuming (e.g., administrative burdens have been called a "time tax", Lowrey, 2021; OIRA, 2024). It follows that scarcity may increase sludge vulnerability, but little evidence is available.

Biases and heuristics:

Biased decision-making may increase sludge vulnerability across the population. When faced with complex or effortful decisions, people often rely on heuristics (mental "rules of thumb") to simplify these decisions, opening the door to systematic biases (e.g., Kahneman et al., 1991). This may especially be the case in contexts involving sludge, because their features tend to make decisions more complex: sludge often involves unfamiliar material (e.g., an online software only used in that process), uncertainty (e.g., the rest of the process or its outcome is unknown), and a lack of frequent use (e.g., a once-every-few-years voter registration process) (Shahab & Lades, 2024).

An example of a relevant bias is the status quo bias (Madrian & Shea, 2001), which may discourage people from taking on effortful tasks that require them to deviate from the default such as cancelling a subscription. Another example is present bias, which can lead to a focus on the short-term and procrastination. Present-biased people might be discouraged from taking costly actions today (such as researching and implementing a process) although these actions would benefit them in the long run (Lades et al., 2021; O'Donoghue & Rabin, 1999). People's limited attention (Gabaix, 2019) and their over-optimism that they can overcome frictions (Tasoff & Letzler, 2014) are likely to make sludge even more harmful. At the same time, there is a lack of research testing specifically whether behavioural biases affect vulnerability to sludge.

Administrative literacy:

A small, emerging body of evidence finds (unsurprisingly) that "administrative literacy", i.e. the ability to "obtain, process, and understand basic information and services from public organisations needed to make appropriate decisions" (Döring, 2021), makes people less vulnerable to sludge. For example, Döring and Madsen (2022) find that having high levels of administrative literacy helps reduce psychological costs when encountering administrative burdens, while Masood and Nisar (2021) find that people's "administrative capital", i.e. their "understanding of bureaucratic rules, processes, and behaviours", helps them navigate administrative burdens. Administrative literacy is a relatively new concept (although it is linked to the broader concept of human capital, discussed in Christensen et al. 2020, and to other concepts such as health literacy, as discussed in Döring, 2021). As a result, relatively little evidence is yet available, in particular for private sludge contexts (most of the evidence is on administrative burdens).

What makes sludge acceptable?

Administrative burden tolerance:

There is little evidence on what features of sludge make it more or less acceptable to people. The closest evidence comes from emerging research on "burden tolerance" (Baekgaard et al., 2025), which measures how people judge the acceptability of administrative burdens. A high burden tolerance means a strong belief that administrative burdens are justified. Halling and Baekgaard's (2024) systematic review of the administrative burden literature finds that factors shaping people's burden tolerance include political ideological beliefs, as conservatism is associated with higher burden tolerance than liberalism (Baekgaard et al., 2021; Bell et al., 2021; Haeder et al., 2021; Haeder & Moynihan, 2025; Halling et al., 2023). In addition, burden tolerance, on the part of people who are observers, is affected by how such people perceive the group facing the administrative burden, for example, whether that group is a minority facing racism, racial resentment, or seen as "deserving" (Baekgaard et al., 2021; Barnes, 2023; Haeder et al., 2021; Haeder & Moynihan, 2025). Providing people with a justification for burdens may also increase tolerance (Halling & Van de Walle, 2025).

In addition to beliefs, people's personal characteristics also influence their burden tolerance. Baekgaard, Halling, & Moynihan's (2025) survey of seven countries finds higher tolerance on the part of those who are males, young adults, less well educated, and with good health. Low administrative capital makes people less tolerant of burdens (Haeder & Moynihan, 2025) while higher income is associated with higher burden tolerance (Halling et al., 2023). People with personal experience using benefits have lower tolerance (Baekgaard et al., 2021; Halling et al., 2023). There is also evidence that personality traits (such as conscientiousness and openness) correlate with tolerance (Aarøe et al., 2021).

Learning from nudge acceptability research:

Research on the acceptability of nudges may also help illuminate the acceptability of sludge. Nudges can be defined in various ways, but they are often taken to be changes in the choice architecture that promote people's welfare while maintaining freedom of choice and without meaningfully changing incentives (Thaler & Sunstein, 2021). Nudges have sometimes been compared to sludge (Mills, 2023; Thaler, 2018); many nudges simplify people's ability to receive benefits or to avoid burdens, whereas sludge has the opposite effect. Factors that influence the acceptability of a nudge include its alignment or nonalignment with people's values and interests, its policy domain, its perceived intrusiveness in people's decision-making, its perceived effectiveness, whether it encourages a desirable behaviour or discourages a harmful one, whether people are already motivated to engage in the target behaviour, and (with mixed results depending on the study) whether people are already engaging in the target behaviour (Gestel et al., 2021; Lemken et al., 2023; Rafaï et al., 2025; Reynolds et al., 2019; Vugts et al., 2024; Yan & Yates, 2019).

Findings from research on the acceptability of nudges should be used with caution in the context of sludge. They are not the same thing. Our study includes a range of public and private sector sludge scenarios to test what types of sludge are seen as acceptable.

Does the type of sludge affect vulnerability and acceptability?

There is a lack of literature exploring individuals' vulnerability to different types of sludge. So far, we do not know whether people are more vulnerable to, and more accepting of, certain types of sludge, despite the fact that behavioural frictions can take many different forms, from complex paperwork to delays or even unpleasant interactions. This is a central contribution of our study. Moreover, the effects of different types of sludge are likely to differ across the population. While there is strong evidence showing the distributive effects of sludge, less is known about whether different groups might be more or less vulnerable to specific types of sludge. Some people might dread the thought of having to call a public service by phone whereas others might be particularly negatively affected by excessive paperwork requirements and complex language (Sunstein, 2020). Likewise, the acceptability of sludge may depend on the specific features of sludge, and not only on people's own characteristics or general beliefs.

More specifically, our study builds on existing typologies of sludge and administrative burden to test how vulnerability and acceptability vary across different types of sludge. We use the *search*, *evaluation*, *implementation*, and *psychological* costs framework (Shahab & Lades, 2024) to classify different types of sludge in our study. This framework roughly maps onto the learning, compliance, and psychological costs framework used in administrative burden research (Herd & Moynihan, 2019; Moynihan et al., 2015) and accommodates both private and public sludge (see beginning of section 2 for detailed descriptions of frameworks). Classifying administrative burdens (in our case, sludge) into a cost typology is especially helpful because it makes it easier to identify and assess different types of administrative burdens (Madsen et al., 2022). However, we do not currently know how these different types compare in terms of vulnerability and acceptability. Our study helps answer this question.

Another categorisation of sludge potentially relevant for vulnerability and acceptability is whether the sludge is occurring in a *public* sector context (e.g., filling out a form online to obtain to a government service) or in a *private* sector context (e.g., filling out a form online to obtain access to a service from a private provider). Previous research suggests that there is an anti-public sector bias against public providers providing similar services to private actors (Marvel, 2016). The difference between the public and the private sector matters because sludge vulnerability and acceptance may depend on context. For example, sludge in a means test to access a taxpayer-funded benefit may be seen as more acceptable, or on the contrary to create higher costs and therefore vulnerability (e.g., due to added stigma), compared to sludge in a private context where paying consumers are attempting to cancel a service. In other words, (some) public services may carry higher stakes than (some) private ones.

Moreover, public services frequently operate as monopolies, whereas private services usually face competitive pressures. It follows that users of public services lack straightforward exit options, which can lead to more frequent and more negative experiences due to selection effects. Awareness of this lack of choice may further amplify the perceived burden of sludge in public-sector settings.

Most empirical research focuses on either public contexts (e.g., administrative burden research, by definition) or private contexts (e.g., most research explicitly studying sludge, see Mills et al., 2023 and Xiao et al., 2024; there are also public sludge studies, see Grieder et al., 2024). At the same time, there is very little research that directly compares these two contexts. Martin et al. (2023) test the effect of public sector sludge (in a benefit scenario) and private sector sludge (in a bill scenario) on decision-making and find that sludge affects decision-making in both contexts, but that the effect is higher for public sector sludge. While this result may well be partly due to the design of the scenarios, it is consistent with the view that people experience sludge differently in the public and private contexts, with people being more vulnerable to, and less accepting of, public sector sludge, perhaps because of their dependence on basic services offered by the public sector.

Methodology

Procedure

We developed an online survey to understand self-reported vulnerability to, and acceptability of, different types of sludge. The survey presented participants with 10 different types of administrative procedures required to complete "a task." We did not specify what this hypothetical task was but asked participants to think of "the task" as something they would like to complete (e.g., obtaining a product, a service, information needed, or another benefit) but something that is not absolutely essential. We clarified that our interest was in participants' assessment of the different administrative procedures, rather than their assessment of different tasks.

This approach allowed us to measure self-reported vulnerability to typical sludge that people encounter. However, it did not capture whether some people are inherently more likely to

encounter sludge than others. Indeed, it is plausible (even likely) that some people experience sludge more frequently than others and therefore suffer more seriously from it. Our survey, by design, focused only on how vulnerable people believe they would feel when confronted with different types of sludge, without requiring that people had experienced this type of sludge in the real-world.

We assigned participants randomly to one of two conditions: for half of the participants, the administrative procedures were framed as originating from a government agency, and for the other half they were framed as originating from a private company. For each administrative procedure, we asked participants four questions to measure how vulnerable they believed themselves to be to this procedure and two questions measuring how acceptable they found the procedure. Explaining the variation of the answers to these questions across individuals and types of sludge is the main aim of this study.

Participants then answered questions regarding various personal characteristics, such as their administrative literacy, their tendency to procrastinate, whether they felt that they did not have enough time, mental energy, and money to deal with important things in their lives, their physical and mental health, whether they had specific disabilities, trust in the Irish Government, age, gender identity, ethnic background, education, marital status, employment status, where they live, how many people live in their household, and income. Finally, we asked participants to report how many of 27 administrative tasks they had attempted (successfully or unsuccessfully) in the last three months. Most questions required participants to provide an answer to reduce missing values. Given that this is data from a survey, all information is self-reported.

The analysis plan for this study was pre-registered on the website of the Open Science Framework (link to be added here) and received ethical approval from the University College Dublin Office of Research Ethics (reference number: LS-LR-24-258-Lades). The full survey instrument is available in the Supplementary Information.

Participants

We recruited 1,785 participants through the panel provider Dynata in October 2024, with the aim of obtaining a sample representative of the Irish population in terms of age, gender, and geographic distribution. As in many other countries, there is much anecdotal evidence about people in Ireland complaining about administrative procedures (Lades et al., 2022). There is also evidence for sludge in contexts such as grants for landowners to plant trees (Lades et al., 2025), In addition, evidence about the sludge experienced by low-income households within the cost-of-living crisis (Ceallaigh et al., 2025) is emerging. While there is no systematic evidence on problems related to sludge and administrative burden in Ireland and comparing those problems to those to other countries, various types of sludge indeed are prevalent in both the public and private sector in Ireland, making Ireland a relevant case for comparing vulnerability and acceptability of different kinds of sludge in both the public and private sector.

All participants received baseline monetary compensation through the panel provider. We dropped 8 observations because they had duplicate study IDs and 186 observations because

they failed an attention check in which we asked participants to select “Agree” as an answer. The final sample for our analysis thus consists of 1,591 participants of whom 57.1% are females. The mean age is 44.3 and 48.7% have an annual net household income of €50,000 or less. Further summary statistics of the sample are presented in Table 1. Table SI.1 in the Supplementary Information shows that there are no statistically significant differences in observables across the two experimental treatments (public vs private sludge). Table SI.2 in the Supplementary Information suggests that our dataset is not fully representative of the Irish population. However, the comparison is imperfect because our survey included only participants aged 18 and older, whereas population census data for Ireland are available only for individuals 15 and older (see table SI.2. for more details). Nevertheless, the comparison suggests that our survey includes a higher proportion of females, participants with higher educational attainment, and those in employment. A potential explanation is that the survey provider sampled additional participants to meet certain quotas, and we did not see a reason to use only a subset of the data.

Table 1. Descriptive statistics.

	Summary
Participants	1,591
Age	44.34 (SE = 14.9)
Gender	
Male and other	682 (42.9%)
Female	909 (57.1%)
Ethnic Origin	
White or White Irish	1,430 (89.9%)
Other	161 (10.1%)
Education	
Lower secondary school or less	79 (5.0%)
Higher secondary school	302 (19.0%)
Post-secondary school	405 (25.5%)
Undergraduate degree	492 (30.9%)
Postgraduate degree	313 (19.7%)
Marital Status	
Single	362 (22.8%)
In a relationship but not cohabiting	97 (6.1%)
Cohabiting	194 (12.2%)
Married or in a civil partnership	810 (50.9%)
Separated, Divorced, Widowed, Other	128 (8.0%)
Employment Status	
Working full-time	855 (53.7%)
Working part-time	238 (15.0%)
Not working	146 (9.2%)
Student	72 (4.5%)
Homemaker	101 (6.3%)
Retired	179 (11.3%)
Location	
City	428 (26.9%)
Suburb	591 (37.1%)
Rural village or remote area	505 (31.7%)
Other	67 (4.2%)
Income	
€10,000 or less	47 (3.0%)
€10,001 to €20,000	101 (6.3%)
€20,001 to €30,000	213 (13.4%)
€30,001 to €40,000	217 (13.6%)
€40,001 to €50,000	198 (12.4%)
€50,001 to €60,000	154 (9.7%)
€60,001 to €70,000	135 (8.5%)
€70,001 to €80,000	94 (5.9%)
€80,001 to €90,000	90 (5.7%)
€90,001 to €100,000	90 (5.7%)
More than €100,000	126 (7.9%)
I don't know or I'd rather not say	126 (7.9%)

Measures

Ten types of sludge:

We presented participants with the ten types of sludge in a random order using the wording described in Table 2. To enable us to compare sludge in the public sector with sludge in the private sector. half of the participants (randomized) saw the descriptions in the table with sludge emerging from interactions with "a private company", while the other half saw the sludge emerging from interactions with "a government agency". This randomisation allowed us to test whether vulnerability to and acceptability of sludge depend on the sector in which the sludge originates. To select the ten types of sludge, we started from the list of sludge presented in the New South Wales Government's Sludge Audit Method Guide. We then simplified the list and reduced it to ten types of sludge to avoid survey fatigue and included types of sludge we anticipated would vary in how people view them. We made sure that each type of sludge could originate from both the private and the public sector to allow clean randomisation.

