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Research Article

When Transformation Deters Recycling: The Role of Privacy Concerns

Aylin Cakanlar[a*] | Gergana Y. Nenkov[b] | Karen Page Winterich[c]

[a]*Center for Retailing, Stockholm School of Economics, Stockholm, Sweden*

[b]*Carroll School of Management, Boston College, Massachusetts, United States*

[c]*Marketing Department, Smeal College of Business, Pennsylvania State University, Pennsylvania, United States*

ABSTRACT

Consumers frequently handle documents that contain private information, such as financial records, but how do consumers dispose of these items when they are finished with them? In an era where digital privacy concerns are escalating, understanding the interplay between privacy and physical waste disposal is crucial. This research examines the role of privacy concerns in consumer disposal decisions. Four studies demonstrate that consumers are less likely to recycle items containing private information compared to those without such information. This reluctance to recycle stems from consumers' perceptions that recycling, since it transforms items into something new, entails heightened levels of handling, sorting, and scrutiny by others. Consequently, when disposing of items containing private information, privacy concerns are exacerbated. Consumers feel that such items are more visible to others when placed in recycling bins rather than conventional trash receptacles. This heightened sense of visibility reduces consumers' inclination to recycle items containing private information. However, actions that reduce the visibility of private information, such as document shredding, enhance consumers' willingness to engage in recycling behavior. These findings contribute to the literature on privacy and sustainability and have implications for companies dealing with private information, as well as for policymakers overseeing consumer privacy matters.

KEYWORDS

privacy, recycling, private information, shredding

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1. Introduction

In light of the overwhelming scientific agreement that humanity is facing a climate (Ripple et al., 2020), businesses, policymakers, and scholars are making efforts to influence individuals to change their consumption habits and adopt sustainable practices to mitigate environmental degradation (Nenkov, 2024; White et al., 2019; Winterich et al., 2023). Though recycling is at the end of the 3R Principle of Reduce Reuse, Recycle for good reason, as it has its limitations (e.g., downgrading and limited market for recycled plastics; Hopewell et al., 2009; OECD , 2023), there are some products (e.g., paper, aluminum) for which recycling is still an important sustainable behavior as it not only conserves natural resources, such as trees used for paper, but also saves energy compared to the production of new raw materials (de Wildt & Meijers, 2023). In this research, we focus specifically on paper recycling, which is one of

Corresponding author:
Aylin Cakanlar | aylin.cakanlar@hhs.se | Center for Retailing, Stockholm School of Economics, Stockholm, Sweden.

the most recyclable materials with the highest rates of being repurposed to make new products (Krofsofsky, 2021). While 68% of paper is currently recycled, which is much greater than the 32% average recycling rate across materials (Krofsofsky, 2021), that still leaves millions of tons of paper (17.2 million tons in 2018) headed to the landfill, with paper making up over 10% of landfilled municipal solid waste (EPA, 2018). We show that privacy concerns deter recycling of paper documents with private information and alleviating these concerns (e.g., via shredding) could reduce the amount of paper that ends up in landfills.

Previous research has examined the impact of various factors, including identity (Trudel et al., 2016), consumer characteristics (i.e., environmental concern; Schultz & Oskamp, 1996), and product characteristics (Trudel & Argo, 2013) on engaging consumers in recycling activities. However, research to date has not examined how privacy concerns can shape consumers' engagement in recycling behavior. We aim to fill this research gap by investigating how privacy concerns influence consumers' willingness to recycle.

Individuals frequently handle documents that contain private information, for instance, financial statements (Warford et al., 2021). Even though many companies provide consumers the opportunity to receive such information digitally, nearly three-quarters of consumers actively request utility, insurance, and medical bills to arrive by mail rather than digitally (Cribby, 2021). As the necessity for individuals to secure their private information has never been more pressing (Hummer & Rebovich, 2023; Okazaki et al., 2020), the preference for paper documents may arise due to concerns regarding digital identity theft, where an individual's personal information is illicitly used to commit fraud (McNally & Newman, 2008). The Federal Trade Commission reported receiving 5.7 million fraud and identity theft complaints, with 1.4 million cases specifically related to identity theft (National Council on Identity Theft Protection, 2024). In contrast to perceptions that identity theft is mostly occurring digitally, the U.S. government warns that one of the most common ways for scammers to steal a consumer's identity is by going through their trash to retrieve banks statements or tax documents, a practice known as dumpster diving (USAGov, 2024). This raises the critical question of how consumers dispose of paper documents containing private information. Consider a scenario where a consumer is faced with discarding a copy of their credit report, which may be laden with private information or is at least perceived by consumers to contain private information. Would they opt for the recycling bin or the trash bin? Would they (mistakenly) think that their private documents are safer in the trash (vs. recycling) bin? This study seeks to uncover how consumers dispose of items that contain private information.

Across four preregistered studies (and a fifth one reported in Methodological Details Appendix (MDA); see Appendix B), we demonstrate that consumers are less likely to recycle items containing private information compared to those without such information. This happens because individuals perceive recycling, as it involves transformation of the recycled material into a new item (Winterich et al., 2019), to require more extensive handling, sorting, and inspection by others. Consequently, the act of discarding items with private information heightens privacy concerns, as individuals believe these items will be more visible to others in the recycling bin than in the trash bin. This heightened perception of exposure reduces their inclination to recycle items with private information. However, actions to reduce the visibility of private information, such as document shredding, enhance consumers' willingness to engage in recycling behavior.

