

Get a Word in Edgewise: Post Character Limit and Social Media-Based Customer Service

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Abstract

In this paper, we study the role of extending character limits on firm responses on social media. By leveraging a natural experiment setting: the unexpected increase in post character limit on Twitter, we empirically investigate the impact on the linguistic styles of social media-based customer service responses. Using a Regression Discontinuity in Time Design and leveraging a panel dataset, our results suggest that extending character limits influences firm to change the linguistic styles in their responses, which could influence consumers' perceptions. Our results show that extending post-character limits significantly reduces the readability ease of firm responses, on average, while increasing the concreteness and personal closeness scores of these responses, on average. We show that these changes were effective in influencing customer satisfaction.

Keywords: social media, customer service, post character limits, linguistic styles

1. Introduction

Social media platforms have evolved from being online communities for sharing posts to vital relationship marketing tools and customer service channels (Gunarathne et al., 2018, 2021). According to a Sprout Social report (2021), 56% of surveyed consumers reported that the main reason for interacting with firms on social media is to receive customer service. Delivering customer service on social media can impact customer satisfaction, which is determined by the influence on consumers' perception of fairness of the complaint resolution (del Río-Lanza et al., 2009; Gunarathne et al., 2018; Smith et al., 1999; Sun et al., 2021). Given the public nature of social media platforms and the lack of nonverbal cues for communication with

customers, implementing proper complaint response strategies has been an important topic for practitioners and academicians (Herhausen et al., 2019; Maecker et al., 2016).

Social media platforms offer minimal media richness, making language and verbatim communication fundamental elements of firms' responses (Ludwig & de Ruyter, 2016). Through specific word categories and language shifts, it is possible to convey a firm's intentions and shape consumers' perceptions (Packard et al., 2018; Sela et al., 2012). However, social media platforms, such as Twitter, impose certain restrictions that control their basic element, i.e., posts. One key restriction is the post character limit (i.e., the maximum number of characters allowed in a post), which can affect how firms construct their responses to consumers. Thus, firms need to carefully select words and linguistic styles within the limited space that influence customers' perceptions.

Social media platforms have continuously refined their character limit rules. For example, Facebook increased its status update character limit in 2011 from 500 to 63,000.¹ Weibo, a Chinese microblogging platform, extended its character limit in 2016 from 140 to 2000.² The effect of such changes is inevitable when it comes to user engagement (Wang & Greenwood, 2020). However, given the importance of language choices in shaping customers' perceptions (Packard et al., 2018; Packard & Berger, 2021; Sela et al., 2012), it is unclear how extending a character limit could impact linguistic styles in firm responses. Therefore, in this study, we take the first step to fill this gap in the literature and ask: How does extending post character limits affect firm responses to their customers on social media in terms of their linguistic styles? Specifically, we explore the effect on linguistic styles that are based on psychological constructs and can influence consumers' perception of firms' behavior, which are: i) readability

¹ <https://www.zdnet.com/article/facebook-increases-status-update-character-limit-to-63206/>

² <https://mashable.com/2016/01/21/weibo-character-limit/>

ease (Lin & Qiu, 2013); ii) concreteness (Larrimore et al., 2011; Tausczik & Pennebaker, 2010); and iii) psychological closeness (Sela et al., 2012).

We examine the effect of extending limits on linguistic styles for several reasons. First, extending limits allows for more space and freedom for firms to change their tone and linguistic styles in their responses. Second, linguistic styles are as equally important as the content of a post. Two messages can contain similar content, but their effects differ based on their word choices (Tausczik & Pennebaker, 2010). Speech act theory posits that speech acts do not merely present information, but are also crafted to convey a speaker's intentions and achieve an intended effect on the listener (Ludwig & de Ruyter, 2016). Finally, in the service recovery context, the tone of and cues in firm responses to customers can be more important than receiving redress or compensation (Davidow, 2003). We propose that extending post limits may instigate changes in the linguistic styles of firm responses that can influence customers' perceptions of the degree of interactional justice in firms' behavior. In the absence of face-to-face interactions, linguistic factors that are based on social and psychological constructs and embedded in the language used can be important impression tactics to influence consumers' perceptions. (Ludwig et al., 2014).