Self-reported vulnerability to sludge:

To measure how vulnerable participants believed themselves to be to sludge, we asked participants whether they disagreed or agreed with four statements: "*It would be difficult for me to carry out this task*", "*This task would be a hassle to me*", "*I would get frustrated when carrying out this task*", and "*There is a high chance that I would not complete this task*". Participants had to respond on a 5-point Likert scale from "*Strongly disagree 1*" to "*Strongly agree 5*". The reliability of this measure was high, with Cronbach's alpha values for the ten sludge types ranging from 0.89 to 0.94. The mean vulnerability score for each type of sludge is shown in table 2.

Acceptability of sludge:

To measure how acceptable participants find each case of sludge, we asked participants whether they disagreed or agreed with two statements: "*The procedure to complete this task is acceptable*", and "*The effort needed to complete this task is fair*". Participants had to respond on a 5-point Likert scale from "*Strongly disagree 1*" to "*Strongly agree 5*". The reliability of this measure was high, with Cronbach's alpha values for the ten sludge types ranging from 0.87 to 0.90. The mean acceptability score for each type of sludge is shown in table 2.

Table 2. Sludge types in the private sector. Half of the participants saw these types of sludge. The other half saw sludge from the public sector. The tasks are sorted according to vulnerability (private and public sector combined).

To carry out a task…	Cost type	Average vulnerability	Average acceptability
… you rely on information from a private company's website. Parts of the website are outdated and some links are broken.	Search costs. Evaluation costs.	3.81	2.39
… you must ask some questions to employees from a private company. The employees are unfriendly and seem to be annoyed by your questions.	Psychological costs.	3.55	2.64
… you must read and understand documents provided by a private company. The documents are written in complex language and use a lot of jargon.	Evaluation costs.	3.54	2.61
… you rely on information from a private company's website. The website is full of information and hard to navigate.	Search costs. Evaluation costs.	3.28	2.81
… you must wait several weeks for a response from a private company without progress updates.	Implementation costs.	3.25	2.74
… you must attend a 10-minute in-person meeting at the office of a private company. You cannot choose the date or the time of the in-person appointment.	Implementation costs.	3.14	2.89
… you are required to follow a process designed by a private company. The process consists of multiple steps. At any given step, you are not informed of what is required in future steps.	Implementation costs.	3.12	2.93
… you must complete a form provided by a private company. The form requests that you list all of your previous addresses.	Implementation costs.	2.61	3.31
… you must print out and send a form in the post to a private company. There is no online option available.	Implementation costs.	2.57	3.35
… you must provide sensitive information such as your religious beliefs and sexual orientation to a private company.	Implementation costs. Psychological costs.	2.40	3.30

Administrative literacy:

To assess participants' self-perceived administrative literacy, we adapted an existing measure for administrative literacy (Döring, 2021; Döring & Madsen, 2022) and asked participants whether they disagreed or agreed with the following three statements: "*I usually understand the content of administrative letters, documents, and emails I receive from the government or from private companies*", "*I usually understand the rules, requirements, or contract details that apply to me as a citizen or as a customer*", and "*I keep myself informed on any changes in regulation or contract details*". Participants had to respond on a 5-point Likert scale from "*Strongly disagree 1*" to "*Strongly agree 5*". Reliability was acceptable and Cronbach's alpha was 0.74.

Tendency to procrastinate:

To measure participants' self-assessed tendency to procrastinate, we adapted the measure from Lillemo (2014) as also used by Mogensen & Thøgersen (2024). We asked participants whether they disagreed or agreed with the following four statements: "*I often put things off for so long that it has negative consequences*", "*When I must start a task, I often end up doing something else*", "*I often postpone things to do until tomorrow*", and "*I often hurry to finish things at the last minute*". Participants had to respond on a 5-point Likert scale from "*Strongly disagree 1*" to "*Strongly agree 5*". The measure demonstrated good reliability, with Cronbach's alpha = 0.87.

Scarcity:

To assess perceptions of scarcity, participants responded to three statements to measure perceived time, mental energy, and financial constraints. We asked participants how often the following statements applied to them or their situation: "*I cannot deal with important things properly due to a lack of time*" to measure time scarcity, "*I cannot deal with important things properly due to a lack of mental energy*" to measure mental energy scarcity, and "*I cannot deal with important things properly because I am busy trying to keep on top of my financial situation*" to measure financial scarcity. Participants had to respond on a 5-point Likert scale from "*Very rarely*" to "*Very often*".

Physical and mental health:

We asked participants about their physical and mental health using "*How is your physical health in general?*" and "*How is your mental health in general?*" with a 5-point Likert scale from "*Very bad*" to "*Very good*" as the answer options. We also asked participants whether they identified as having any disabilities offering a list of five disabilities and an "*Other*" option.

Correlations of main variables:

To get a first impression of the data, Table 3 presents the correlations across the main, non-demographic variables we analyse. For this table, we calculated the average self-reported vulnerability score and the average acceptability score for each individual across all 10 types of sludge. We see a relatively high and significantly negative correlation between our two dependent variables self-reported vulnerability and acceptability (-0.693*).

Table 3. Pairwise correlations of the main variables.

Variables	(V)	(A)	(AL)	(P)	(TS)	(MES)	(FS)	(MH)	(PH)
Vulnerability (V)	1.000								
Acceptability (A)	-0.693*	1.000							
Admin Literacy (AL)	-0.250*	0.262*	1.000						
Procrastination (P)	0.249*	-0.097*	-0.301*	1.000					
Time scarcity (TS)	0.234*	-0.087*	-0.180*	0.509*	1.000				
Mental energy scarcity (MES)	0.278*	-0.135*	-0.269*	0.597*	0.611*	1.000			
Financial scarcity (FS)	0.196*	-0.027	-0.170*	0.490*	0.578*	0.602*	1.000		
Mental health (MH)	-0.147*	0.116*	0.214*	-0.290*	-0.291*	-0.487*	-0.386*	1.000	
Physical health (PH)	-0.117*	0.123*	0.169*	-0.169*	-0.118*	-0.229*	-0.212*	0.502*	1.000

Note: * $p<0.05$

Analytic procedure

As pre-registered, we used multilevel regression models to predict self-reported vulnerability to sludge type *s* of individual *i* by a set of independent variables as described below. To account for repeated measures, where the same participant assessed their vulnerability to sludge ten times, we clustered the standard errors at the individual level. We pre-registered the following model:

$$Vul_{i,s} = \beta_0 + \beta_1 SludgeType + \beta_2 AdminLit_i + \beta_3 Procrast_i + \beta_4 ScarcityTime_i + \beta_5 ScarcityEnergy_i + \beta_6 ScarcityMoney_i + \boldsymbol{X_i}\boldsymbol{\beta} + v_s + \epsilon_{i,s}, \quad (1)$$

where $Vul_{i,s}$ is the vulnerability score of participant *i* for sludge type *s*.[1] The other variables indicate the measures as indicated by their names. The vector $\boldsymbol{X_i}$ represents the demographic control variables: physical health, mental health, age, female dummy, ethnicity, education, civil status, employment status, location (city, suburb, rural or other), number of people living in the household and income. The β coefficients represent the associations between the independent variables and the self-assessed vulnerability to sludge and should not be interpreted causally. The error terms v_s and $\epsilon_{i,s}$ represent the structure of the data with error terms on the sludge type level and the individual-level, respectively.

Since the causal relationships between the psychological predictors are uncertain (e.g., people who procrastinate might have less time or vice versa), the model in equation (1) might potentially confound estimates. Hence, we also present the results when adding one psychological variable at a time without controlling for the other psychological variables in an exploratory analysis. To further explore whether the associations between independent variables and vulnerability differed across sludge types, we included interaction terms between $SludgeType$ and the respective independent variable based on the regressions that do not control for the other psychological variables. All other components of the model remained identical.

We then repeat the same analysis steps with a different dependent variable: acceptability of sludge. The only difference in this analysis is that we also include a dummy indicating whether the sludge originates in the public or the private sector. Other than that, the analysis is as described in the previous paragraph.

[1] We had pre-registered to also add "trust in the Irish government" as an independent variable. However, there is literature that views trust in the government as an outcome of burdensome experiences in the behavioural public administration literature, because experiencing burdens might reduce trust in government (Bell et al., 2024), although not all studies find this relationship (Mikkelsen et al., 2025). Hence, there might be issues of endogeneity when including trust as a predictor.

Results 1: Self-reported vulnerability to sludge

Types of sludge predicting self-reported vulnerability

To test whether people believe themselves to be more vulnerable to some sludge than to others, we regressed reported vulnerability to sludge on the type of sludge (either originating in the private or public sector) without controlling for any other variables. The results of this regression align with the mean vulnerability scores presented in Table 2 and are illustrated in Figure 1.

Among the 10 types of sludge, outdated websites with partly broken links were reported as causing the highest levels of vulnerability (M=3.809, SE=0.039 for private sector sludge and M=3.833, SE=0.038 for public sector sludge). Participants were least negatively affected by a requirement to report one's religion and sexual orientation (M=2.493, SE=0.046 for private sector sludge and M=2.319, SE=0.042 for public sector sludge). While this is not a preregistered analysis, we disaggregate the data by whether the sludge emerges from interactions with either the private or the public sector as this is of particular interest to public administration researchers. Regressing self-reported vulnerability on the origin of the sludge shows no significant differences in the overall mean vulnerability score between public and private sector sludge (b=0.037, p=0.354).

Additional regressions for each type of sludge individually show some significant but small differences. People report being more vulnerable to public than to private sector sludge for unfriendly contacts (b=0.118, p=0.043), websites with too much information (p=0.117, p=0.036), when having to attend a meeting at a specific time (b=0.157, p=0.011), and when having to send a form in the post (b=0.158, p=0.010). When having to state one's religion and sexual orientation, people report being more vulnerable when asked by the private sector (b=-0.174, p=0.005). In the following, and consistent with our pre-registration, we do not include the public/private variable in the regressions.

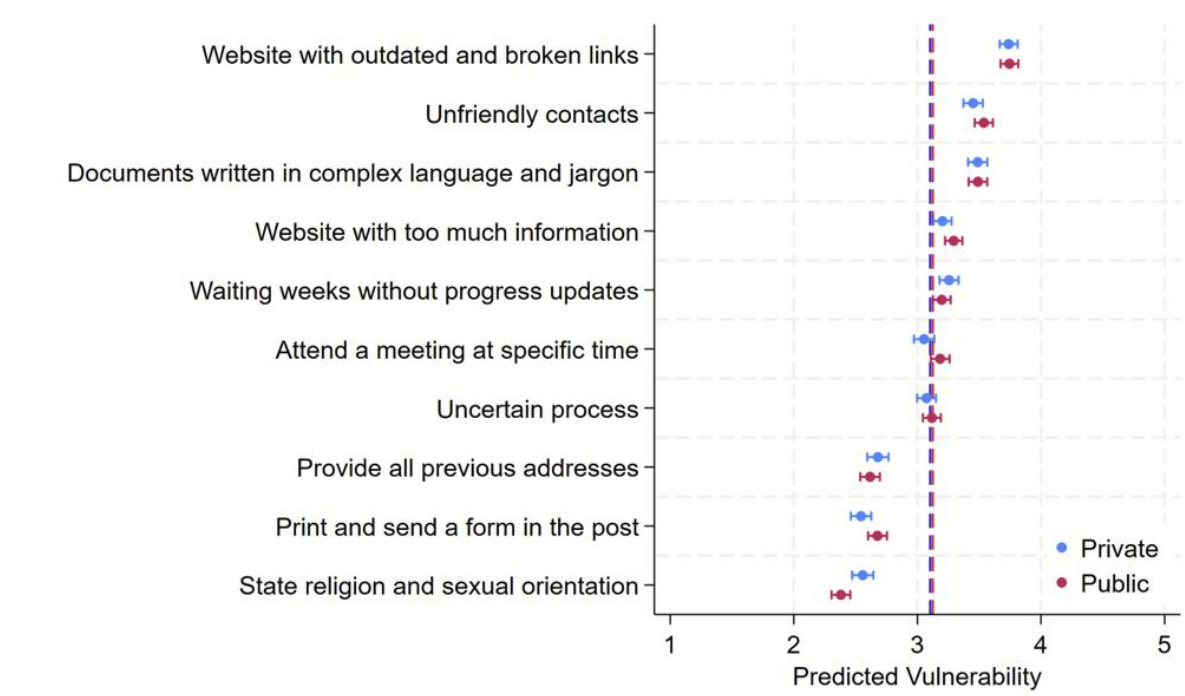

Figure 1. Vulnerability to sludge predicted by type of sludge only and no other control variables based on multi-linear regressions with 1,591 individuals and 15,910 observations, depending on whether the sludge emerges from either the private or the public sector.