Our findings offer several contributions to the literature on privacy and sustainability and have implications for companies within sectors dealing with private consumer information, as well as for policy makers overseeing consumer privacy matters. First, we add to the growing body of literature that examines how privacy concerns can influence consumer behavior at different stages of the consumer decision journey (Brough & Martin, 2020; Brough et al., 2022; Martin & Palmatier, 2020). While existing research has explored the impact of consumers' privacy concerns

during the acquisition and consumption stages of the consumer journey (willingness to disclose personal information; Hallam & Zanella, 2017, purchasing behaviors; Okazaki et al., 2020), it has not yet investigated how consumers dispose of items that contain private information.

Additionally, our research enriches the body of knowledge on understanding consumer sustainable behaviors (Nenkov, 2024; White et al., 2019; Winterich et al., 2019, 2023). Previous studies indicate that consumers are more likely to recycle items that represent their identity (Trudel et al., 2016), yet we find that items with private information, which are identity relevant, are less likely to be recycled. Additionally, consumers are less inclined to recycle products that are physically altered or distorted (Trudel & Argo, 2013). However, our research suggests that this trend is reversed for documents containing private information. In this case, shredding such documents—considered a form of product distortion—can actually increase consumers' willingness to recycle those items as it reduces the visibility of private information. These findings contribute to the growing research focused on consumer recycling behaviors (e.g., Cakanlar et al., 2024; Sun & Trudel, 2017; Wu et al., 2023), offering a more nuanced understanding on how the type of product and the physical state of products can impact recycling.

Furthermore, our results hold significant implications for marketers and policymakers working towards sustainability objectives. Though it may be important to focus on reducing plastic use given limitations of plastic recycling, the efficiency of paper recycling and consumers' continued desire to obtain paper documents with millions of tons of paper still ending up in landfills (EPA, 2018), indicates the importance of identifying factors that boost consumer paper recycling is crucial. Our research reveals that reducing the visibility of private information on documents by shredding can motivate consumers to recycle more.

2. Conceptual Framework

2.1. Recycling and Private Information

In response to escalating environmental challenges, businesses, marketers, and policymakers are urging individuals to adopt sustainable practices like recycling (Li et al., 2021), especially paper recycling as paper is one of the most recyclable materials with the highest rates of being repurposed to make new products (Krofsofsky, 2021). Paper recycling offers considerable environmental and economic advantages (Budolfson et al., 2021). For example, recycling paper can lower energy consumption by 65% when compared to manufacturing new products and can play a crucial role in diminishing water and air pollution (Hole & Hole, 2019). Additionally, it promotes economic resilience by utilizing local materials, bolstering domestic manufacturing, and creating job opportunities in recycling and manufacturing industries (EPA, 2024b). However, might consumers be particularly resistant to recycling documents with private information?

In society, entities such as governments, public services, businesses, and individuals exchange a significant amount of sensitive data for various purposes (Sánchez & Batet, 2016). Documents containing sensitive or private details are regarded as confidential. As discussed earlier, the way people handle these documents is critically important due to the risk of identity theft (McNally & Newman, 2008). Since a common method employed by thieves to acquire victims' personal identification details is to go through their trash to retrieve banks statements or tax documents, a practice known as dumpster diving (USAGov, 2024; Vieraitis et al., 2015), individuals might be particularly vigilant of protecting their private information, impacting the way they choose to dispose of private information.

Previous studies have not explored how the presence of private information affects consumer recycling behaviors. Given the widespread presence of documents containing private information and rising concerns over privacy (Brough & Martin, 2020), it is important to understand how consumers' privacy concerns can affect their recycling behavior. Prior research can

shed some light on this matter. First, research finds that when a product is associated with a consumer's identity, it is perceived as more valuable and more likely to be recycled (Trudel et al., 2016). This finding might suggest that consumers are more likely to recycle documents with private information because it is relevant to their identity and thus more valuable. Additionally, consumers are more likely to recycle products that are in their original form compared to those that are distorted (Trudel & Argo, 2013). As such, consumers should be more likely to recycle documents with private information, unless they are shredded, in which case the distortion should decrease recycling.

However, counter to these predictions from prior research, we propose consumers are less likely to recycle documents with private information, unless it is distorted, as detailed later. We draw upon prior research on the salience of transformation in recycling (Winterich et al., 2019). Though transformation salience can effectively increase recycling rates for products such as cans and bottles, this research did not consider materials with private information. We argue that the process of transforming waste materials into new products or materials, inherent in recycling, amplifies privacy concerns, deterring recycling.

Recycling is "the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products" (EPA, 2023) and encompasses three primary stages: collection, processing, and remanufacturing into new products (EPA, 2024a), with human labor playing a crucial role in sorting activities (Kaya, 2023; Schumacher & Forster, 2022). This transformation that involves human involvement leads people to view recycling as a process more dependent on manual effort compared to other waste disposal methods. Indeed, when participants (N = 100) were presented with the following statements, "The recycling process involves people more than other disposal methods" and "Recycling demands greater manual labor than other disposal methods" ($r = .773$, $p < .001$), their indicated agreement to these statements was above the mean (Midpoint = 4 vs. $M = 4.94$, $SD = 1.50$; $t = 10.940$; $p < .001$), highlighting the view of recycling as a process heavily dependent on human effort.