We leverage a panel dataset of customer-initiated Twitter threads mentioning the official accounts of 10 airlines in North America. On November 7, 2017, Twitter unexpectedly extended its post (tweet) character limit from 140 to 280.³ Leveraging this increase as a source of an exogenous shock, we use a Regression Discontinuity in Time (RDiT) approach to empirically estimate the effect of extending character limits on the linguistic styles of firm responses (Hausman & Rapson, 2018). Our results show that: 1) the readability ease score of firm responses reduces, on average, which is counterintuitive; 2) concreteness and psychological closeness scores increase, on average. In a follow-up question, we empirically investigate whether these linguistic changes are effective and find that our theorizing is supported. Linguistic styles can serve as signals to firms' interpersonal efforts that influence customers' perceptions.

To our best knowledge, this is the first study to empirically examine the effect of extending character limits, a social media platform feature, on linguistic styles of firm responses. A notable exception is a study by Wang and Greenwood (2020) that examined the effect of increasing post length limits on users'

engagement and posting behavior (i.e., the length and volume of posts). Our study differs in that it examines the language styles of posts beyond the effect on the length of responses and in the context of social media-based customer service, which has gained increasing interest in the literature. From the follow-up question, we contribute to the literature in understanding how subtle changes in linguistic styles can influence consumers' evaluations, in turn, affecting customer satisfaction. The findings have important implications for firms delivering customer service on social media and provide insights that will be informative in understanding the consequences of post character limit changes on their efforts.

2. Related literature

2.1. Social media-based customer service

With mobile technologies and the internet advances, social media platforms have been an important channel for customer service and marketing communication. Social media interactions can affect upselling efforts and churn risk, which depends on customers' previous service experience (Maecker et al., 2016). Thus, social media-based customer service has become an emerging topic of interest in the Information Systems (IS) literature that examined the dynamics of firm responses on social media (Gunaratne et al., 2018, 2021; Sun et al., 2021). We contribute to this stream of literature by examining how extending post-character limits could affect the dynamics of social media-based customer service.

2.2. Consumers' perceptions of justice in complaint handling

Customer complaint management describes the strategies and tactics that firms use to resolve an issue. Considered a defensive marketing strategy, complaint management has received great academic attention over the past few decades. It can affect customer satisfaction through its influence on consumers' perception of justice, which refers to consumers' evaluations of the degree of fairness in firms' complaint handling efforts (Smith et al., 1999; Tax et al., 1998). A three-dimensional view of perceived justice has evolved: i) distributive justice (deals with decision outcomes); ii) procedural justice (deals with decision-making procedures); iii) interactional justice (deals with interpersonal behavior or manner in the enactment of

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https://blog.twitter.com/en_us/topics/product/2017/tweetingmadeeasier.html

procedures and delivery of outcomes) (Tax et al., 1998). Prior literature has examined both the direct effect of different organizational response efforts, such as apology and redress, on the dimensions of justice, and the indirect effect of response efforts on customer satisfaction (through their effect on consumers' perceived justice) (Blodgett et al., 1997; Smith et al., 1999; Tax et al., 1998).

Given that language is interpersonal, examining linguistic styles is relevant to interactional justice because they involve the manner and tone in which customers are treated. Interactional justice perceptions can be formed based on cues provided during a customer service encounter. Several elements in a textual response have been identified in prior studies that are associated with interactional justice, such as truthfulness and directness (Blodgett et al., 1997; Ulrich, 1984).

Compared to offline settings, social media has lower levels of media richness, which limits the ability to transmit cues that could influence consumers' evaluations of interactional justice. Traditional cues inferred from face-to-face service interactions are absent on social media (Ludwig et al., 2013). Traditional channels offer opportunities for firms to communicate not only verbal, but also nonverbal cues impacting consumers' evaluation of interactional justice and post-complaint outcomes, such as customer satisfaction. To overcome this limitation, firms can use language variations that serve as antecedents of perceived interactional justice (Herhausen et al., 2019; Packard et al., 2018; Xu & Zhao, 2022). We contribute to this stream of literature by examining how changes in linguistic styles of firm responses affect customer satisfaction.