Socio-economic disadvantage predicting self-reported vulnerability

We then predicted self-reported vulnerability to sludge by the variables representing potential socio-economic disadvantages. As illustrated in Figure 2, mental health (b=-0.111, p<0.001) and physical health (b=-0.061, p=0.026) are negatively associated with self-reported vulnerability to sludge. To illustrate the strength of this coefficient, based on this regression somebody who reports having "1 = *Very bad*" mental health reports an estimated value of vulnerability to sludge of 3.42 (SE=0.062) and somebody who reports having "*5 = Very good*" mental health reports an estimated value of vulnerability to sludge of 2.98 (SE=0.039).

We also find a positive association between age (b=0.049, p=0.018) and self-reported vulnerability to sludge. Moreover, participants with lower secondary school education or less report being less vulnerable to sludge compared to those with higher education and especially undergraduate and postgraduate degrees. Participants living in a rural village or remote area report being more vulnerable to sludge compared to participants living in a city. The Supplementary Information includes the regression table SI.3. presenting these results with all coefficients and standard errors.

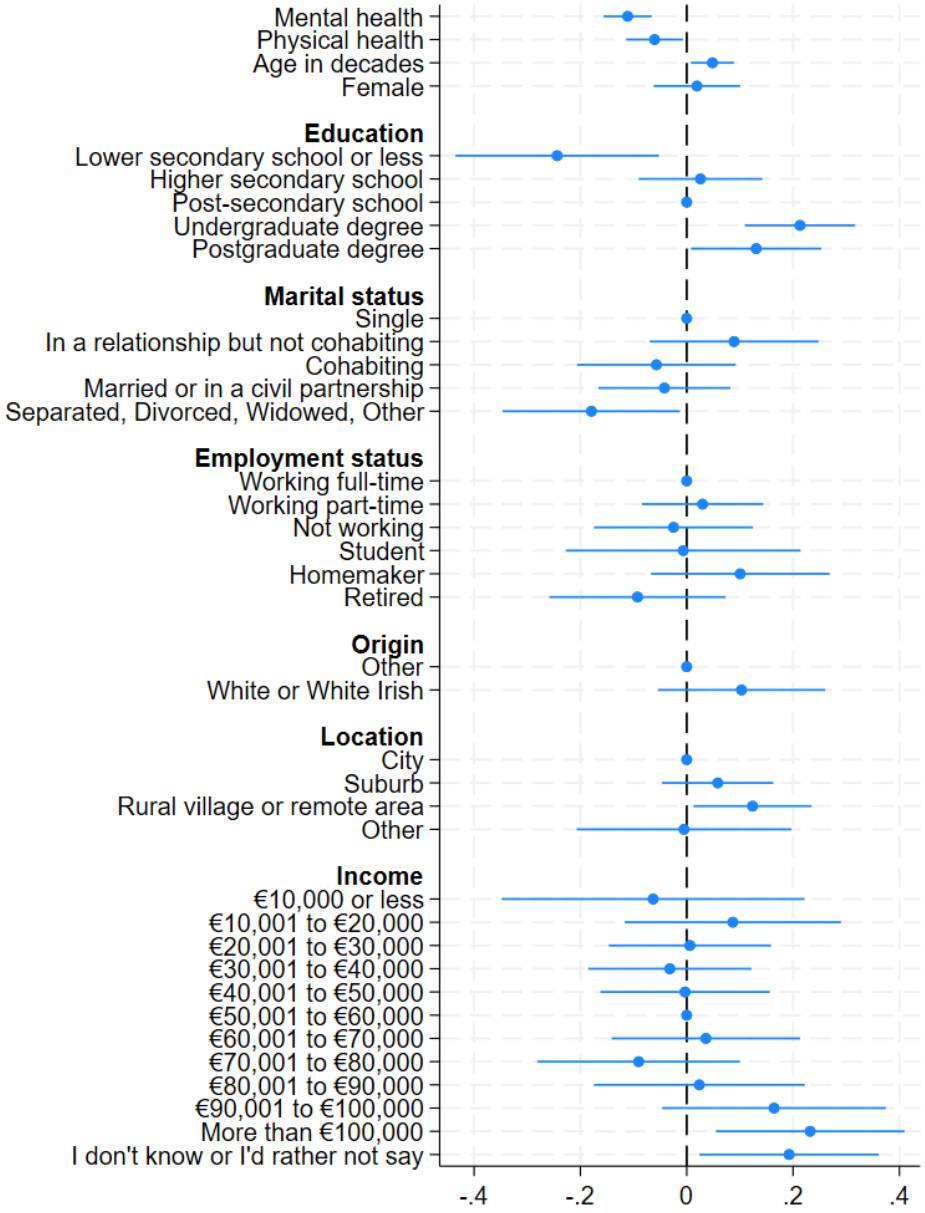

Figure 2. Variables representing socio-economic disadvantage as predictors of vulnerability to sludge based on multi-linear regressions with 1,591 individuals and 15,910 observations.

Behavioural predictors of vulnerability

In the next step, we added the five "behavioural" independent variables to the regression. Figure 3 presents the coefficients of these behavioural variables. The figure presents the associations between the variables and self-reported vulnerability to sludge when adding all five variables to the same regression with the blue circles. This is the pre-registered analyses. The red squares in Figure 3 represent the same associations when including only one of the five variables at a time (i.e. when not controlling for the other four behavioural variables). This analysis shows that all effects are stronger when not controlling for the other variables and even financial scarcity becomes significant, suggesting that these 5 variables are linked to each other.

Since it is a priori not known how the behavioural variables are causally linked to each other, the results illustrated by the red squares come from our preferred (albeit not preregistered) model.

We find several significant predictors of self-reported vulnerability to sludge. The next paragraphs rely on the preregistered models that include all controls (the blue circles in Figure 3). Administrative literacy is negatively associated with self-reported vulnerability to sludge (b=-0.192, p<0.001) and the tendency to procrastinate is positively associated with self-reported vulnerability to sludge (b=0.057, p<0.001). Moreover, time scarcity (b=0.065, p=0.004) and mental energy scarcity (b=0.101, p<0.001) are positively associated with self-reported vulnerability to sludge.

In contrast, the association between financial scarcity and self-reported vulnerability to sludge is not significant (b=0.030, p=0.186). We also note that in these regressions, neither physical health (b=-0.033, p=0.198) nor mental health (b=0.004, p=0.850) is a significant predictor of self-reported vulnerability to sludge, suggesting that the added psychological parameters might be a pathway that explain the previously significant associations between the physical and mental health variables and self-reported vulnerability to sludge. Table SI.3. in the Supplementary Information includes these results with all details.

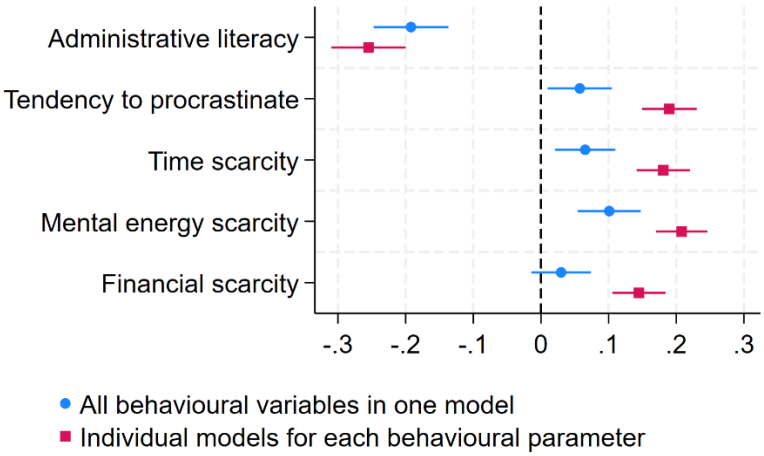

Figure 3. Behavioural predictors of self-reported vulnerability to sludge from multi-level linear regressions with 1,591 individuals and 15,910 observations controlling for demographics and mental and physical health. The blue circles illustrate the results of one single regression with all five behavioural parameters included. The red squares illustrate the results of five regressions that include only the respective behavioural predictor (i.e. without controlling for the other four behavioural parameters).

Interactions between behavioural variables and type of sludge predicting self-reported vulnerability

We also tested whether the associations between the five behavioural variables (administrative literacy, procrastination, time scarcity, mental energy scarcity, and financial scarcity) and self-

reported sludge vulnerability differed across different types of sludge. In this section, we highlight one interaction that we consider most interesting and the other four interaction diagrams are presented in the Supplementary Information (in Figure SI.1.). Given that the previous section suggests that there are some relationships between the five behavioural variables and we do not know how they are causally linked, we test for interaction effects without controlling for the other four behavioural variables.

As shown in Figure 4, administrative literacy plays a significant role across most types of sludge. However, its importance is particularly pronounced when dealing with documents that are written in complex language and use a lot of jargon. In contrast, administrative literacy does not matter for dealing with requests to provide personal information such as religious beliefs and sexual orientation.

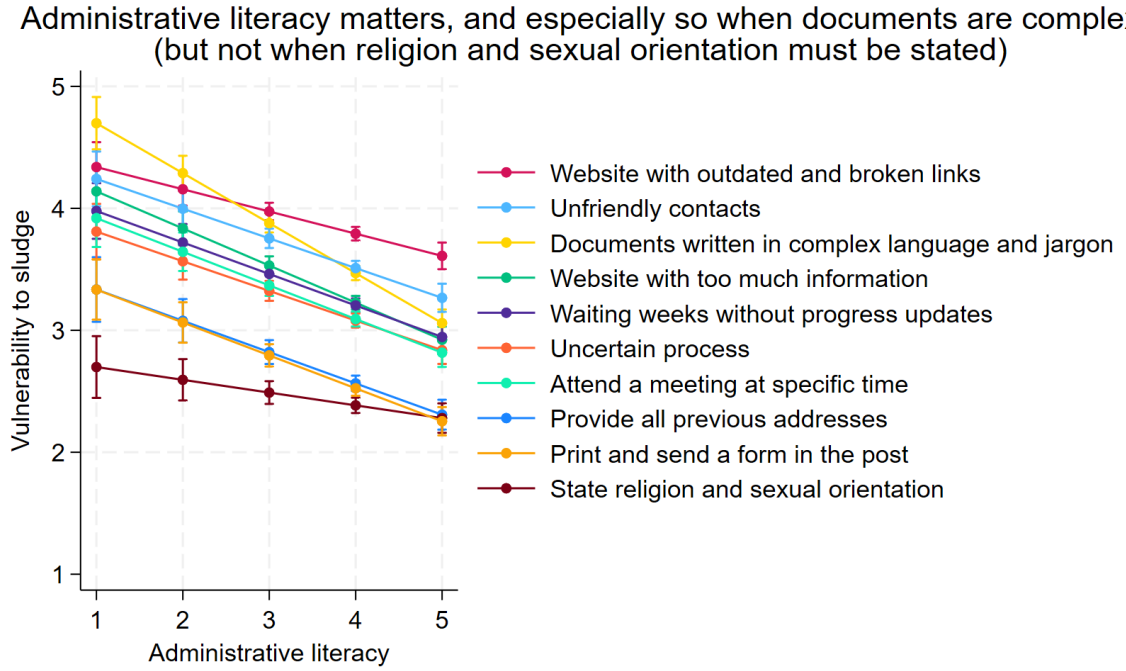

Figure 4. Interaction effects predicting self-reported vulnerability to sludge by the interaction between administrative literacy and sludge types based on multi-linear regressions with 1,591 individuals and 15,910 observations.

Results 2: Acceptability of sludge

What types of sludge are less accepted than others?

To test whether people accept some sludge more than others, we regressed acceptability of sludge on the type of sludge without controlling for any other variables. The results of this regression align with the mean acceptability scores presented in Table 2 and are illustrated in Figure 5. For example, among the ten types of sludge, outdated websites with partly broken links are least acceptable (M=2.415, SE=0.429 for private sector sludge and M=2.364,

SE=0.430 for public sector sludge) and having to print and send a form via post is most acceptable (M=3.437, SE=0.0438 for private sector sludge and M=3.261, SE=0.0415 for public sector sludge). Figure 5 shows sludge acceptability for private and public sludge separately. This analysis shows a small difference in the overall mean acceptability of sludge between public and private sector sludge (b=-0.074, p=0.070), and only minor variations for individual types of sludge. Regressions for each type of sludge individually show that sludge in the public sector is less acceptable when a form needs to be printed and sent in the post (b=-0.177, p=0.003), when a process is uncertain (b=-0.157, p=0.009), and especially when and contacts are unfriendly (b=-0.260, p<0.001).