Given that situational factors influence consumer privacy concerns (Brough & Martin, 2020), the direct involvement of people in recycling processes may heighten concerns among individuals considering discarding items with private information. They may perceive that such items, if placed in the recycling bin, would be more exposed than if discarded in the trash. This concern could deter them from recycling documents or items containing private information, driven by the perception that these items might be visible by others and would be safer in the trash. Stated formally,

H_1: Individuals are less likely to recycle paper items that contain private information compared to items that lack such information.

H_2: This effect will be mediated by increased visibility perceptions for items in the recycling bin.

Given that individuals perceive recycling as a transformation process requiring human effort, their concerns about the visibility of items to others in the recycling bin impact their willingness to recycle items containing private information. Therefore, minimizing the visibility of private information should influence their disposal choices. Specifically, we predict that shredding documents, which involves cutting paper into strips or finer pieces (Madain, 2023), will reduce the perceived visibility of private information, which in turn can increase consumers' willingness to recycle. This prediction is counter to prior research that has linked distortion to lower recycling rates (Trudel & Argo, 2013) because in this case the product value that is lost in distortion, the private information, increases recycling.

H_3: The act of shredding will attenuate the effect of private information on consumers' intention to recycle.

3. Overview of the Studies

We conducted four studies to test our hypotheses. Study 1 provides preliminary evidence supporting our hypothesis that in daily life consumers are less likely

to recycle paper items containing private information compared to paper items without such information (H_1). Study 2 provides further evidence of our effect in a controlled experiment by manipulating the type of information present on the discarded paper. An additional study reported in Appendix B replicates these findings by using a different sample of consumers. Study 3 delves into our proposed mechanism (H_2), showing that discarding paper items with private information heightens concerns over their visibility in recycling bins, which in turn diminishes people's willingness to recycle these items. Study 4 identifies an intervention to increase recycling of documents with private information: document shredding attenuates the effect of private information on consumers' willingness to recycle (H_3).

Across all studies, we did not collect any answers from participants who failed an attention check question at the beginning of the study. For brevity, we report only the key analyses and measures in the paper and report all measures collected for exploratory reasons in Appendix B. In all online studies, which utilized convenience sampling and involved participants recruited from online research platforms, we aimed to recruit at least 100 participants per cell. We do not exclude any participants in any of the studies.

4. Study 1

In Study 1, we examine how consumers recycle paper with and without private information in their daily lives. We posit that consumers are less inclined to recycle papers containing private information, such as credit card statements and medical bills, compared to those without such sensitive details, like pharmacy fliers or advertisement about bank services. This study was preregistered and is available at https://aspredicted.org/KDW_BTD

4.1. Procedure

We aimed to recruit 300 participants from Prolific. In the end, 296 participants completed the study (M_{age} = 41.29, SD = 13.66; 49% female). Participants were presented with ten different types of papers and asked to specify how they dispose of them in their daily lives when shredding is unavailable. Specifically, participants viewed ten items in a randomized order: five of these items contained private information (bank statements, credit card statements, prescription medication documents, tax returns, and employment records), while the remaining five were similar to these documents but contained non-private information (such as advertisements for bank services, credit card offers, pharmacy flyers, TurboTax return ads, and work newsletters). Participants indicated how they usually dispose of these items—whether they place them in either the recycling bin or the trash bin. As a manipulation check, for each item they indicated the extent to which they perceive these documents to be private on a 7-point scale (1 = "not at all", to 7 = "very much"). Finally, participants indicated their level of concern about the environment (1 = "not at all", to 7 = "very much"), responded to two items regarding their recycling habits (how convenient it is to recycle at home, frequency of recycling; r = .816, p < .001), and provided their age and gender.

4.2. Results

4.2.1. Manipulation check

We first examined the extent to which the documents were perceived as private. By using paired sample t-tests, we compared the privacy score of private documents to their non-private counterparts. For example, we compared the privacy score for bank statements to that of the similar but non-private document, advertisements for bank services. The results show that private documents were perceived to be more private than their non-private counterparts (see Table 1).

4.2.2. Recycling rate

We calculated the proportion of participants who placed the item in the recycling bin for each product category. The results are presented in Table 2 below. We then conducted chi-square tests of proportions for each type of paper containing private information and compared them to papers that do not contain any private information (see Table 2). Findings indicate that consumers exhibit a lower tendency to recycle items containing private information compared to those without such information. Including environmental concern and recycling habits as control variables did not change the results.