2.3. Psycholinguistic theory

Studies in IS and marketing have highlighted the importance of language used in the context of customer service. Firms craft their responses by using linguistic styles that can affect customers' behavior, and subtle wording shifts can convey information about the customer-firm relationship, which shapes consumers' attitudes towards firms (Packard et al., 2018; Sela et al., 2012).

From a psychological perspective, linguistic styles provide insights beyond content words and can impact customer decision-making (Ludwig et al., 2013, 2014). Prior research has examined linguistic styles relying on literature based on psycholinguistic theories. Packard and Berger (2021) analyzed customer-firm interactions in an online apparel retailer and found that employees using more concrete language are perceived to be helpful. Stephen et al. (2015) examined how brand

content characteristics on social media, such as persuasion, affect consumer engagement and found less clear posts have positive consumer responses, such as more likes. Relying on speech act theory, prior studies have shown that firms use linguistic styles in speech acts when crafting posts to influence consumers' behaviors. Based on psycholinguistic theories, Lee et al. (2019) studied user-generated content and assessed their perceived quality through the use of certain linguistic styles, such as pronouns and function words. Our study contributes to this stream by investigating how linguistic styles that are driven by the use of psychological-based linguistic characteristics change following a platform feature change.

3. Hypothesis development

Social media platforms are designed with features or properties that could either enable or constrain users' behaviors on these platforms, which are often referred to as affordances (Evans et al., 2017). Post-character limits are one form of affordances that could impact users' digital behavior, including firm responses. Limited research has examined the relationship between character limits and linguistic styles. For example, Gligorić et al. (2018) provided evidence on the link between character limits and individual creativity. Oz et al. (2018) found that shorter Twitter posts were more impolite and uncivil compared to longer Facebook posts. Due to character limits, firms might use specific and limited linguistic styles to deliver information, forcing them to sacrifice the tone of their responses over the content. Thus, we argue that with extended character limits, firms are more likely to change their linguistic styles as extended limits could afford those firms to support their strategies in influencing consumers' perceptions.

First, we examine readability ease, which refers to the effort and educational level required to comprehend a piece of text. Based on the syntactical and style elements of a given text, different readability measures have been developed to reflect text readability. Prior literature has suggested that perceived ease of processing information creates positive evaluations. Theoretically, when a message is presented syntactically and stylistically in a way that matches the receiver's processing strategy, a cognitive fit occurs (Vessey & Galletta, 1991). In online reviews, readability ease is an important factor in influencing the perceived usefulness of reviews (Liu & Park, 2015). Dillard et al. (2007) stated that consumers prefer reviews with understandable content compared to reviews with complicated content.

However, prior studies have also found a link between the difficulty of processing information and

judgments of required task skills (Song & Schwarz, 2008). Consumers can interpret a text characterized by processing difficulty as a signal of an agent's skills, and this difficulty can increase consumers' perceptions of an agent's competence and task complexity (Thompson & Ince, 2013). In online managerial responses, higher readability scores in managerial responses (i.e., responses that use more complex words) can positively affect customers' incremental satisfaction as customers perceive firms to be more knowledgeable and competent, indicating firms' care for their customers.

With constrained character limits, posts are often written in shorter sentences with simple words and structures (Johnson, 2015; Rimjhim & Chakraborty, 2018). For example, posts that are constrained by the 140-character limit on Twitter contain more abbreviations (Gligorić et al., 2018). Thus, extended limits may afford and influence firms to respond using longer sentences with more complex words, decreasing the readability ease scores (Jaidka et al., 2018; Xu & Zhao, 2022). However, a countervailing mechanism may occur. The Menzerath-Altmann law, which is a linguistic law of the structure of language, indicates that the longer the language construct or sentence, the shorter its constituents or words (Naumann et al., 2012). In other words, restricted character limits can force posts to be written with shorter sentences containing more complex words. Walsh and Brinker (2016) compared post lengths in different types of mediums and found that mediums that allowed for longer texts were associated with shorter words. Therefore, extending limits may result in sentences containing shorter words. With the availability of more space, firms are given more space to respond with fewer longer words which makes the text easier to process (Lin & Qiu, 2013). Thus, we introduce two competing hypotheses:

H1A: *Extending character limits will be positively associated with the readability ease of firm responses.*

H1B: *Extending character limits will be negatively associated with the readability ease of firm responses.*

Second, we examine concreteness, which as opposed to abstractness, describes the extent to which words refer to specific and vivid objects, places, or behaviors (Hansen & Wänke, 2010). Determined by word choices, concrete language is more specific, making it less open to different interpretations and allowing for faster information processing (Elliott et al., 2015). Extant research has identified three function word categories that signal concrete language: articles, prepositions, and quantifiers (Larrimore et al., 2011; Tausczik & Pennebaker, 2010). Concrete language can increase a consumer's perception of how understanding and attentive a customer service agent is to their specific needs, leading to increased customer satisfaction and future purchase volume (Packard & Berger, 2021). Prior

studies have found that concreteness can decrease the feeling of psychological distance, increase engagement, and shape listeners' behaviors and attitudes (Elliott et al., 2015; Hansen & Wänke, 2010). In online question-answer sites, concrete language was found to increase users' evaluation of the helpfulness of the content (Peng et al., 2020).

Studies have shown that users tend to use more concrete language when writing longer reviews (Aerts et al., 2017), and when character limits are constrained, people tend to write in a more abstract language (Lu et al., 2021). In addition, with limited space, removing function words, such as articles, is an effective strategy for a post's success as these words do not carry actual information (Gligorić et al., 2019). When character limits increase, social media posts can include more function words (Boot et al., 2019; Gligorić et al., 2018). Therefore, we expect firms to increase the concreteness levels of their responses to customers by increasing their usage of articles, prepositions, and quantifiers after extending character limits. Therefore, we hypothesize that:

H2: *Extending character limits will be positively associated with language concreteness in firm responses.*

Finally, we examine psychological closeness which is measured as the number of first-person pronouns in a firm response. Personal pronouns have been shown to reflect the mental and social status of a speaker and can reflect the relationship closeness between conversing partners and signal a sense of group identity (Íñigo-Mora, 2004; Sela et al., 2012). Greater use of personal pronouns signals a greater involvement with the receiver (Walther, 2007), which is an important factor in influencing consumers' perception of interactional justice. We focus on first-person pronouns for several reasons. First-person pronouns can affect customers' perceptions of the emotional and behavioral involvement of service agents in customer-firm interaction, which could increase customers' actual and intended purchases (Barcelos et al., 2018; Packard et al., 2018). Also, psycholinguistic research has found that the frequent use of first-person pronouns is characterized by telling the truth (Pennebaker 2011).

With constrained character limits, conversing partners are less likely to express psychological closeness as compared to longer posts, such as on other platforms that do not exhibit strict limits (Lin & Qiu, 2013). Also, under the 140-character limits, the first-person pronoun, *I*, for example, will most likely be omitted (Gligorić et al., 2020). Therefore, with the extending character limits, we expect an increase in first-person pronoun use as extended limits can afford firms to use first-person pronouns to signal their desire to establish psychological closeness, which in turn

influences customers' perceptions of firm behavior. Thus, we hypothesize that:

H3: *Extending character limits will be positively associated with the psychological closeness of firm responses.*

4. Research methodology

4.1. Context and data

On November 7, 2017, Twitter unexpectedly extended its character limit from 140 to 280 in languages impacted by the limit constraint, such as English. This exogenous change provides an opportunity for a natural experiment to examine how extending character limits affects the linguistic styles of firm responses. To empirically estimate the effect of extending the character limit, we leverage a panel dataset from Twitter, which is constructed of customer-initiated threads mentioning the official accounts of 10 major airlines in North America from March 2017 to June 2018.⁴ A customer initiates a thread by mentioning the official airline's Twitter handler and the firm (airline) may decide to respond to the customer, which could result in a series of exchanged tweets that form a thread. We consider threads that received at least one firm response as we are interested in examining the changes in linguistic styles before and after the post-limit change. We consider threads that were 1) written in English; 2) not retweets; 3) did not include multi-user participation; 4) contained three or more words in a firm response. We examine the first firm response in a thread for our analysis and calculate the average for each linguistic style for each firm on each day. The panel data size is 4,752 firm-day.