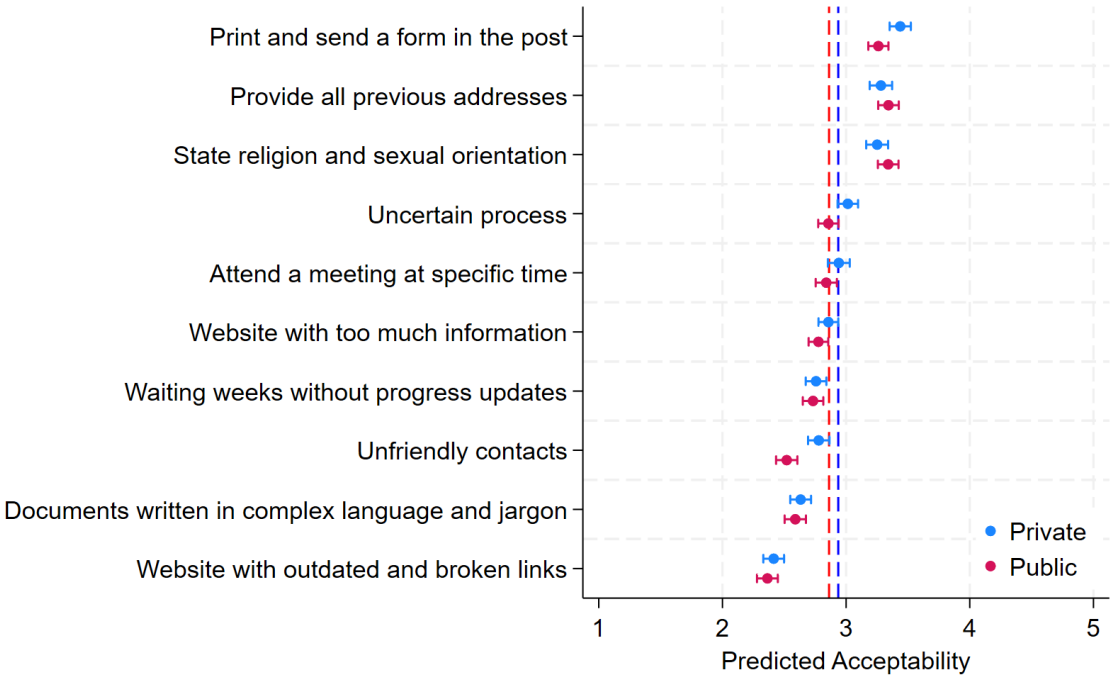

Figure 5. Acceptability of sludge predicted by type of sludge only and no other control variables based on multi-linear regressions with 1,591 individuals and 15,910 observations.

Socio-economic disadvantage predicting acceptability of sludge

Again, we predicted acceptability of sludge by the variables representing potential socio-economic disadvantages. As illustrated in Figure 6, mental health (b=-0.091, p<0.001) and physical health (b=-0.081, p=0.005) are negatively associated with sludge acceptability. Somebody who reports having "1 = *Very bad*" mental health has an estimated value of sludge acceptability of 2.66 (SE=0.067) and somebody who reports having "*5 = Very good*" mental health has an estimated value of sludge acceptability of 3.02 (SE=0.040).

We also find a negative association between age in decades (b=-0.063, p=0.003) and sludge acceptability. Moreover, more educated participants report substantially lower sludge acceptability, as do Irish compared to non-Irish participants. Participants living in a rural

village or remote area or in a suburb report lower sludge acceptability compared to participants living in a city. The Supplementary Information includes the regression table SI.4. presenting these results with all coefficients and standard errors. We also see a negative association between income and acceptability of sludge where those who are richer are less accepting.

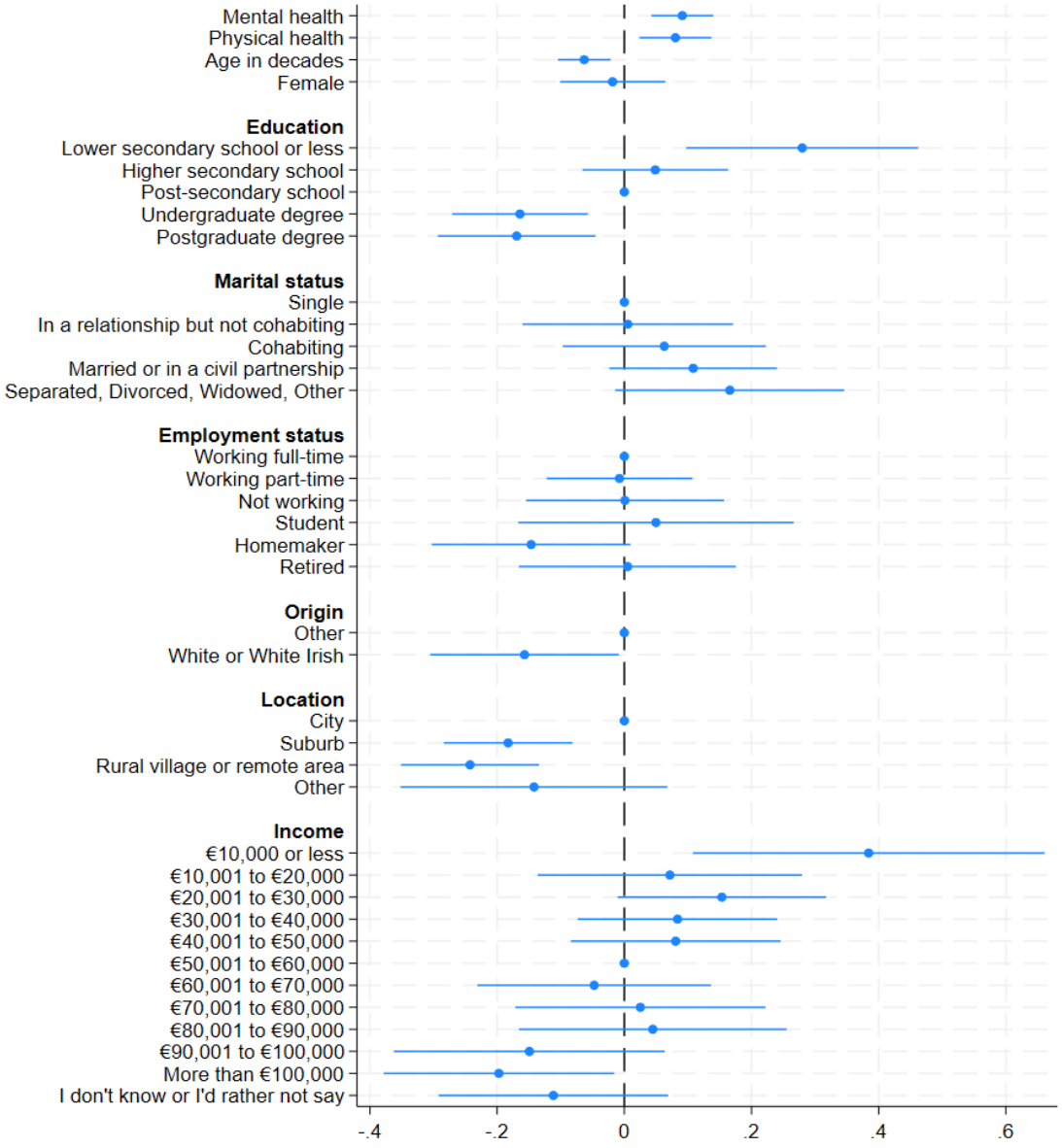

Figure 6. Socio-economic disadvantage predictors of acceptability of sludge based on multi-linear regressions with 1,591 individuals and 15,910 observations.

Behavioural predictors of sludge acceptability

We tested whether the five behavioural variables predicted acceptability. Figure 7 presents the coefficients of these psychological variables again when adding all five behavioural variables in the same regression and when running five separate regressions (i.e. when not controlling

for the other four behavioural variables). Again, all effects are stronger when not controlling for the other behavioural variables.

We find two significant predictors of sludge acceptability in the more conservative model that illustrated by the blue circles. Administrative literacy is positively associated with sludge acceptability (b=0.267, p<0.001) and mental energy scarcity is negatively associated with acceptability of sludge (b=-0.073, p=0.003). When not controlling for the other 4 behavioural variables, the effects become stronger and the tendency to procrastinate and time scarcity also become statistically significant.

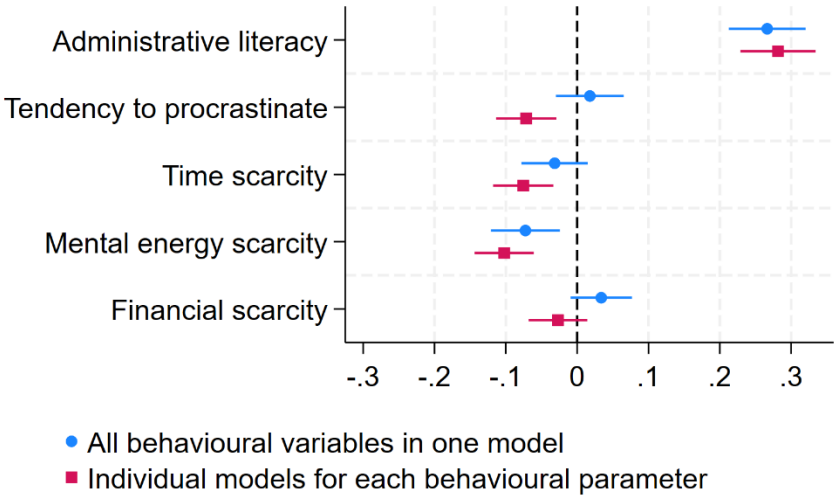

Figure 7. Behavioural predictors of sludge acceptability from multi-level linear regressions with 1,591 individuals and 15,910 observations controlling for demographics and mental and physical health. The blue circles illustrate the results of one single regression with all five behavioural parameters included. The red squares illustrate the results of five regressions that include only the respective behavioural predictor (i.e., without controlling for the other four behavioural parameters).

Interactions between psychological predictors and sludge acceptability

Finally, we tested whether the associations between sludge acceptability and the five behavioural variables differed across different types of sludge. Again, we did not control for the other four behavioural variables in these models. For consistency with the previous analysis, Figure 8 presents the associations between administrative literacy and sludge acceptability by sludge type. The figure shows that sludge acceptability is generally higher for people with higher administrative literacy, and that is the case for all 10 types of sludge. We find the strongest effect of administrative literacy for documents that are written in complex language and jargon; that is particularly unacceptable for participants with lower administrative literacy.

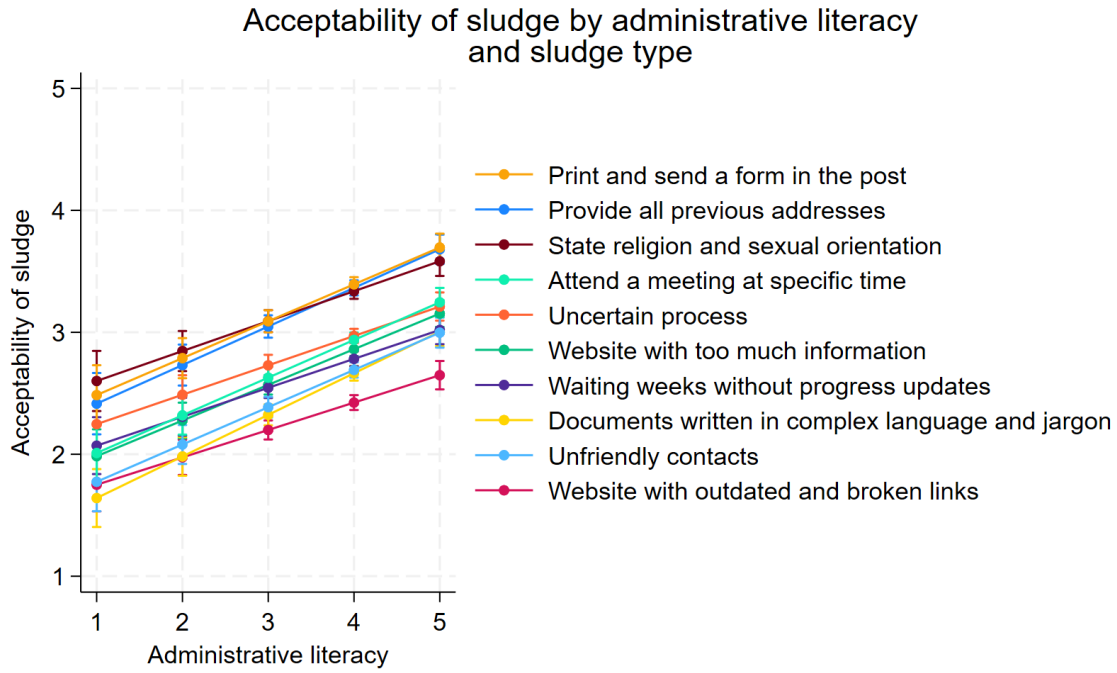

Figure 8. Interaction effects predicting sludge acceptability by the interaction between administrative literacy and sludge types based on multi-linear regressions with 1,591 individuals and 15,910 observations.

Discussion

Key results

We summarise four main results. *First*, some types of sludge are more problematic than others. Participants indicated that they are particularly vulnerable (1) to websites that are outdated and include broken links, (2) when employees are unfriendly, (3) when documents are written in complex language and use a lot of jargon, and (4) when websites are full of information and hard to navigate. These types of sludge were also judged to be amongst the least acceptable. Using an existing typology (Shahab & Lades, 2024), these four types of sludge can be classified as leading to search costs, evaluation costs, or psychological costs (see Table 1). We note that the six least problematic types of sludge are best classified as leading to implementation costs.

Still, it would be premature to claim that sludge that leads to implementation costs are less problematic than sludge leading to the other types of costs. Magnitude matters; very high implementation costs might well be more troublesome than low costs of other kinds. In any case, we evaluated only a small subset of 10 sludge types, and there are many other types of sludge that can lead to implementation costs that might be highly problematic. In addition, implementation might appear straightforward when thinking about it while doing a survey; in real life, implementation costs might be far more problematic than anticipated. One reason for the difficulty of anticipating how vulnerable one might be to implementation costs is the empathy gap that can make it hard for people to see the real-world effects of sludge (Soman et al., 2019).

Second, we tested whether self-reported sludge vulnerability and acceptability differ depending on whether the sludge is emerging from a government agency (the public sector) or a company (the private sector). Since we randomised participants into a private or a public sector treatment group, these results can be interpreted causally. The patterns in the data suggest that there are only minor differences in sludge vulnerability and acceptability depending on whether the sludge emerges from the private or the public sector. We had predicted this for self-reported sludge vulnerability, but we were surprised to see such small effects also for sludge acceptability. Given the nature of our survey (self-reported, hypothetical tasks that people have not actually experienced, and not incentivised), these results should be viewed with caution; the comparison of private vs public sector sludge is an interesting area for future work (see below).