Table 1. Manipulation Check

Item	Private Mean (SD)	Non-private Mean (SD)	t-test
Bank document (bank information statement vs. advertisement about bank services)	6.63 (.93)	2.11 (1.51)	t = 42.185, p < .001
Credit card (credit card statement vs. advertisement about credit card)	6.51 (1.05)	2.87 (1.92)	t = 29.432, p < .001
Medical document (i.e., prescription medication document vs. pharmacy flyer)	5.97 (1.32)	1.70 (1.22)	t = 39.783, p < .001
Tax return (i.e., tax document vs. TurboTax return advertisements)	6.60 (.94)	2.00 (1.58)	t = 40.876, p < .001
Employment document (i.e., employment record vs. work newsletter)	6.47 (.97)	2.39 (1.60)	t = 37.648, p < .001

SD = Standard Deviation

Table 2. Recycling Rate

Item	Private Recycling Rate	Non-private Recycling Rate	Chi square test
Bank document (bank information statement vs. advertisement about bank services)	33%	54%	$\chi 2$ = 26.695, p < .001
Credit card (credit card statement vs. advertisement about credit card)	35%	46%	$\chi 2$ = 7.781, p = .006
Medical document (i.e., prescription medication document vs. pharmacy flyer)	34%	56%	$\chi 2$ = 29.042, p < .001
Tax return (i.e., tax document vs. TurboTax return advertisements)	33%	54%	$\chi 2$ = 26.780, p < .001
Employment document (i.e., employment record vs. work newsletter)	32%	57%	$\chi 2$ = 37.590, p < .001

4.3. Discussion

Study 1 provides initial evidence for our hypothesis, demonstrating that in their daily lives consumers are less likely to recycle papers containing private information compared to those without such information. Study 2 replicates these findings by manipulating the type of information present on the paper.

5. Study 2

This study used a 2-condition (information type: generic, private) between-subjects design. We aimed to recruit 300 participants from Connect. In the end, 296 participants completed the study (M_{age} = 39.44, SD = 11.98; 42% female). This study was pre-registered and is available at https://aspredicted.org/9KR_X32.

All participants were asked to imagine receiving a personalized letter from the bank, with their name on it. In the private information condition, participants imagined receiving a credit card statement that included their credit card number, and transaction

history. In the generic information condition, participants imagined receiving a document containing general information about the various financial services offered by the bank to its members. Following this, all participants were presented with two bins: one designated for recycling and the other for trash, and they indicated their choice of bin for disposing of the document (see Appendix A for details). Finally, participants indicated their level of concern about the environment (1 = "not at all", to 7 = "very much") and provided their age and gender.

5.1. Results

We conducted a logistic regression to examine the role of private information on participants' disposal choice. Participants' choice of disposal (0 = trash, 1 = recycling) was regressed on information type (0 = generic, 1 = private). As predicted, participants expressed a lower intention to recycle paper containing private information compared to paper that does not include such information (48% vs. 76%; b = −1.230, Wald $\chi 2$ = 23.512, p < .001). The effect remained significant (b = −1.258, Wald χ^2 = 23.203, p < .001) when participants' environmental concerns were added to the model as a covariate. Moreover, the interaction between environment concern and information type was not significant (b = −.099, Wald χ^2 = .300, p = .584).

5.2. Discussion

Study 2 provides further support for our predictions and shows that consumers are less inclined to recycle items that contain private information when compared to items that lack such information. We replicated these findings in an additional study using a student sample (see Additional Study in Appendix B).

6. Study 3

In Study 3, we provide further support for the effect of private information on recycling decisions. Importantly, we examine the underlying mechanism driving this effect (H_2). We propose that the disposal of items containing private information in recycling bins amplifies privacy concerns. This is because the human involvement in the operations of transforming recycled paper into new items leads to a belief that items placed in recycling bins are more visible to others compared to those in traditional trash receptacles. This increased perception of visibility reduces individuals' willingness to recycle items with private information. This study was pre-registered and is available at https://aspredicted.org/3TJ_LFH

6.1. Procedure

This study used a 2-condition (information type: generic, private) between-subjects design. We aimed to recruit 300 participants from Prolific Academic. In the end, 299 participants completed the study (M_{age} = 37.68, SD = 11.89; 48% female). Similar to Study 2, all participants imagine receiving a letter from their insurance provider, with their name on it. In the private information condition, the letter contained their insurance coverage details and other confidential information, including their social security number. In the generic information condition, the letter provided generic information about various insurance policies. Subsequently, participants were presented with two bins (one for recycling and one for trash) and indicated their choice of bin for document disposal. Following this, participants were asked to complete two questions measuring perceptions of the visibility of items in the recycling bin ("People are more likely to see the information on a piece of paper when it is placed in the…" 1 = "Trash bin", to 7 = "Recycling bin"; "When you put a piece of paper in the recycling bin, how likely is it that someone will see the information on the paper?"; 1 = "not likely at all", to 7 = "very likely"; r = .78; p < .001). Participants also responded to three questions regarding human involvement in recycling (see Appendix B for results). At the end, all participants answered a question assessing their environmental concerns ("In general, how concerned are you about the environment?"; 1 = "not at all" to 7 = "very much") and provided demographic information.

6.2. Results

6.2.1. Disposal decision

We conducted a logistic regression using participants' disposal decision as the dependent variable (0 = trash bin, 1 = recycling bin) and the information type as the independent variable (0 = generic, 1 = private). Participants expressed a lower intention to recycle paper containing private information compared to paper that

does not include such information (45% vs. 76%; b = −1.343, Wald χ^2 = 28.466, p < .001). The effect remained significant (b = −1.388, Wald χ^2 = 28.508, p < .001) when participants' environmental concerns were added to the model as a covariate. Moreover, the interaction between environment concern and information type was not significant (b = −.231, Wald χ^2 = 1.274, p = .259).

6.2.2. Perceived visibility

We performed a one-way analysis of variance (ANOVA) to investigate the effect of private information on individuals' perceptions regarding the visibility of items in the recycling bin. The results show a significant difference between two conditions ($M_{private}$ = 4.69, SD = 1.38 vs. $M_{non-private}$ = 4.33, SD = 1.21, F (1, 297) = 5.997, p = .015), suggesting that disposing of items with private information increases the perception that these items will be more visible to others in the recycling bin.