4.2. Measures

We operationalize our main outcome variables as follows. For H1, the dependent variable is $\ln(\text{Avg.RE.Score})_{it}$, the log-transformed average readability ease (RE) score of firm i responses on day t .⁵ RE score measures the number of words in a sentence and the number of syllables in a word in a given text and evaluates the complexity of the text to determine the level of education needed to understand that text (Kincaid et al., 1975). RE score, which is a simple quantity suitable for a short amount of text (tweet), produces values between 0 and 122. Higher values indicate greater ease in readability, while lower values

indicate lower ease in readability. Since tweets are generally short and the use of punctuation is often unconventional, we followed Davenport and DeLine (2014) who uses a modified form of the Flesch Reading Ease (FRE) and treats each response as having a single sentence. The standard FRE formula is:

$$RE = 206.835 - 1.015 \left(\frac{\#words}{\#sentence} \right) - 84.6 \left(\frac{\#syllables}{\#words} \right) \quad (1)$$

For H2, the dependent variable is $\ln(\text{Avg.Concreteness})_{it}$, the log-transformed average concreteness score of firm i responses on day t . Three linguistic categories are used: articles, prepositions, and quantifiers. The concreteness score for a firm response is the sum of the three categories. To extract these categories, we used LIWC, a natural language processing technique and linguistic dictionary developed by Pennebaker et al. (2015) for exploring the psychological meaning of words. For H3, the dependent variable is $\ln(\text{Avg.First.Pronoun})_{it}$, the log-transformed average number of first-person pronouns in firm i responses on day t . We used singular and plural first-person pronoun categories in LIWC to measure first-person pronouns in a firm response. Table 1 presents the summary statistics for the key variables in our study.

Table 1. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Avg.RE.Score	4,752	69.843	6.345	9.992	103.70
Avg.Concreteness	4,752	3.570	1.125	0.00	15.00
Avg.First.Pronoun	4,752	1.606	0.530	0.00	5.00
Avg.Num.of.Char	4,752	103.576	24.887	38	275

4.3. Empirical model

We employ a regression discontinuity design (RDD) to estimate the main effects of extending post-character limits (D. S. Lee & Lemieux, 2010). RDD is a non-experimental econometric approach and is used to establish the causal effect of a treatment or an intervention by considering the observations that lie close to a threshold value that determines whether a treatment is assigned (D. S. Lee & Lemieux, 2010). In this study, we adopt an RDIT framework, with the duration as the running variable and the character limit change date (i.e., November 7, 2017) as the

⁴ The airlines are (in alphabetical order): Air Canada, Alaska Air, American Airlines, Delta Airlines, Frontier Airlines, Southwest Airlines, Spirit Airlines, United Airlines, and Westjet

⁵ Replication with the untransformed dependent variable yield consistent results.

discontinuity threshold. This allows us to control for potential different non-linear time trends before and after the change. RDiT approach has been used to estimate the causal impacts of policy changes across different disciplines (Hausman & Rapson, 2018). Similar to Lee et al. (2018), we specify the following parametric polynomial model with fixed-effects and compare the same subject (i.e., firm) that receives the treatment before and after the post-character limit change:

$$Y_{it} = \beta_0 + \beta_1 Post_t + \sum_{p=0}^P \beta_{2,p} Duration_t^p + \sum_{p=0}^P \beta_{3,p} Post_t \times Duration_t^p + time_t + v_i + \varepsilon_{it}, \quad (2)$$

where Y_{it} denotes one of our dependent variables for firm i in day t . $Post_t$ is a dummy for whether day t is on or after the character limit change. $Duration_t$ is the number of days after the character limit change; a positive value indicates that day t is after the change and vice versa. The interaction term $post_t \times Duration_t^p$ is included to allow the regression model to differ on both sides of the threshold point (D. S. Lee & Lemieux, 2010). The value of P , which is the maximum polynomial order, ranges from 0 to 2 to assess the robustness of our estimation results. $time_t$ corresponds to day-of-week and holiday dummies, such as New Year's Day and New Year's Eve, to control for time effects, and v_i is firm fixed-effects. ε_{it} is the error term.