Third, we found that some variables describing facets of socio-economic disadvantage do predict sludge vulnerability and acceptability. Significantly, participants with relatively low mental health indicated being more vulnerable to and less accepting of sludge. We also note that mental health was not a significant predictor of sludge vulnerability and acceptability when including the five behavioural variables in the same regression. In our interpretation, which is in line with the results presented in the regression tables in the supplementary information (tables SI.3. and SI.4.), it is likely that low mental health leads to mental energy scarcity, which in turn leads to more sludge vulnerability and less sludge acceptability. However, we are hesitant to conduct formal mediation analyses as these might give the impression that our data can be interpreted causally. Instead, we believe that future experimental work should test these effects using study designs that are able to show causal relationships.

We had expected more and stronger associations between demographic variables and sludge vulnerability. One reason for these relatively weak associations could be our focus on sludge vulnerability and acceptability *conditional on experiencing some sludge*. It is likely that vulnerable groups do experience more sludge and hence still are harmed by sludge more than less vulnerable groups. Our results merely suggest that vulnerable groups, at large, do not consider themselves as being more vulnerable to sludge than other groups once they must engage with the sludge. It might also be the case that repeatedly experiencing administrative frictions creates a learning effect and thus reduces the vulnerability to sludge. These are open questions for future longitudinal research. Given the ambiguity of the possible interpretations, we prefer not interpreting the correlations between demographics and sludge assessments at face value.

Fourth, and finally, the behavioural variables (administrative literacy, procrastination, time scarcity, mental energy scarcity, and financial scarcity) are quite strongly associated with sludge vulnerability and acceptability. This highlights the importance of analysing these behavioural factors when dealing with the inequality that sludge can bring about. For example, the strong negative associations between administrative literacy and vulnerability to sludge suggests that administrative literacy can act as a buffer from sludge. This is in line with previous research on administrative literacy and administrative burden, which suggests that people with high levels of administrative literacy cope better with the imposed frictions (Döring, 2021; Döring & Madsen, 2022).

Limitations and future work

Our study has limitations that suggest important directions for future research. First, this is a cross-sectional data set, and we can make only limited claims about causality (in particular for the comparison between private vs. public sector sludge). There might be unobserved confounding factors that explain some of the other associations we have found. Future work should rely more on experimental designs that manipulate important determinants of vulnerability to and acceptability of sludge to measure causal effects. For example, future research should experimentally vary time scarcity or the level and type of sludge in a task and measure how well different individuals experience and complete the task.

Second, our measures of vulnerability to sludge and acceptability of sludge are based on self-reported, non-incentivised survey responses. This methodological choice might explain some of our findings. For example, our two dependent variables (vulnerability and acceptability) are strongly (negatively) correlated, which is theoretically plausible but could also reflect common-method bias or a desire for consistency. Future research should therefore complement self-reports with behavioural measures, such as performance in real-effort tasks, to capture non-hypothetical vulnerability to sludge.

A third limitation regards external validity. In the real world, participants are never asked to evaluate a process independent of context. We asked participants to assume that they would like to complete a "task" without further specifying this task, and participants might view this as a highly hypothetical question. For that reason, our results are indicative of people's "beliefs" about their vulnerability, and these beliefs might not necessarily align with objective measures of vulnerability. Incorrect assessments of how vulnerable people report themselves to be to sludge might explain why sludge related to implementation costs is seen as least problematic in our data. To highlight this limitation, throughout the manuscript we refer to self-reported, rather than actual, vulnerability.

The gap between subjective beliefs about vulnerability to sludge and actual, objective vulnerability also has important implications for behavioural public policy. Some forms of sludge that impose significant real-world costs may not be perceived as problematic by people when filling out a survey and therefore may not be reflected in survey responses. Participants may simply fail to recognise that they would be affected by such sludge or may not consciously register its impact. Moreover, the survey made sludge salient to participants. In the real world, people may not notice sludge in the first place. These issues are particularly relevant in the private sector, where firms may deliberately design "strategic" sludge, such as barriers to service cancellation, that effectively steer consumer behaviour while appearing unobjectionable when described abstractly or when evaluated without direct experience. Such forms of sludge are unlikely to emerge as problematic in survey-based research, yet they may be among the most concerning from a behavioural public policy perspective. It may also be the case that participants report sludge to be unacceptable in a survey which makes sludge salient, whereas people would not notice the same sludge in the real world. An important future research direction is therefore to measure the gap between subjective and objective vulnerability to sludge.

A related reason for the limited external validity of our study is that we asked participants to assess sludge that they did not necessarily experience themselves. This design choice allowed us to compare many different types of sludge without limiting our analysis to types of sludge or contexts that people had experienced, allowing for greater comparability while still using relatively common types of sludge. The lack of first-hand experience, however, is a limitation because it can be difficult for people to anticipate how onerous a task is without experiencing it first-hand due to an "empathy gap" (Soman et al., 2019). This might explain why public and private sector sludge are evaluated so similarly, and why sludge related to implementation costs is generally seen as least problematic in our study. Future studies might make tasks more concrete by referencing specific government agencies and private companies, focusing on tasks participants have previously encountered, or using real-effort task experiments in which participants must navigate actual sludge within the study context.

A final limitation, and a focus for future work, involves the issue of magnitude. In the abstract, people might think that one kind of sludge is more acceptable than another kind of sludge. But if the apparently more acceptable form of sludge turns to take far more time than the apparently less acceptable form, people's judgments might flip.

To conclude, we see several avenues for future research in this area. First, it would be important to extend the types of sludge that are analysed. For example, having to cancel a membership is one of the most often mentioned types of sludge, but we did not include it as it was difficult to come up with this type of sludge in the private and the public sector as well. Second, additional (combinations of) predictors of vulnerability to and acceptability of sludge should be tested. For example, data on overoptimism, present bias, status quo bias, limited attention, thinking styles, and cultural and financial capital might help us better understand who is most vulnerable to sludge. Moreover, our data suggest that poor mental health contributes to mental energy scarcity, which in turn increases vulnerability to sludge and decreases acceptability of sludge. This pathway should be investigated further.

Third, repeated exposure to sludge may increase administrative literacy, potentially reducing vulnerability to sludge over time, which could be tested using longitudinal study designs. Fourth, cross-national studies should test whether the patterns found in Ireland are similar in other countries as well. Fifth, stating and varying magnitudes (measured in relevant terms, including time) would be quite valuable). Finally, we see great potential for real-effort task experiments that systematically vary the level and type of sludge and identify individual-level moderators. These experiments would allow the investigation of the non-hypothetical, concrete, and causal impact of sludge on experiences and behavioural outcomes.

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Supplementary Information for

Vulnerability to and Acceptability of Different Types of Sludge

Table SI.1. Observables across the two experimental treatments (public vs private sludge).

	Private	Public	Total	Test
Participants	755 (47.5%)	836 (52.5%)	1,591 (100.0%)	
Age	44.1 (14.7)	44.5 (15.0)	44.3 (14.9)	0.573
Gender				
Male and other	324 (42.9%)	358 (42.8%)	682 (42.9%)	0.971
Female	431 (57.1%)	478 (57.2%)	909 (57.1%)	
Ethnic Origin				
White or White Irish	72 (9.5%)	89 (10.6%)	161 (10.1%)	0.464
Other	683 (90.5%)	747 (89.4%)	1,430 (89.9%)	
Education				
Lower secondary school or less	37 (4.9%)	42 (5.0%)	79 (5.0%)	0.628
Higher secondary school	136 (18.0%)	166 (19.9%)	302 (19.0%)	
Post-secondary school	186 (24.6%)	219 (26.2%)	405 (25.5%)	
Undergraduate degree	247 (32.7%)	245 (29.3%)	492 (30.9%)	
Postgraduate degree	149 (19.7%)	164 (19.6%)	313 (19.7%)	
Marital Status				
Single	180 (23.8%)	182 (21.8%)	362 (22.8%)	0.315
In a relationship, not cohabiting	43 (5.7%)	54 (6.5%)	97 (6.1%)	
Cohabiting	86 (11.4%)	108 (12.9%)	194 (12.2%)	
Married or in a civil partnership	394 (52.2%)	416 (49.8%)	810 (50.9%)	
Separated, Divorced, Widowed, Other	52 (6.9%)	76 (9.1%)	128 (8.0%)	
Employment Status				
Working full-time	419 (55.5%)	436 (52.2%)	855 (53.7%)	0.444
Working part-time	116 (15.4%)	122 (14.6%)	238 (15.0%)	
Not working	70 (9.3%)	76 (9.1%)	146 (9.2%)	
Student	33 (4.4%)	39 (4.7%)	72 (4.5%)	
Homemaker	41 (5.4%)	60 (7.2%)	101 (6.3%)	
Retired	76 (10.1%)	103 (12.3%)	179 (11.3%)	
Location				
City	197 (26.1%)	231 (27.6%)	428 (26.9%)	0.866
Suburb	281 (37.2%)	310 (37.1%)	591 (37.1%)	
Rural village or remote area	243 (32.2%)	262 (31.3%)	505 (31.7%)	
Other	34 (4.5%)	33 (3.9%)	67 (4.2%)	
Income				
€10,000 or less	18 (2.4%)	29 (3.5%)	47 (3.0%)	0.335
€10,001 to €20,000	47 (6.2%)	54 (6.5%)	101 (6.3%)	
€20,001 to €30,000	98 (13.0%)	115 (13.8%)	213 (13.4%)	
€30,001 to €40,000	102 (13.5%)	115 (13.8%)	217 (13.6%)	
€40,001 to €50,000	107 (14.2%)	91 (10.9%)	198 (12.4%)	
€50,001 to €60,000	76 (10.1%)	78 (9.3%)	154 (9.7%)	
€60,001 to €70,000	74 (9.8%)	61 (7.3%)	135 (8.5%)	
€70,001 to €80,000	38 (5.0%)	56 (6.7%)	94 (5.9%)	
€80,001 to €90,000	42 (5.6%)	48 (5.7%)	90 (5.7%)	
€90,001 to €100,000	38 (5.0%)	52 (6.2%)	90 (5.7%)	
More than €100,000	61 (8.1%)	65 (7.8%)	126 (7.9%)	
I don't know or I'd rather not say	54 (7.2%)	72 (8.6%)	126 (7.9%)	

Note: Using test regress across levels of private vs public sludge for age. Using test pearson across levels of private vs public sludge for female, ethnic origin, education, marital status, employment status, location, and income.

Table SI.2. Descriptive statistics from our survey compared with the Census 2022 data from the Irish Central Statistics Office (CSO).

	Our survey (18 and above)	**Irish population (15 and above)**
Participants/Population	1,591	
Age	44.34 (SE = 14.9)	45.9
Gender		
Male and other	682 (42.9%)	49%
Female	909 (57.1%)	51%
Ethnic Origin		
White or White Irish	1,430 (89.9%)	88%
Other	161 (10.1%)	12%
Education		
Lower secondary school or less	79 (5.0%)	24%
Higher secondary school	302 (19.0%)	19%
Post-secondary school	405 (25.5%)	22%
Undergraduate degree	492 (30.9%)	23%
Postgraduate degree	313 (19.7%)	13%
Marital Status		
Single	362 (22.8%)	43%
In a relationship but not cohabiting	97 (6.1%)	-
Cohabiting	194 (12.2%)	-
Married or in a civil partnership	810 (50.9%)	46%
Separated, Divorced, Widowed,		11%
Other	128 (8.0%)	
Employment Status		
Working full-time	855 (53.7%)	45%
Working part-time	238 (15.0%)	9%
Not working	146 (9.2%)	10%
Student	72 (4.5%)	12%
Homemaker	101 (6.3%)	7%
Retired	179 (11.3%)	17%
Location		
City	428 (26.9%)	34%
Suburb	591 (37.1%)	30%
Rural village or remote area	505 (31.7%)	36%
Other	67 (4.2%)	-
Income		See note below.
€10,000 or less	47 (3.0%)	
€10,001 to €20,000	101 (6.3%)	
€20,001 to €30,000	213 (13.4%)	
€30,001 to €40,000	217 (13.6%)	
€40,001 to €50,000	198 (12.4%)	
€50,001 to €60,000	154 (9.7%)	
€60,001 to €70,000	135 (8.5%)	
€70,001 to €80,000	94 (5.9%)	
€80,001 to €90,000	90 (5.7%)	
€90,001 to €100,000	90 (5.7%)	
More than €100,000	126 (7.9%)	

I don't know or I'd rather not say	126 (7.9%)

Note: Summary statistics for the Irish population aged 18 and over (to make it comparable with our survey in which participants had to be 18 or over) are not readily available. For comparison purposes, we manually compiled relevant data from the 2022 Census conducted by the Irish Central Statistics Office (CSO). For some variables, namely education, marital status, and employment status, data are only available for individuals aged 15 and over. We have therefore used this sample for the other remaining variables, except for Location (for which there is no data disaggregated by single year of age). The Census did not collect information on income. The only available income data from the CSO come from the 2023 Survey on Income and Living Conditions (SILC), which reports average household income by quintile as follows: €20,118 for households below the 20th percentile; €38,163 for those in the 20th–39th percentile; €55,014 for the 40th–59th percentile; €73,615 for the 60th–79th percentile; and €127,473 for the 80th–100th percentile. These are not directly comparable to the data in our survey and hence we did not include them in the table above.