6.2.3. *Process evidence*

We conducted a mediation analysis (Model 4 in PROCESS; Hayes, 2017; 5,000 bootstrapped samples) with disposal decision as the dependent variable, the experimental condition as the independent variable, and perceived visibility as a mediator. The indirect effect of private information on disposal choice through perceived visibility was significant (b = −.21 SE = .10, CI_{95} [−.43−.04]; see Figure 1).

6.3. Discussion

This study provides further support for the role of privacy concerns in disposal decisions (H_1). It also offers evidence for the underlying mechanism (H_2). Considering that recycling is perceived as a transformation process where items are more likely to be handled, sorted, and inspected by others, disposing of items containing private information in recycling bins intensifies the belief that these items will be more visible to others compared to if they were placed in traditional trash receptacles. This heightened perception of visibility consequently reduces individuals' inclination to recycle items containing personal information.

7. Study 4

Study 4 delves into an important moderator, both theoretically relevant and practically important, that influences the impact of privacy on disposal decisions: document shredding. Specifically, the act of shredding documents, which reduces the visibility of private information, can potentially boost consumers' engagement in recycling behaviors. This study was pre-registered and is available at https://aspredicted.org/8VS_9MC

7.1. Procedure

We recruited 700 participants from Prolific Academic (M_{age} = 38.67, SD = 12.85; 50% female) and randomly assigned them to one of four conditions in a 2 (information: private, generic) × 2 (shredding: absent, present) between-subjects design.

All participants imagine receiving a letter from the bank, with their name on it. In the private information condition, participants imagined receiving a credit card statement with confidential details like their credit card number, transaction history, and social security number. In the generic information condition, participants received a document about the bank's general financial services. In the shredding condition, participants were told they shredded the document. In the absence of shredding, no information regarding shredding was given. A pretest confirmed that this act reduces the perceived visibility of the information on the document (see Pretest in Appendix B). Afterward, all participants were presented with two bins (one for recycling and one for trash) and made their choice for document disposal. Participants also indicated the extent to which they perceive the paper as garbage (see Appendix B for details). At the end, participants provided demographic information.

7.2. Results

We conducted logistic regression analyses to examine participants' disposal choice (0 = trash, 1 = recycling) as a function of the information type (0 = generic, 1 = private) and the act of shredding (0 = absent, 1 = present). The results revealed the predicted significant interaction between information type and shredding (b = .893, Wald χ^2 = 7.012, p = .008). The main effect of information type was statistically significant (b = −1.609, Wald χ^2 = 44.200, p < .001) wherein participants exhibited

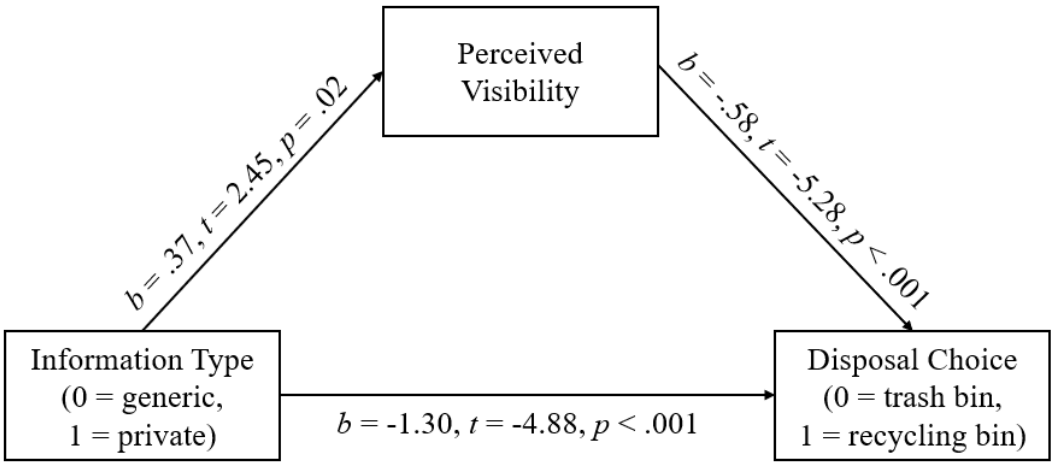

Figure 1. Process Evidence

lower intentions to recycle in the private information condition, while the main effect of the act of shredding was not statistically significant (b = −.316, Wald χ^2 = 1.481, p = .224).

As predicted, the magnitude of the effect of privacy on disposal decisions was decreased when it was first shredded (75% vs. 59%; Wald χ^2 = 9.266, p = .002) compared to when shredding was not mentioned (80% vs. 45%; Wald χ^2 = 44.200, p < .001; see Figure 2). Looking at the contrasts in another way, in the private information condition, the act of shredding increased participants' intention to recycle compared to when shredding was not mentioned (59% vs. 45%; Wald χ^2 = 7.189, p = .007). The effect of shredding was not significant in the generic condition (75% vs. 80%; Wald χ^2 = 1.481, p = .224). Albeit only directional, there is a decrease in recycling when the product is distorted via shredding in the generic information condition, consistent with (Trudel & Argo, 2013).