5. Results

In this section, we report our results from the baseline model (Equation 2) and additional analysis. Our results rely on several assumptions and require robustness tests. First, we control for a set of confounding variables, such as the traffic of tweet volume and customers' social influence (i.e., number of followers). Second, RDiT relies on discontinuity within a short time window (D. S. Lee & Lemieux, 2010). We follow the "augmented local linear" approach by Hausman and Rapson (2018) to check the robustness of the RDiT. Third, the length of the observation window can affect the RDiT results. Therefore, we use ± 6 months and ± 5 months as the observations window and re-run our RDiT analysis. Results are robust. Fourth, to ensure that our results are not driven by spurious correlations, we run a falsification test focusing on the periods before the character limit change. We should not observe significant estimates of the $Post$ term since there is no real change in the character limit. Finally, the number of characters and linguistic styles in responses

could suffer from endogeneity. We estimate a two-stage least squares (2SLS) model with an instrumental variable. Due to the page limit, we present the most critical test, instrumental variable regression. Results from other robustness tests are consistent with our main findings.

5.1. Baseline results

The estimation results of Equation 2 for each of our dependent variables are shown in Tables 2-4, where the main variable of interest is $Post$. Table 2 shows the results for the readability ease score (i.e., when $\ln(Avg.RE.Score)$ is the dependent variable). The estimates of $Post$ are negative and significant across different model specifications, supporting H1B. Column 1 indicates that the character limit change led to an average decrease of 8% in the RE score of firms' responses.⁶ In other words, extending character limits led to higher readability (i.e., more complex). Table 3 shows the results for the concreteness score (i.e., when $\ln(Avg.Concreteness)$ is the dependent variable). The estimates of $Post$ are positive and significant, supporting H2. Column 1 indicates that the character limit change led to an average increase of 32% in the concreteness score of firms' responses. Table 4 presents the results for psychological closeness (i.e., when $\ln(Avg.First.Pronoun)$ is the dependent variable). The estimates of $Post$ are positive and significant, supporting H3. From Column 1, the finding indicates that the post character limit change led to an average increase of 32% in the psychological closeness score of firms' social media-based customer service responses. Overall, the results suggest that extending character limits had an impact on the linguistic styles of firm responses to customers on social media.

Table 2. Effects of extending post-character limit on readability ease score

Dependent Variable:	Polynomial	Polynomial	Polynomial
	Order 0	Order 1	Order 2
$\ln(Avg.RE.Score)$	(1)	(2)	(3)
Post	-0.081*** (0.017)	-0.037** (0.012)	-0.046*** (0.010)
Duration		-0.000* (0.000)	0.000 (0.000)
Duration ²			0.000 (0.000)
Post × Duration		-0.000** (0.000)	-0.000* (0.000)
Post × Duration ²			-0.000 (0.000)
Constant	4.272*** (0.009)	4.264*** (0.009)	4.271*** (0.010)
Firm FE	Yes	Yes	Yes

⁶ Percentage change is calculated as $[(e^{-0.081} - 1) \times 100\%] = -7.6\% \approx 8\%$. The negative sign indicates a decrease.