Table SI.3. All predictors of vulnerability to sludge

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Type of sludge (base = Provide all previous addresses)							
Website with outdated and broken links	1.216***	1.216***	1.216***	1.216***	1.216***	1.216***	1.216***
	(0.0358)	(0.0358)	(0.0358)	(0.0358)	(0.0358)	(0.0358)	(0.0358)
Website with too much information	0.670***	0.670***	0.670***	0.670***	0.670***	0.670***	0.670***
	(0.0342)	(0.0342)	(0.0342)	(0.0342)	(0.0342)	(0.0342)	(0.0342)
Documents written in complex language	0.929***	0.929***	0.929***	0.929***	0.929***	0.929***	0.929***
	(0.0361)	(0.0361)	(0.0361)	(0.0361)	(0.0361)	(0.0361)	(0.0361)
Waiting weeks without progress updates	0.639***	0.639***	0.639***	0.639***	0.639***	0.639***	0.639***
	(0.0346)	(0.0346)	(0.0346)	(0.0346)	(0.0346)	(0.0346)	(0.0346)
Uncertain process	0.513***	0.513***	0.513***	0.513***	0.513***	0.513***	0.513***
	(0.0354)	(0.0354)	(0.0354)	(0.0354)	(0.0354)	(0.0354)	(0.0354)
Unfriendly contacts	0.943***	0.943***	0.943***	0.943***	0.943***	0.943***	0.943***
	(0.0352)	(0.0352)	(0.0352)	(0.0352)	(0.0352)	(0.0352)	(0.0352)
State religion and sexual orientation	-0.204***	-0.204***	-0.204***	-0.204***	-0.204***	-0.204***	-0.204***
	(0.0368)	(0.0368)	(0.0368)	(0.0368)	(0.0368)	(0.0368)	(0.0368)
Attend a meeting at specific time	0.531***	0.531***	0.531***	0.531***	0.531***	0.531***	0.531***
	(0.0356)	(0.0356)	(0.0356)	(0.0356)	(0.0356)	(0.0356)	(0.0356)
Print and send a form in the post	-0.0383	-0.0383	-0.0383	-0.0383	-0.0383	-0.0383	-0.0383
	(0.0348)	(0.0348)	(0.0348)	(0.0348)	(0.0348)	(0.0348)	(0.0348)
Administrative literacy		-0.192***	-0.255***				
		(0.0282)	(0.0281)				
Procrastination		0.0574**		0.190***			
		(0.0242)		(0.0207)			
Time scarcity		0.0653***			0.179***		
		(0.0228)			(0.0202)		
Mental energy scarcity		0.101***				0.208***	
		(0.0238)				(0.0193)	
Financial scarcity		0.0298					0.145***
		(0.0225)					(0.0200)
Mental health	-0.111***	-0.00430	-0.0818***	-0.0720***	-0.0711***	-0.0110	-0.0639***
	(0.0231)	(0.0227)	(0.0221)	(0.0225)	(0.0228)	(0.0236)	(0.0230)
Physical health	-0.0605**	-0.0331	-0.0451*	-0.0449*	-0.0495*	-0.0517**	-0.0471*
	(0.0271)	(0.0257)	(0.0264)	(0.0265)	(0.0266)	(0.0262)	(0.0268)
Age (in decades)	0.0485**	0.0840***	0.0478**	0.0661***	0.0836***	0.0769***	0.0680***
	(0.0206)	(0.0200)	(0.0202)	(0.0201)	(0.0206)	(0.0201)	(0.0205)
Female	0.0193	0.0303	0.0214	0.0396	0.0219	0.0148	0.0413
	(0.0415)	(0.0398)	(0.0405)	(0.0407)	(0.0405)	(0.0402)	(0.0411)
White or White Irish	0.103	0.0530	0.0846	0.0921	0.0620	0.0683	0.0988
	(0.0802)	(0.0746)	(0.0772)	(0.0785)	(0.0775)	(0.0769)	(0.0775)
Education (base = Post-secondary school)							
Lower secondary school or less	-0.244**	-0.220**	-0.233**	-0.236**	-0.227**	-0.234**	-0.231**
	(0.0975)	(0.0947)	(0.0991)	(0.0946)	(0.0947)	(0.0939)	(0.0958)
Higher secondary school	0.0259	0.0244	0.00122	0.0288	0.0438	0.0435	0.0313
	(0.0593)	(0.0555)	(0.0576)	(0.0569)	(0.0579)	(0.0567)	(0.0581)
Undergraduate degree	0.213***	0.198***	0.232***	0.205***	0.184***	0.183***	0.205***

	(0.0529)	(0.0500)	(0.0514)	(0.0513)	(0.0519)	(0.0517)	(0.0522)
Postgraduate degree	0.131**	0.136**	0.161***	0.129**	0.108*	0.115*	0.128**
	(0.0625)	(0.0587)	(0.0606)	(0.0606)	(0.0606)	(0.0606)	(0.0620)
Marital status (base = Single)							
In a relationship but not cohabiting	0.0891	0.0899	0.0989	0.101	0.0654	0.107	0.0387
	(0.0810)	(0.0732)	(0.0766)	(0.0781)	(0.0775)	(0.0771)	(0.0795)
Cohabiting	-0.0570	-0.00876	-0.0394	-0.0189	-0.0585	-0.00960	-0.0523
	(0.0762)	(0.0708)	(0.0738)	(0.0730)	(0.0744)	(0.0722)	(0.0753)
Married or in a civil partnership	-0.0419	0.0208	-0.0116	0.00849	-0.0481	0.00869	-0.0304
	(0.0633)	(0.0613)	(0.0628)	(0.0622)	(0.0625)	(0.0609)	(0.0627)
Separated, Divorced, Widowed, Other	-0.179**	-0.142*	-0.160*	-0.154*	-0.173**	-0.149*	-0.186**
	(0.0851)	(0.0819)	(0.0834)	(0.0847)	(0.0855)	(0.0822)	(0.0852)
Employment status (base = Working full-time)							
Working part-time	0.0299	0.00716	0.0265	0.0145	0.0152	0.0105	0.0260
	(0.0581)	(0.0540)	(0.0569)	(0.0554)	(0.0559)	(0.0558)	(0.0567)
Not working	-0.0249	-0.0276	-0.0396	-0.0396	0.00565	-0.0234	-0.0199
	(0.0763)	(0.0714)	(0.0725)	(0.0753)	(0.0741)	(0.0736)	(0.0763)
Student	-0.00654	0.000913	-0.00538	-0.0253	-0.000394	0.00265	0.0204
	(0.113)	(0.102)	(0.107)	(0.106)	(0.110)	(0.105)	(0.109)
Homemaker	0.101	0.0372	0.0656	0.0745	0.0935	0.0521	0.0863
	(0.0856)	(0.0774)	(0.0831)	(0.0813)	(0.0827)	(0.0802)	(0.0833)
Retired	-0.0926	-0.0459	-0.0729	-0.0903	-0.0494	-0.0790	-0.0495
	(0.0846)	(0.0822)	(0.0837)	(0.0838)	(0.0837)	(0.0823)	(0.0844)
Location (base = City)							
Suburb	0.0584	0.0509	0.0448	0.0420	0.0611	0.0641	0.0777
	(0.0534)	(0.0507)	(0.0521)	(0.0521)	(0.0520)	(0.0517)	(0.0527)
Rural village or remote area	0.124**	0.103*	0.109**	0.114**	0.117**	0.113**	0.133**
	(0.0565)	(0.0532)	(0.0553)	(0.0551)	(0.0548)	(0.0548)	(0.0553)
Other	-0.00503	0.00827	-0.0343	0.0129	0.0310	0.0163	0.0263
	(0.103)	(0.0977)	(0.102)	(0.0997)	(0.102)	(0.0969)	(0.103)
People living in household (base = One adult, no children)							
1 adult, 1 or more children	-0.0262	-0.0400	-0.0294	-0.0192	-0.0213	-0.0403	-0.0673
	(0.0961)	(0.0904)	(0.0942)	(0.0916)	(0.0943)	(0.0930)	(0.0964)
2 adults, no children	0.0500	0.00237	0.0236	0.0374	0.0451	0.0188	0.0162
	(0.0806)	(0.0756)	(0.0775)	(0.0788)	(0.0794)	(0.0770)	(0.0798)
2 adults, 1 or more children	-0.0408	-0.0919	-0.0461	-0.0547	-0.0572	-0.0926	-0.0980
	(0.0877)	(0.0821)	(0.0843)	(0.0851)	(0.0858)	(0.0840)	(0.0867)
3 or more adults, no children	0.0278	-0.0219	-0.00721	0.0265	0.0315	-0.00474	-0.0135
	(0.0843)	(0.0788)	(0.0809)	(0.0814)	(0.0829)	(0.0815)	(0.0832)
3 or more adults, 1 or more children	-0.00960	-0.0597	-0.0199	-0.0242	-0.0127	-0.0566	-0.0776
	(0.117)	(0.109)	(0.111)	(0.112)	(0.114)	(0.113)	(0.115)
Other	0.152	0.0778	0.102	0.111	0.155	0.127	0.0893
	(0.132)	(0.124)	(0.126)	(0.129)	(0.128)	(0.131)	(0.132)
Income (base = €50,001 to €60,000)							
€10,000 or less	-0.0632	-0.231*	-0.129	-0.114	-0.126	-0.198	-0.134
	(0.145)	(0.135)	(0.145)	(0.142)	(0.135)	(0.137)	(0.143)
€10,001 to €20,000	0.0868	0.0235	0.0668	0.0729	0.0508	0.0570	0.00725
	(0.104)	(0.0950)	(0.100)	(0.0982)	(0.100)	(0.0980)	(0.101)
€20,001 to €30,000	0.00605	-0.0455	0.00829	-0.0381	-0.0334	-0.0206	-0.0550

	(0.0778)	(0.0724)	(0.0751)	(0.0756)	(0.0756)	(0.0746)	(0.0768)
€30,001 to €40,000	-0.0318	-0.0584	-0.0258	-0.0580	-0.0612	-0.0467	-0.0573
	(0.0783)	(0.0738)	(0.0762)	(0.0763)	(0.0758)	(0.0761)	(0.0764)
€40,001 to €50,000	-0.00308	-0.0354	-0.0222	-0.0275	-0.0211	-0.00303	-0.0225
	(0.0813)	(0.0767)	(0.0781)	(0.0802)	(0.0800)	(0.0793)	(0.0795)
€60,001 to €70,000	0.0360	-0.00638	0.0172	0.00140	0.0206	0.0182	0.0189
	(0.0904)	(0.0833)	(0.0861)	(0.0868)	(0.0871)	(0.0881)	(0.0880)
€70,001 to €80,000	-0.0904	-0.0951	-0.103	-0.0940	-0.105	-0.0685	-0.0868
	(0.0972)	(0.0927)	(0.0968)	(0.0940)	(0.0934)	(0.0960)	(0.0945)
€80,001 to €90,000	0.0238	-0.0157	0.00989	-0.00303	-0.00759	0.00223	0.0285
	(0.101)	(0.0916)	(0.0959)	(0.0983)	(0.0974)	(0.0963)	(0.0977)
€90,001 to €100,000	0.164	0.104	0.121	0.130	0.145	0.142	0.169
	(0.107)	(0.102)	(0.105)	(0.106)	(0.104)	(0.104)	(0.106)
More than €100,000	0.232**	0.205**	0.241***	0.194**	0.204**	0.205**	0.242***
	(0.0904)	(0.0876)	(0.0869)	(0.0907)	(0.0888)	(0.0899)	(0.0901)
I'd rather not say	0.193**	0.187**	0.186**	0.193**	0.192**	0.197**	0.179**
	(0.0860)	(0.0792)	(0.0813)	(0.0846)	(0.0839)	(0.0826)	(0.0853)
Constant	2.767***	2.289***	3.610***	1.962***	2.055***	1.775***	2.145***
	(0.179)	(0.244)	(0.198)	(0.195)	(0.201)	(0.203)	(0.205)
Observations	15,910	15,910	15,910	15,910	15,910	15,910	15,910
Number of psid	1,591	1,591	1,591	1,591	1,591	1,591	1,591

Robust standard errors clustered at the individual in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure SI.1. Interactions between behavioural variables and types of sludge predicting sludge vulnerability.