7.3. Discussion

Results from this study show that shredding documents, which reduces the visibility of private information, can serve as an intervention to boost consumers' engagement in recycling behaviors, providing support for H_3.

8. General Discussion

Individuals frequently deal with documents that hold private information, such as financial records. In four studies (and fifth one reported in Appendix B), we examine how consumers dispose of items containing private details. Our findings show that consumers are less inclined to recycle documents with private information compared to those without. This reluctance stems from the perception that the transformation processes of recycling—often involving sorting, handling, and inspection by others—make such documents more exposed to public view. As a result, the concern over increased visibility results in a reduced propensity to recycle items containing private information. However, shredding documents to reduce the visibility of sensitive information significantly encourages the recycling of items containing such information among consumers.

8.1. Theoretical and Managerial Implications

The current research makes several contributions to the existing literature. Firstly, we contribute to the growing body of literature concerning consumers' privacy concerns (Brough et al., 2022; Martin & Palmatier, 2020). While previous studies have delved into the implications of privacy concerns during the acquisition and consumption stages of the consumer journey (e.g. Okazaki et al., 2020; Schweidel et al., 2022; Song et al., 2021), to the best of our knowledge, previous

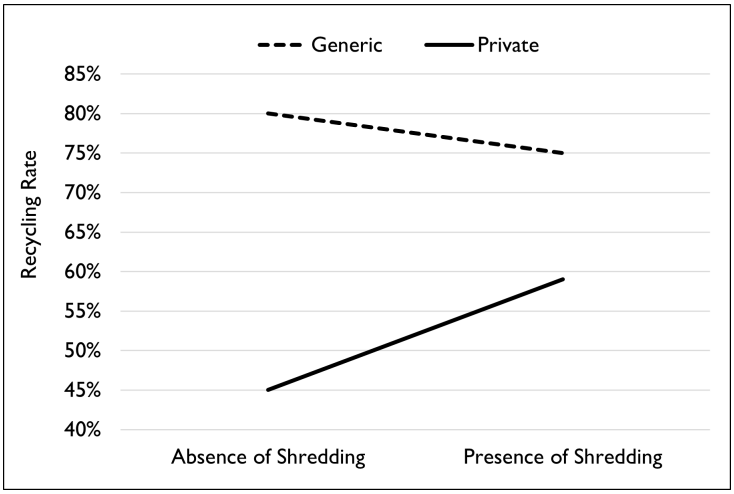

Figure 2. Interaction of Information Type and Shredding

research has not examined how privacy concerns influence consumer behavior during the disposal stage. Our research fills this gap by investigating the role of privacy concerns in consumers' disposal decisions. In doing so, our research also contributes to the existing literature on consumers' engagement in recycling behavior. While this research stream has explored various factors influencing consumers' participation in recycling behavior (e.g., Catlin & Wang, 2013; Kidwell et al., 2013; Trudel & Argo, 2013; Trudel et al., 2016; White et al., 2011; Winterich et al., 2019), our findings reveal an additional factor affecting disposal decisions: consumers' privacy concerns.

Furthermore, our results demonstrate that shredding documents, which diminishes the visibility of private information, can enhance consumers' engagement in recycling items containing such information. Although distorting a product significantly from its original form may cause consumers to view it as less useful, potentially prompting them to discard it in the garbage rather than recycle it (Trudel & Argo, 2013), our findings suggest that the content of the item can influence the degree to which distortion adversely affects recycling behavior. Regarding items containing private information, product distortion—in the form of document shredding—can indeed enhance recycling. However, for items lacking private information, product distortion may undermine recycling behavior, as observed in previous literature (Trudel & Argo, 2013).

Our study illuminates that by reducing the visibility of private information on documents through shredding (or distorting documents in another way when shredding is unavailable), consumers are more likely to recycle. This insight underscores the potential for targeted interventions aimed at promoting responsible waste disposal practices and advancing environmental sustainability initiatives. Companies mailing documents with private information could prompt consumers to shred first, then recycle. By promoting document shredding and other privacy-preserving measures as standard practice, businesses can acknowledge consumer concerns about information security while increasing the recycling of paper waste. Such practices not only comply with privacy laws but also demonstrate a proactive approach in environmental stewardship, potentially setting industry standards. Moreover, these dual benefits reinforce the importance of sustainable waste management strategies that consider both environmental impact and privacy concerns, thereby encouraging a more holistic approach to corporate responsibility. Since not all consumers have a shredder accessible, companies and recycling processors should clarify the transformation process of recyclables to reduce visibility perceptions. That is, recycled paper is mixed with water and other ingredients and fully bro-

ken down into small fibers before being transformed into new paper. Emphasizing this complete breakdown of the paper in the recycling transformation may alleviate privacy concerns. Implementing strategies to facilitate document shredding and clarify the transformation process for paper recycling could be instrumental in mitigating paper waste and fostering a more environmentally conscious society.

The findings of this research also have significant policy implications, suggesting avenues for regulatory bodies and government policymakers to foster an environment that promotes both privacy and recycling. Governments could consider developing policies that require companies to adopt comprehensive data destruction and recycling protocols. Such policies might include mandates for businesses to provide consumers with easy access to shredding facilities or services, and to educate them on the importance of recycling documents that contain private information. Additionally, policymakers could incentivize companies through subsidies or tax benefits to adopt green practices that include secure document disposal and recycling. By embedding these practices into regulatory frameworks, governments can ensure that environmental sustainability and data privacy are not mutually exclusive but are integrated into the fabric of daily business operations, thereby achieving greater compliance and promoting a culture of responsibility and sustainability.