Time Dummies	Yes	Yes	Yes
Observations	4,752	4,752	4,752
R-squared	0.189	0.212	0.213

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 3. Effects of extending post-character limit on concreteness score

Dependent Variable:	Polynomial Order 0	Polynomial Order 1	Polynomial Order 2
<i>ln(Avg.Concreteness)</i>	(1)	(2)	(3)
Post	0.282*** (0.043)	0.195*** (0.046)	0.150*** (0.042)
Duration		-0.000 (0.000)	0.001 (0.001)
Duration ²			0.000 (0.000)
Post × Duration		0.001** (0.000)	0.001 (0.001)
Post × Duration ²			-0.000 (0.000)
Constant	1.079*** (0.028)	1.062*** (0.048)	1.092*** (0.030)
Firm FE	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes
Observations	4,752	4,752	4,752
R-squared	0.102	0.110	0.111

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 4. Effects of extending post-character limit on psychological closeness

Dependent Variable:	Polynomial Order 0	Polynomial Order 1	Polynomial Order 2
<i>ln(Avg.First.Pronoun)</i>	(1)	(2)	(3)
Post	0.389*** (0.060)	0.159*** (0.036)	0.174** (0.077)
Duration		0.000 (0.000)	-0.000 (0.001)
Duration ²			-0.000 (0.000)
Post × Duration		0.001* (0.000)	0.001 (0.002)
Post × Duration ²			0.000 (0.000)
Constant	1.415*** (0.037)	0.262*** (0.030)	0.246*** (0.069)
Firm FE	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes
Observations	4,752	4,752	4,752
R-squared	0.218	0.059	0.059

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

5.2. Instrumental variable regression

A central challenge in our main analysis is endogeneity: the number of characters in a Twitter post affects each of the dependent variables. We rely on instrumental variable regression to alleviate this concern. A valid instrumental variable should exogenously determine the number of post characters but has no effect on any of the dependent variables

except through its effect on the number of characters. We use the change in the post-character limit as an instrumental variable. It is a valid instrument if it correlates with the number of characters, which within our sample, there is evidence of a significant correlation. We estimate a 2SLS regression model with an instrumental variable, which is the most consistent and unbiased estimator for a panel dataset with endogenous variable(s) (Angrist & Pischke, 2008). Formally, we estimate the 2SLS regression as follows:

$$Avg.Num.of.Char_{it} = \alpha_0 + \alpha_1 Post_t + \delta X_{it} + time_t + v_i + \tau_{it}, \quad (3)$$

$$Y_{it} = \gamma_0 + \gamma_1 Avg.Num.of.Char_{it} + \lambda X_{it} + time_t + v_i + \varepsilon_{it}, \quad (4)$$

Equation 3 is our first-stage regression, where *Avg.Num.of.Char_{it}* is instrumented by *Post_t*. Equation 4 is the second-stage regression; *Y_{it}* represents one of the dependent variables for firm *i* in day *t*; *X_{it}* represents a vector of control variables; λ is a vector of coefficients. Our regression is just-identified; thus, we are incapable of assessing overidentifying restrictions. However, we obtain the F-statistics to evaluate instrument exogeneity, which satisfies the validity of the instrument. Table 5 presents the results of Equation 3 and shows a high correlation between our instrumental variable and the independent variable. Table 6 presents the second-stage estimation results for each of the dependent variables. Overall, the findings are consistent with our main findings.

Table 5. First-stage results

Variables	(1) Avg.Num.of.Char
Post	27.040*** (4.687)
Constant	90.388*** (2.286)
F statistic	33.28***
Observations	4,752
R-squared	0.388

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 6. Relationship between number of characters and linguistic styles (2SLS)

Variables	(1) ln(Avg.RE.S core)	(2) ln(Avg.Concreteness)	(3) ln(Avg.First.Pronoun)
Avg.Num.of.Char	-0.00293***	0.01035***	0.01108***
Constant	4.571*** (0.022)	-0.017 (0.114)	-1.280*** (0.242)
Control Variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes
Observations	4,752	4,752	4,752
R-squared	0.091	0.396	0.396

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6. Extension: Effectiveness of linguistic style changes in firm responses