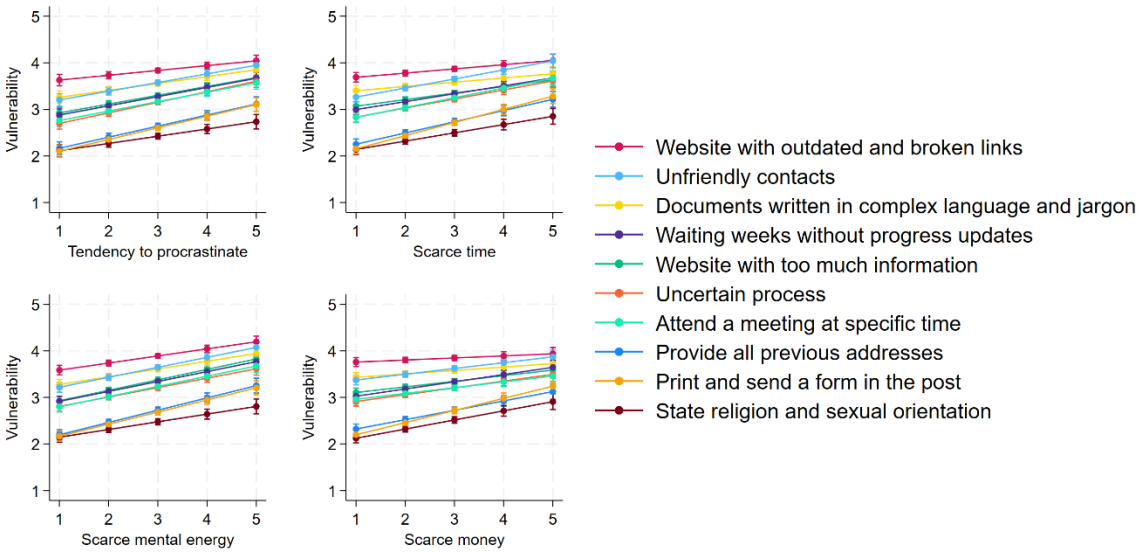


Table SI.4. All predictors of sludge acceptability

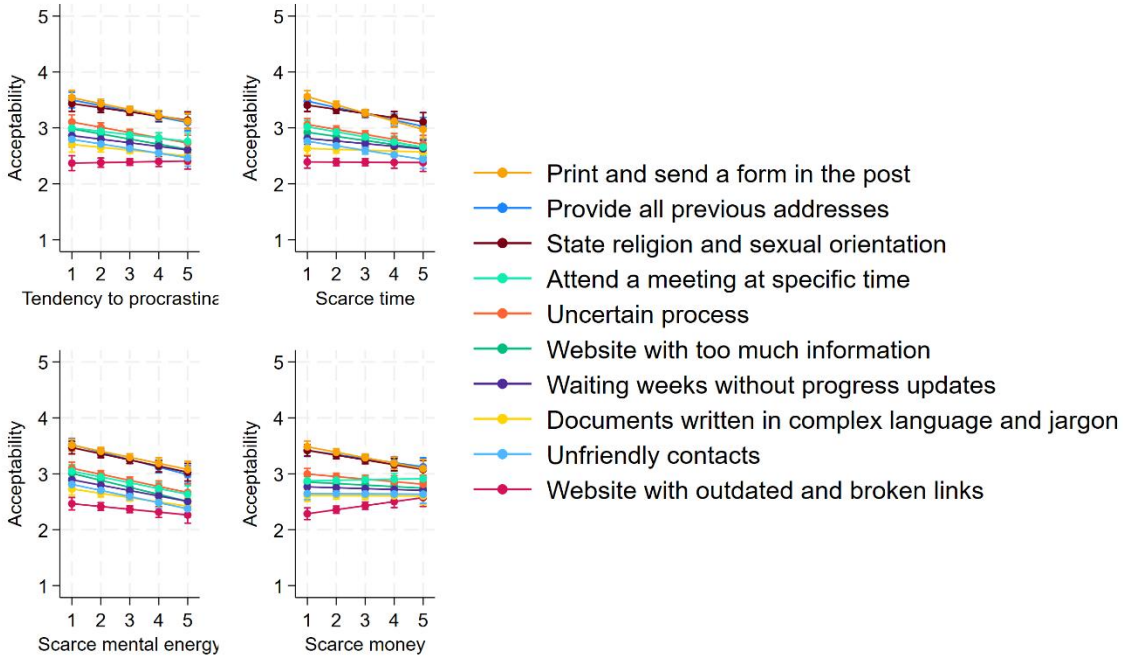
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Type of sludge (base = Provide all previous addresses)							
Website with outdated and broken links	-0.926***	-0.926***	-0.926***	-0.926***	-0.926***	-0.926***	-0.926***
	(0.0384)	(0.0384)	(0.0384)	(0.0384)	(0.0384)	(0.0384)	(0.0384)
Website with too much information	-0.499***	-0.499***	-0.499***	-0.499***	-0.499***	-0.499***	-0.499***
	(0.0344)	(0.0344)	(0.0344)	(0.0344)	(0.0344)	(0.0344)	(0.0344)
Documents written in complex language	-0.704***	-0.704***	-0.704***	-0.704***	-0.704***	-0.704***	-0.704***
	(0.0369)	(0.0369)	(0.0369)	(0.0369)	(0.0369)	(0.0369)	(0.0369)
Waiting weeks without progress updates	-0.569***	-0.569***	-0.569***	-0.569***	-0.569***	-0.569***	-0.569***
	(0.0359)	(0.0359)	(0.0359)	(0.0359)	(0.0359)	(0.0359)	(0.0359)
Uncertain process	-0.382***	-0.382***	-0.382***	-0.382***	-0.382***	-0.382***	-0.382***
	(0.0373)	(0.0373)	(0.0373)	(0.0373)	(0.0373)	(0.0373)	(0.0373)
Unfriendly contacts	-0.671***	-0.671***	-0.671***	-0.671***	-0.671***	-0.671***	-0.671***
	(0.0374)	(0.0374)	(0.0374)	(0.0374)	(0.0374)	(0.0374)	(0.0374)
State religion and sexual orientation	-0.0157	-0.0157	-0.0157	-0.0157	-0.0157	-0.0157	-0.0157
	(0.0367)	(0.0367)	(0.0367)	(0.0367)	(0.0367)	(0.0367)	(0.0367)
Attend a meeting at specific time	-0.426***	-0.426***	-0.426***	-0.426***	-0.426***	-0.426***	-0.426***
	(0.0360)	(0.0360)	(0.0360)	(0.0360)	(0.0360)	(0.0360)	(0.0360)
Print and send a form in the post	0.0311	0.0311	0.0311	0.0311	0.0311	0.0311	0.0311
	(0.0346)	(0.0347)	(0.0346)	(0.0346)	(0.0346)	(0.0346)	(0.0346)
Public Sludge	-0.0756*	-0.0541	-0.0557	-0.0759*	-0.0690*	-0.0744*	-0.0747*
	(0.0391)	(0.0378)	(0.0379)	(0.0389)	(0.0390)	(0.0387)	(0.0391)
Administrative literacy		0.266***	0.282***				
		(0.0275)	(0.0269)				
Procrastination		0.0178		-0.0715***			
		(0.0243)		(0.0216)			
Time scarcity		-0.0315			-0.0734***		
		(0.0237)			(0.0215)		
Mental energy scarcity		-0.0725***				-0.102***	
		(0.0247)				(0.0211)	
Financial scarcity		0.0338					-0.0269
		(0.0220)					(0.0209)
Mental health	0.0912***	0.0332	0.0587**	0.0765***	0.0748***	0.0420	0.0825***
	(0.0248)	(0.0250)	(0.0237)	(0.0247)	(0.0248)	(0.0260)	(0.0249)
Physical health	0.0805***	0.0645**	0.0640**	0.0746***	0.0761***	0.0762***	0.0780***
	(0.0289)	(0.0278)	(0.0278)	(0.0288)	(0.0290)	(0.0286)	(0.0292)
Age (in decades)	-0.0631***	-0.0722***	-0.0623***	-0.0697***	-0.0775***	-0.0771***	-0.0667***
	(0.0211)	(0.0208)	(0.0203)	(0.0212)	(0.0216)	(0.0212)	(0.0214)
Female	-0.0183	-0.0121	-0.0204	-0.0260	-0.0193	-0.0161	-0.0224
	(0.0423)	(0.0412)	(0.0408)	(0.0424)	(0.0422)	(0.0422)	(0.0424)
White or White Irish	-0.157**	-0.119	-0.135*	-0.153**	-0.140*	-0.140*	-0.156**
	(0.0757)	(0.0731)	(0.0729)	(0.0762)	(0.0757)	(0.0752)	(0.0754)
Education (base = Post-secondary school)							
Lower secondary school or less	0.280***	0.267***	0.269***	0.277***	0.273***	0.275***	0.277***
	(0.0931)	(0.0891)	(0.0893)	(0.0912)	(0.0929)	(0.0915)	(0.0927)
Higher secondary school	0.0487	0.0667	0.0759	0.0476	0.0414	0.0401	0.0477

	(0.0584)	(0.0565)	(0.0565)	(0.0578)	(0.0581)	(0.0578)	(0.0583)
Undergraduate degree	-0.164***	-0.170***	-0.184***	-0.161***	-0.152***	-0.149***	-0.163***
	(0.0545)	(0.0522)	(0.0525)	(0.0542)	(0.0543)	(0.0541)	(0.0545)
Postgraduate degree	-0.169***	-0.191***	-0.202***	-0.168***	-0.160**	-0.161**	-0.169***
	(0.0632)	(0.0613)	(0.0618)	(0.0629)	(0.0628)	(0.0627)	(0.0633)
Marital status (base = Single)							
In a relationship but not cohabiting	0.00549	-0.0190	-0.00664	0.00100	0.0147	-0.00348	0.0148
	(0.0845)	(0.0796)	(0.0799)	(0.0849)	(0.0837)	(0.0840)	(0.0845)
Cohabiting	0.0629	0.0319	0.0426	0.0485	0.0632	0.0395	0.0619
	(0.0815)	(0.0776)	(0.0779)	(0.0806)	(0.0809)	(0.0803)	(0.0813)
Married or in a civil partnership	0.108	0.0674	0.0748	0.0893	0.111	0.0834	0.106
	(0.0673)	(0.0668)	(0.0660)	(0.0678)	(0.0677)	(0.0677)	(0.0674)
Separated, Divorced, Widowed, Other	0.166*	0.134	0.143	0.156*	0.163*	0.151	0.167*
	(0.0919)	(0.0890)	(0.0885)	(0.0925)	(0.0931)	(0.0919)	(0.0920)
Employment status (base = Working full-time)							
Working part-time	-0.00761	0.00253	-0.00421	-0.00182	-0.00172	0.00188	-0.00690
	(0.0585)	(0.0565)	(0.0563)	(0.0581)	(0.0582)	(0.0584)	(0.0584)
Not working	0.00101	0.0104	0.0174	0.00656	-0.0115	0.000315	9.28e-05
	(0.0794)	(0.0745)	(0.0749)	(0.0790)	(0.0788)	(0.0782)	(0.0793)
Student	0.0498	0.0489	0.0485	0.0568	0.0473	0.0453	0.0448
	(0.110)	(0.103)	(0.104)	(0.110)	(0.110)	(0.108)	(0.110)
Homemaker	-0.146*	-0.0994	-0.110	-0.137*	-0.144*	-0.123	-0.144*
	(0.0797)	(0.0745)	(0.0751)	(0.0789)	(0.0794)	(0.0786)	(0.0799)
Retired	0.00515	-0.0189	-0.0180	0.00429	-0.0130	-0.00160	-0.00291
	(0.0871)	(0.0852)	(0.0853)	(0.0869)	(0.0873)	(0.0864)	(0.0873)
Location (base = City)							
Suburb	-0.183***	-0.168***	-0.167***	-0.177***	-0.184***	-0.185***	-0.186***
	(0.0516)	(0.0502)	(0.0501)	(0.0516)	(0.0515)	(0.0514)	(0.0518)
Rural village or remote area	-0.243***	-0.220***	-0.225***	-0.239***	-0.240***	-0.237***	-0.244***
	(0.0554)	(0.0533)	(0.0535)	(0.0554)	(0.0552)	(0.0553)	(0.0555)
Other	-0.142	-0.114	-0.108	-0.149	-0.156	-0.152	-0.148
	(0.107)	(0.103)	(0.106)	(0.106)	(0.106)	(0.104)	(0.107)
People living in household (base = One adult, no children)							
1 adult, 1 or more children	0.105	0.104	0.109	0.103	0.103	0.112	0.113
	(0.102)	(0.0995)	(0.0993)	(0.102)	(0.102)	(0.101)	(0.102)
2 adults, no children	-0.0499	-0.0199	-0.0210	-0.0452	-0.0480	-0.0346	-0.0437
	(0.0888)	(0.0843)	(0.0847)	(0.0888)	(0.0889)	(0.0878)	(0.0887)
2 adults, 1 or more children	0.123	0.136	0.130	0.129	0.130	0.149	0.134
	(0.0962)	(0.0916)	(0.0918)	(0.0960)	(0.0959)	(0.0951)	(0.0964)
3 or more adults, no children	-0.00538	0.0318	0.0330	-0.00490	-0.00703	0.0106	0.00228
	(0.0879)	(0.0835)	(0.0834)	(0.0873)	(0.0880)	(0.0868)	(0.0877)
3 or more adults, 1 or more children	0.00644	0.0178	0.0186	0.0119	0.00797	0.0296	0.0191
	(0.121)	(0.115)	(0.115)	(0.120)	(0.120)	(0.119)	(0.121)
Other	0.0423	0.0883	0.101	0.0577	0.0420	0.0549	0.0541
	(0.157)	(0.148)	(0.145)	(0.157)	(0.159)	(0.159)	(0.158)
Income (base = €50,001 to €60,000)							
€10,000 or less	0.384***	0.488***	0.456***	0.403***	0.409***	0.450***	0.397***
	(0.141)	(0.136)	(0.137)	(0.141)	(0.140)	(0.140)	(0.141)
€10,001 to €20,000	0.0717	0.0898	0.0941	0.0770	0.0866	0.0864	0.0865