9. Limitation and Future Research Suggestions

Our work has a few limitations, which can open avenues for future research. In this research, we primarily focused on participants' self-reported willingness to recycle items containing private information. However, it is crucial to examine actual recycling behavior and future research could conduct field studies or analyze secondary data to observe real-world recycling actions. Additionally, expanding the study to encompass various contexts and demographic groups would be beneficial in determining whether privacy concerns impact recycling behavior across different populations and cultures. For example, while this study focused on the US, privacy concerns may vary across cultures (Engström et al., 2023). Therefore, future research should aim to improve the generalizability of these findings by investigating how privacy concerns influence recycling behavior in different cultural contexts.

Moreover, we show that consumers exhibit a diminished inclination to recycle items containing private information in contrast to those lacking such details, as individuals anticipate heightened visibility of such items in recycling bins relative to traditional trash receptacles. There may nevertheless be other alternative mechanisms that we have not tested, which also underlie the effect between privacy concerns and recycling decisions. Examining factors such as perceived vulnerability to identity theft, trust in waste management systems, and attitudes towards data security measures could provide deeper insights into the drivers of recycling behavior in the context of privacy concerns. Alternatively, it is possible that the heightened privacy concern when disposing of paper documents may be utilized to increase the transition to digital documents. If companies remind consumers of the potential visibility of private information when disposing of documents in recycling bins when encouraging consumers to go paperless, they may increase the rate of those going paperless compared to focusing on sustainability motivations.

Furthermore, future research could explore how consumers' dispositional characteristics, such as their willingness to disclose information, may influence the extent to which privacy concerns affect their recycling behavior. It is possible that the effect might be stronger for individuals who are more sensitive about disclosing private information, while it may attenuate as individuals become more open to disclosing such information.

In sum, our study underscores the importance of understanding privacy concerns in the context of disposal decisions, and recycling behavior in particular and highlights the potential of interventions targeting document shredding to facilitate greater participation in recycling activities, ultimately advancing environmental conservation objectives while acknowledging consumer privacy concerns.

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ORCID

Aylin Cakanlar
| https://orcid.org/0000-0001-7244-7782
Gergana Y. Nenkov
| https://orcid.org/0000-0003-4580-5972
Karen Page Winterich
| https://orcid.org/0000-0002-4190-4036

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Appendix A. Study Materials and Measures

Study 2

Private information condition

Imagine that you decide to check your mail and notice that you've received a letter from your bank. When you open the letter, you see that they've sent your credit card statement. As you examine the document with your name written on it, you notice that it includes your credit card number, and transaction history.

You review your credit card statement and when you are done, you decide to throw it out.

In which of the two bins below will you dispose of this document?

Generic information condition

Imagine that you check your mail and notice that you've received a letter from your bank. When you open the letter, you see that they've sent you an advertisement. As you examine the document with your name written on it, you notice that it includes only generic information about different types of financial services the bank provides for their members.

You review the advertisement and when you are done, you decide to throw it out.

In which of the two bins below will you dispose of this document?

Study 3

Private information condition

Imagine that you decide to check your mail and notice that you've received a letter from your insurance provider. When you open the letter, you see that they've sent information about your insurance policy. As you examine the document with your name written on it, you notice that it includes your insurance coverage details, and other types of confidential information, such as your social security number.

You review your insurance coverage details, and when you are done, you decide to throw it out.

In which of the two bins below will you dispose of this document?

Generic information condition

Imagine that you decide to check your mail and notice that you've received a letter from your insurance provider. When you open the letter, you see that they've sent information about different policies. As you examine the document with your name written on it, you notice that it includes only generic information about different types of insurance policies.

You review the information and when you are done, you decide to throw it out.

In which of the two bins below will you dispose of this document?

Study 4

Private information condition (shredding available)

Imagine that you decide to check your mail and notice that you've received a letter from your bank. When you open the letter, you see that they've sent your credit card statement. As you examine the document with your name written on it, you notice that it includes your credit card number, transaction history, and other types of confidential information, such as your social security number.

You review your credit card statement and when you are done, you shred the document and then throw it out.

In which of the two bins below will you dispose of this document?

Generic information condition (shredding available)

Imagine that you check your mail and notice that you've received a letter from your bank. When you open the letter, you see that they've sent you an advertisement. As you examine the document with your name written on

it, you notice that it includes only generic information about different types of financial services the bank provides for their members.
You review the advertisement and when you are done, you shred the document and then throw it out.
In which of the two bins below will you dispose of this document?

Private information

Imagine that you decide to check your mail and notice that you've received a letter from your bank. When you open the letter, you see that they've sent your credit card statement. As you examine the document with your name written on it, you notice that it includes your credit card number, transaction history, and other types of confidential information, such as your social security number.
You review your credit card statement and when you are done, you decide to throw it out.
In which of the two bins below will you dispose of this document?

Generic infomration

Imagine that you check your mail and notice that you've received a letter from your bank. When you open the letter, you see that they've sent you an advertisement. As you examine the document with your name written on it, you notice that it includes only generic information about different types of financial services the bank provides for their members.
You review the advertisement and when you are done, you decide to throw it out.
In which of the two bins below will you dispose of this document?