Given our theorization that linguistic styles serve as cues affecting consumers' evaluations, it would be interesting to check whether the changes in linguistic styles positively influence customer satisfaction (Smith et al., 1999; Tax et al., 1998). We measure *Customer.Satisfaction_{it}*, which is the number of satisfied customers on day *t* for firm *i*, by checking if a customer at the end of a thread expressed their satisfaction (using words such as “thanks”) or indicated to like the firm's response via Twitter's built-in Like feature (Hu et al., 2018). We use a fixed-effects negative binomial model to test the effect and include: i) the *Post* dummy variable; ii) the measures of linguistic styles; iii) interaction terms between each linguistic style measure and the *Post* dummy; iv) one day lag of total customer satisfaction. Table 7 presents our results. We find that the estimate of *Post* is negative and significant, which can be due to higher customer expectations that firms would provide more explanations especially when the character limits increase. The estimate of *Avg.RE.Score* × *Post* is positive and significant, indicating that the average effect of RE, in terms of increasing customer satisfaction, increased after extending character limits. We notice a similar effect for *Avg.First.Pronoun* × *Post*. These results suggest that the firm efforts are well justified, supporting our theorization. However, the estimate of *Avg.Concreteness* × *Post* is insignificant in terms of influencing customer satisfaction. This could be due to the context of this study. On social media, customers might expect more precise responses to their requests. Quantifiers and prepositions, such as “Few” and “Alot”, may indicate imprecise language.

Table 7. Comparing the effectiveness of linguistic styles before and after extending character limits

Variables	Customer.Satisfaction
Post	-1.296*** (0.390)
Avg.RE.Score	-0.016*** (0.004)
Avg.Concreteness	0.064** (0.028)
Avg.First.Pronoun	-0.029 (0.048)
Avg.RE.Score × Post	0.017*** (0.005)
Avg.Concreteness × Post	-0.046 (0.032)
Avg.First.Pronoun × Post	0.104* (0.055)
Customer.Satisfaction _(t-1)	0.025*** (0.002)
Constant	3.181***

	(0.312)
Firm FE	Yes
Time Dummies	Yes
Observations	4,658

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7. Discussion

In this study, we took the first step to empirically examine the impact of extending character limits on social media platforms on linguistic styles of firm responses. Our basic proposition is that extending character limits may have afforded firms to change their linguistic styles that can influence customers' evaluations of firms' behavior. Using a dataset of firm responses to customers on Twitter, our findings show the average readability ease of firm responses decreases after extending post-character limits, while the average concreteness and psychological closeness in firm responses increases. Empirical analysis of the follow-up research question shows that these changes were effective in increasing customer satisfaction, except for concreteness, which could be due to the context of this study, i.e., social media-based customer service.

From a theoretical point of view, our findings are consistent with the affordance framework (Evans et al., 2017; Jaidka et al., 2019). Moreover, our findings are consistent with prior studies highlighting the importance of communication style or word choices in customer service (Packard et al., 2018; Packard & Berger, 2021; Sela et al., 2012). Also, our findings are consistent with the consumers' perceptions of the justice framework that linguistic styles can serve as cues influencing consumers' evaluation of interactional dimension, in turn, influencing customer satisfaction.

This study has several primary contributions. To our best knowledge, it is amongst the first in the literature that examines the effect of a social media feature change on firm responses. A notable exception is a study by Wang and Greenwood (2020) that examined the impact of extending length limits on user engagement. Also, it contributes to the literature on the role of social media platforms in customer service by examining how length limits influence firms' linguistic choices, which did not receive attention from academic researchers despite the impact being unclear. We show that linguistic styles can serve as antecedents that influence consumers' evaluations.

This study has important practical implications as it highlights the potential impact of extending character limits in triggering changes in firm responses. This highlights the importance of understanding how to better utilize the limited pose space to influence consumers' perceptions. This study provides evidence underscoring the importance of language when

delivering customer service as it plays an important role in communicating firm interpersonal behavior. Firms can benefit from extending character limits as they devise specific response strategies.

Our study is not without limitations. First, we examine the impact of extending post-character limits on Twitter. The results may not be generalizable to other platforms, such as online review platforms. Second, researchers could identify different boundary conditions that could moderate the impact of extending character limits on the linguistic styles of firm responses. Third, our data is based on airlines on social media platforms. We should be careful in generalizing the results to other industries. Finally, future research can examine other dimensions of firm response behavior, such as politeness, that could influence consumers' perceptions.

8. References

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