	(0.106)	(0.103)	(0.103)	(0.106)	(0.106)	(0.106)	(0.106)
€20,001 to €30,000	0.153*	0.149*	0.151*	0.170**	0.169**	0.166**	0.165*
	(0.0836)	(0.0796)	(0.0795)	(0.0835)	(0.0832)	(0.0829)	(0.0840)
€30,001 to €40,000	0.0837	0.0793	0.0770	0.0935	0.0957	0.0910	0.0884
	(0.0800)	(0.0763)	(0.0767)	(0.0795)	(0.0790)	(0.0789)	(0.0796)
€40,001 to €50,000	0.0808	0.0984	0.103	0.0900	0.0886	0.0809	0.0845
	(0.0841)	(0.0798)	(0.0796)	(0.0837)	(0.0835)	(0.0834)	(0.0839)
€60,001 to €70,000	-0.0474	-0.0248	-0.0254	-0.0344	-0.0407	-0.0386	-0.0442
	(0.0937)	(0.0900)	(0.0897)	(0.0930)	(0.0927)	(0.0930)	(0.0932)
€70,001 to €80,000	0.0253	0.0321	0.0375	0.0267	0.0307	0.0144	0.0245
	(0.100)	(0.0978)	(0.0976)	(0.100)	(0.0996)	(0.101)	(0.100)
€80,001 to €90,000	0.0448	0.0702	0.0595	0.0549	0.0574	0.0554	0.0439
	(0.107)	(0.101)	(0.101)	(0.108)	(0.107)	(0.107)	(0.107)
€90,001 to €100,000	-0.149	-0.0961	-0.103	-0.136	-0.142	-0.138	-0.150
	(0.109)	(0.105)	(0.105)	(0.108)	(0.107)	(0.108)	(0.109)
More than €100,000	-0.197**	-0.193**	-0.207**	-0.183**	-0.186**	-0.184**	-0.199**
	(0.0925)	(0.0894)	(0.0894)	(0.0925)	(0.0915)	(0.0924)	(0.0924)
I'd rather not say	-0.111	-0.110	-0.105	-0.111	-0.112	-0.114	-0.109
	(0.0921)	(0.0860)	(0.0867)	(0.0916)	(0.0914)	(0.0909)	(0.0921)
Constant	3.234***	2.588***	2.289***	3.537***	3.521***	3.721***	3.349***
	(0.189)	(0.253)	(0.203)	(0.211)	(0.213)	(0.221)	(0.214)
Observations	15,910	15,910	15,910	15,910	15,910	15,910	15,910
Number of psid	1,591	1,591	1,591	1,591	1,591	1,591	1,591

Robust standard errors clustered at the individual in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure SI.2. Interactions between behavioural variables and types of sludge predicting sludge acceptability



Sludge: Vulnerability and Acceptability

Start of Block: Welcome and consent

Welcome to this study on your views about administrative tasks! You are being invited to participate in a research study on your views about administrative tasks by a research group led by Prof Leonhard Lades from UCD and the University of Stirling. If you agree to take part in this study, you will be asked to complete an online survey that will take you about 10 minutes to complete. There are minimal risks associated with this research study. Your answers in this study will remain anonymous and confidential. We will make the anonymous data available to other researchers and use it for scientific publications and presentations. You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. If you have questions about this project or if you have a research-related problem, you may contact Leonhard Lades at l.k.lades@stir.ac.uk. By clicking "I agree" below you are indicating that you are at least 18 years old, have read this consent form and agree to participate in this research study.

- ○ I agree
- ○ I do not agree

End of Block: Welcome and consent

Start of Block: Demographics for Quota

What is your gender?

- ○ Female
- ○ Male
- ○ Other

What is you age?

- ○ 18 - 24
- ○ 25 - 34
- ○ 35 - 44
- ○ 45 - 54
- ○ 55 - 64
- ○ 65+

In which region do you live?

- ○ Leinester
- ○ Munster
- ○ Connaught
- ○ Ulster

End of Block: Demographics for Quota

Start of Block: Intro to the tasks

Key information:

On the following 10 pages, you will see short descriptions such as:
"To carry out a task, ...

... you must complete a form."
We will not give you more details about what ***"the task"*** is. Please think of ***"the task"*** as something you would like to complete, because it would provide you with something you want (such as a product, a service, information you need, or another benefit). However, completing ***"the task"*** is not absolutely essential to you. The second part of the sentence (in

the example above: ***"you must complete a form"***) will describe a different administrative procedure on every page. We are mainly interested in what you think about these procedures.

End of Block: Intro to the tasks

Start of Block: Private Sludge Vignettes With Loop Merge

(Page ${lm://CurrentLoopNumber} of 10) ***To carry out a task, ... ${lm://Field/1}***

{${lm://Field/1} is defined as the following.}

1	you must complete a form provided by a private company. The form requests that you list all of your previous addresses.
2	you rely on information from a private company's website. Parts of the website are outdated and some links are broken.
3	you rely on information from a private company's website. The website is full of information and hard to navigate.
4	you must read and understand documents provided by a private company. The documents are written in complex language and use a lot of jargon.
5	you must wait several weeks for a response from a private company without progress updates.
6	you are required to follow a process designed by a private company. The process consists of multiple steps. At any given step, you are not informed of what is required in future steps.
7	you must ask some questions to employees from a private company. The employees are unfriendly and seem to be annoyed by your questions.
8	you must provide sensitive information such as your religious beliefs and sexual orientation to a private company.
9	you must attend a 10-minute in-person meeting at the office of a private company. You cannot choose the date or the time of the in-person appointment.
10	you must print out and send a form in the post to a private company. There is no online option available.

Do you disagree or agree with the following statements?

	Strongly disagree 1	Somewhat disagree 2	Neutral 3	Somewhat agree 4	Strongly agree 5
It would be difficult for me to carry out this task.	○	○	○	○	○
This task would be a hassle to me.	○	○	○	○	○
I would get frustrated when carrying out this task.	○	○	○	○	○
There is a high chance that I would not complete this task.	○	○	○	○	○

Do you disagree or agree with the following statements?

	Strongly disagree 1	Somewhat disagree 2	Neutral 3	Somewhat agree 4	Strongly agree 5
The procedure to complete this task is acceptable.	○	○	○	○	○
The effort needed to complete this task is fair.	○	○	○	○	○

End of Block: Private Sludge Vignettes With Loop Merge

Start of Block: Public Sludge Vignettes With Loop Merge

(Page ${lm://CurrentLoopNumber} of 10) ***To carry out a task, ... ${lm://Field/1}***

{${lm://Field/1} is defined as the following.}

1	you must complete a form provided by a government agency. The form requests that you list all of your previous addresses.
2	you rely on information from a government website. Parts of the website are outdated and some links are broken.
3	you rely on information from a government website. The website is full of information and hard to navigate.
4	you must read and understand documents provided by a government agency. The documents are written in complex language and use a lot of jargon.
5	you must wait several weeks for a response from a government agency without progress updates.
6	you are required to follow a process designed by a government agency. The process consists of multiple steps. At any given step, you are not informed of what is required in future steps.
7	you must ask some questions to staff from a government agency. The staff members are unfriendly and seem to be annoyed by your questions.
8	you must provide sensitive information such as your religious beliefs and sexual orientation to a government agency.
9	you must attend a 10-minute in-person meeting at the office of a government agency. You cannot choose the date or the time of the in-person appointment.
10	you must print out and send a form in the post to a government agency. There is no online option available.

Do you disagree or agree with the following statements?

	Strongly disagree 1	Somewhat disagree 2	Neutral 3	Somewhat agree 4	Strongly agree 5
It would be difficult for me to carry out this task.	○	○	○	○	○
This task would be a hassle to me.	○	○	○	○	○
I would get frustrated when carrying out this task.	○	○	○	○	○
There is a high chance that I would not complete this task.	○	○	○	○	○

Do you disagree or agree with the following statements?

	Strongly disagree 1	Somewhat disagree 2	Neutral 3	Somewhat agree 4	Strongly agree 5
The procedure to complete this task is acceptable.	○	○	○	○	○
The effort needed to complete this task is fair.	○	○	○	○	○

End of Block: Public Sludge Vignettes With Loop Merge

Start of Block: Self-assesses administrative capability

Now we have some more general questions about yourself. Do you disagree or agree with the following statements?

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
I usually understand the content of administrative letters, documents, and emails I receive from the government or from private companies.	○	○	○	○	○
I usually understand the rules, requirements, or contract details that apply to me as a citizen or as a customer.	○	○	○	○	○
This is an attention check. Please select "Agree".	○	○	○	○	○
I keep myself informed on any changes in regulation or contract details.	○	○	○	○	○

Page Break

Do you disagree or agree with the following statements?

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
I often put things off for so long that it has negative consequences	○	○	○	○	○
When I must start a task, I often end up doing something else	○	○	○	○	○
I often postpone things to do until tomorrow	○	○	○	○	○
I often hurry to finish things at the last minute	○	○	○	○	○

End of Block: Self-assesses administrative capability

Start of Block: Scarcity and health

How often does this statement apply to you or your situation?

	Very rarely	Rarely	Sometimes	Often	Very often
I cannot deal with important things properly due to a lack of time.	○	○	○	○	○
I cannot deal with important things properly due to a lack of mental energy.	○	○	○	○	○
I cannot deal with important things properly because I am busy trying to keep on top of my financial situation.	○	○	○	○	○

Page Break

How is your **physical health** in general?

	Very bad	Bad	Fair	Good	Very good
Physical health	○	○	○	○	○

How is your **mental health** in general?

	Very bad	Bad	Fair	Good	Very good
Mental health	○	○	○	○	○

Do you identify as having any of the following disabilities? (Please select all that apply)

- ☐ Intellectual disability
- ☐ Neurodivergent (e.g. Autism, ADHD)
- ☐ Physical disability (e.g. mobility impairment, chronic condition)
- ☐ Learning disability (e.g. Dyslexia, Dyscalculia)
- ☐ Mental health condition
- ☐ Other, please specify

_____

Page Break

How much do you trust the Irish government?

- ○ Not at all1
- ○ 2
- ○ 3
- ○ 4
- ○ Trust completely5

End of Block: Scarcity and health

Start of Block: Demographics

What is your age? (Please enter a number between 18 and 99)

_____

What is your gender identity?

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say
- ○ Other, please specify _____

What is your ethnic group/ background?

- ○ White or White Irish
- ○ Black or Black Irish
- ○ Asian or Asian Irish
- ○ Other, please specify _____

What is the highest level of education which you have already completed?

- ○ No formal qualifications
- ○ Lower secondary school (e.g. Junior Certificate)
- ○ Higher secondary school (e.g. Leaving Certificate)
- ○ Post-secondary school qualification (e.g. Diploma, Certificate, PLC, other)
- ○ Undergraduate degree (e.g. BA, BSc, Bachelors, other)
- ○ Postgraduate degree (e.g. Masters; PhD; Professional Qualification e.g. Bar; Accountancy, other)
- ○ Other, please specify _____

What is your marital status? (Please select the one that most applies to you currently.)

- ○ Single
- ○ In a relationship but not cohabiting
- ○ Cohabiting
- ○ Married
- ○ In a civil partnership
- ○ Separated and not currently in a relationship
- ○ Divorced and not currently in a relationship
- ○ Widowed and not currently in a relationship
- ○ Other, please specify _____

What is your current employment status? (Please pick the category that most applies to you.)

- ○ Working full-time for pay (35 hours or more per week)
- ○ Working part-time for pay (less than 35 hours per week)
- ○ On sick leave but still employed
- ○ Temporarily laid off
- ○ Not currently employed, looking for work
- ○ Unable to work due to health issues
- ○ Student
- ○ Homemaker caring for family
- ○ Retired
- ○ Other, please specify _____

How would you describe the area you live?

- ○ City
- ○ Suburb
- ○ Rural village or remote area
- ○ Other, please specify _____

How many people are there in total in your household, including yourself? (Please only include people who currently live in the household.)

- ○ One adult, no children
- ○ One adult, one or more children
- ○ Two adults, no children
- ○ Two adults, one or more children
- ○ Three or more adults, no children
- ○ Three or more adults, one or more children
- ○ Other, please specify _____

Which category best describes your yearly household income after taxes? Please include ALL income from employment, social security, support from family, government benefits (e.g. disability/ unemployment benefits), retirement accounts, rental property, investments, etc.

- ○ €10,000 or less
- ○ €10,001 to €20,000
- ○ €20,001 to €30,000
- ○ €30,001 to €40,000
- ○ €40,001 to €50,000
- ○ €50,001 to €60,000
- ○ €60,001 to €70,000
- ○ €70,001 to €80,000
- ○ €80,001 to €90,000
- ○ €90,001 to €100,000
- ○ More than €100,000
- ○ I don't know or I'd rather not say

End of Block: Demographics

Start of Block: Extra sludge tasks

This is the last question we have for you. Below is a list of various administrative tasks you may have (successfully or unsuccessfully) worked on in the last three months. Please select **all tasks** you have worked on in **the last three months**.

- [ ] Apply for a license or a permit
- [ ] Apply for financial aid
- [ ] Apply for social benefits
- [ ] Apply for healthcare benefits
- [ ] Apply for a social security number
- [ ] Apply for a rebate
- [ ] Apply for a visa
- [ ] Cancel a service/ membership
- [ ] Claim a tax credit
- [ ] Enroll in an educational programme
- [ ] File a complaint
- [ ] Fill out a form or questionnaire
- [ ] File a tax return
- [ ] Open a bank account
- [ ] Switch service providers
- [ ] Enroll in a retirement plan
- [ ] Apply for a loan

- [ ] Apply for insurance
- [ ] Renew a prescriptiion
- [ ] Register for an event
- [ ] Deactivate a social media account
- [ ] Unsubscribe from a mailing list
- [ ] Register to vote
- [ ] Register at a website
- [ ] Renew a license or passport
- [ ] Apply for a job
- [ ] Apply for a refund

Did we miss other tasks you have worked on? Please list them here.

_____

End of Block: Extra sludge tasks

Start of Block: Thank you

Thank you very much for participating in this survey! The aim of the survey is to better understand whether some people are more strongly influenced by administrative tasks than others and whether some procedures are seen as more acceptable than others. If you have further questions or are interested in the results, please contact Leonhard Lades via l.k.lades@stir.ac.uk. Thanks again! *Please click below to be re-directed to the survey panel company.*

End of Block: Thank you