Appendix B. Methodological Details Appendix

1. Additional Study Replicating Study 2 with a Student Sample

This study used a 2-condition (information type: generic, private) between-subjects design. A total of 133 undergraduate students participated in this study in exchange for course credit (Mage = 20.01, SD = .95; 52% female); the study was conducted in a behavioral lab at a U.S. university. All participants were asked to imagine receiving a personalized letter from the bank, with their name on it. In the private information condition, participants imagined receiving a credit card statement that included their credit card number, transaction history, and other confidential details, such as their social security number. In the generic information condition, participants imagined receiving a document containing general information about the various financial services offered by the bank to its members. Following this, all participants were presented with two bins: one designated for recycling and the other for trash, and they indicated their choice of bin for disposing of the document.

Results

We conducted a logistic regression to examine the role of private information on participants' disposal choice. Participants' choice of disposal (0 = trash, 1 = recycling) was regressed on information type (0 = generic, 1 = private). As predicted, participants expressed a lower intention to recycle paper containing private information compared to paper that does not include such information (39% vs. 71%; b = -1.361, Wald $\chi 2$ = 13.548, p < .001).

2. Pretest

We recruited 100 participants from Connect via Cloud Research (Mage = 39.12, SD = 12.33; 44% female). Participants imagined receiving a credit card statement that included their credit card number, transaction history, and other confidential details. Once they review the credit card statement, they imagine shredding and throwing out. They indicated the extent to which shredding can reduce visibility of information in a document (1 = not at all, 7 = very much).

The mean perceived visibility score was significantly above the midpoint (midpoint = 4), indicating that participants perceived shredding as effective in reducing the visibility of information in a document (M = 5.91, SD = 1.19; t(99) = 16.051, p < .001).

3. Additional Analyses

3.1. Study 3

In this study, participants also answered three questions examining the role of human involvement in the recycling process ("The recycling process involves people more than other disposal methods"; "Recycling demands greater manual labor than other disposal methods" and "Recycling involves more hands-on work than other disposal methods"; α = .93, p < .001). However, a factor analysis demonstrated that these three items and the two items measuring perceived visibility (our focal mediator) loaded on the same factor (see results in Table B.1), suggesting that the two scales are capturing a similar construct.

Therefore, we focused on our key mediator items in the paper, as they more precisely capture the underlying mechanism (i.e., perceived visibility). Nevertheless, we created an index measure of all items and conducted a mediation analysis using PROCESS Macro (Model 4 with 5000 bootstrap samples, 95% CI corrected intervals), which once again revealed a significant indirect effect (a $\times$ b = $-$.19, SE = .09, CI_{95} [$-$.39, $-$.04]).

Table B.1. MDA Factor Loadings

Item	λ
The recycling process involves people more than other disposal methods.	0.819
Recycling demands greater manual labor than other disposal methods.	0.911
Recycling involves more hands-on work than other disposal methods.	0.914
People are more likely to see the information on a piece of paper when it is placed in the... - Trash bin: Recycling bin.	0.669
When you put a piece of paper in the recycling bin, how likely is it that someone will see the information on the paper? - Not likely at all: Very likely	0.705

Extraction Method: Principal Component Analysis; λ = Factor Loading

3.2. Study 4

In this study, participants indicated the extent to which they perceive the paper as garbage (1 = "not at all" to 7 = "very much"). Similar to other studies, participants indicated their level of concern about the environment (1 = "not at all" to 7 = "very much").

We conducted a 2 (information type: generic, private) × 2 (shredding: absent, present) analysis of variance (ANOVA) on participants' perception of the paper as garbage. The results revealed a significant effect of information type ($F(1, 702) = 17.138$, $p < .001$), and a non-significant effect of shredding ($F(1, 702) = 1.166$, $p = .281$). There was a marginally significant interaction of information type × the act of shredding ($F(1, 702) = 3.299$, $p = .070$).

Planned contrasts showed that the magnitude of the effect of privacy was decreased when it was first shredded ($M_{private} = 4.51$ $SD = 2.09$ vs. $M_{generic} = 4.86$ $SD = 1.98$; $F(1, 702) = 2.663$, $p = .104$) compared to when shredding was not mentioned ($M_{private} = 4.98$ $SD = 1.92$ vs. $M_{generic} = 4.07$ $SD = 2.13$; $F(1, 702) = 17.988$, $p < .001$). In the generic information condition, there was no difference in perceptions of paper as garbage ($M_{no-shred} = 4.98$, SD = 1.92 vs. $M_{shred} = 4.86$, SD = 1.98; $F(1, 702) = .294$, $p = .588$). However, in the private information condition, participants perceived the shredded paper more as a garbage compared to the non-shredded paper ($M_{no-shred} = 4.07$, SD = 2.13 vs. $M_{shred} = 4.51$, SD = 2.09; $F(702) = 3.898$, $p = .049$).

Environmental concern. The interaction between information and shredding remained significant (= .871, Wald $\chi^2 = 6.234$, $p = .013$) when participants' environmental concerns were added to the model as a covariate. The three-way interaction between environmental concern, shredding, and type of information was not significant (b = .15, SE = .25, t(700) = .59, p = .55, CI_{95} [-.35, .65]).