

ADVERTISING RIVALRY AND DISCRETIONARY DISCLOSURE

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Advertising is a critical competition device that affects interactions among firms in the product market. I find that a nontrivial portion of public firms, even among those with intense advertising activities, do not disclose advertising expenses in their financial statements, indicating significant disclosure discretion. I further use product category-level data to construct measures that capture firm-level advertising rivalry. I predict and find that the likelihood of disclosing advertising expenses is negatively associated with advertising rivalry. This association is more pronounced when firms have less trackable media outlets, more volatile underlying advertising expenditures, and more mature products. These findings suggest that firms consider their advertising expenditures proprietary and that concerns of product market competition discourage their disclosure of advertising expenses despite the materiality constraint.

BIOGRAPHICAL SKETCH

Chuchu Liang earned her Master's degree in Professional Accounting and Bachelor's degree in Information Management and Information Systems from Tsinghua University in 2013 and 2011, respectively. In 2013, she joined the doctoral program in Accounting at the S.C. Johnson Graduate School of Management at Cornell University. Her work has been presented at numerous conferences, including the American Accounting Association Annual Meeting, the Financial Accounting and Reporting Section Midyear Meeting, and the MIT Asia Conference in Accounting.

Chuchu Liang's dissertation was supervised by Dr. P. Eric Yeung.

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CHAPTER 1

ADVERTISING RIVALRY AND DISCRETIONARY DISCLOSURE

1.1. Introduction

Advertising is an important competition device that affects interactions among firms in the product market (Bagwell 2007).¹ Literatures in economics and marketing suggest that advertising is often *combative* in nature, i.e., advertising mainly “steals” business from rivals and has negative net externalities on rivals’ profits (e.g., Borden 1942; Lambin 1976; Netter 1982). As a response to a firm’s increase in advertising, rivals tend to increase reciprocal advertising efforts, which in turn reduce the firm’s profits. In equilibrium, profit-maximizing firms have excessive advertising, resulting in a prisoner’s dilemma (e.g., Marshall 1919; Stigler 1968; Dixit and Norman 1978). In this study, I examine the effect of advertising rivalry on firms’ discretionary disclosure of advertising expenses in their financial statements.

Examining discretionary disclosure of advertising expenses is important. First, as advertising expenditures represent firms’ strategic brand-related investments, advertising expenses disclosed in audited financial statements may reveal valuable information (at least confirmatory signals, Ball et al. 2012) to market participants who are unlikely to accurately estimate firms’ advertising expenditures due to search costs (e.g., Gow et al. 2017).² Second, accounting researchers have not recognized the significant discretion in firms’ disclosure of advertising expenses despite the

¹ The importance of advertising in product market is also reflected in the large amount of corporate advertising expenditures. For instance, in 2014 alone, companies in the United States spent a total of estimated \$297 billion on advertising across all industries and media outlets, which is comparable to the \$283 billion spent on research and development (R&D) directly funded by companies (IHS Markit 2015; Wolfe 2016).

² For instance, see the article “Apple mysteriously stopped disclosing how much it spends on ads”, *Business Insider*, 11/24/2016, in which financial analysts argued that firm-disclosed advertising expenses were useful for them.

materiality constraint, which has implications for research on firm valuation and investment policies.³ Third, prior studies tend to examine the effects of general competition measures on broad disclosure outcomes, generating mixed evidence for the proprietary cost hypothesis (see Beyer et al. 2010 and Berger 2011 for detailed discussions). My study considers the multi-dimensional nature of competition and links a unique dimension of competition (i.e., advertising rivalry) to a specific disclosure outcome (i.e., disclosure of advertising expenses).

Advertising rivalry is defined as the intensity of a firm's competition with its advertising rivals, where an advertising rivalry is a peer firm that advertises in at least one overlapping product category. Advertising rivalry between any two firms can be captured by their similarity in terms of allocating advertising expenditures across product categories. Intuitively, advertising rivalry between two firms is higher when they: i) advertise in more overlapping product categories, and ii) allocate a higher proportion of their advertising expenditures in the overlapping product categories.

I hypothesize that firms faced with more intense advertising rivalry have stronger incentives to hide their underlying advertising expenditures in order to avoid triggering rivals' aggressive responses, and thus are less likely to disclose advertising expenses in their financial statements.⁴ Specifically, when advertising rivalry is more intense, firms with high advertising expenditures are less likely to disclose in order to avoid signaling their aggression and triggering rivals' reciprocal actions. Firms with low advertising expenditures are also less likely to disclose in order to avoid signaling

³ For instance, the Walt Disney Company spent almost one billion dollars (or 4% of sales) in 2001 on advertising over major media outlets tracked by a third-party company, but did not disclose its advertising expenses in its 10-K.

⁴ Statement of Position (SOP) 93-7, later codified to Accounting Standards Codification (ASC) 720-35, requires firms to expense advertising costs either as incurred or the first time the advertising takes place, except for direct-response advertising that may be capitalized when stringent conditions are met. Thus, advertising expenses reflect almost all the underlying advertising expenditures.

their weakness and triggering rivals' predatory actions (e.g., Darrough 1993; Clinch and Verrecchia 1997).

This hypothesis may not be supported empirically for two reasons. First, current US Generally Accepted Accounting Principles (GAAP) explicitly require public firms to disclose the amount of advertising expenses when material, so competition should not affect the disclosure decision as long as the materiality constraint is binding (Heitzman et al. 2010).⁵ Second, to the extent that rivals can accurately estimate firms' advertising expenditures (i.e., not proprietary), the disclosure decision is inconsequential.

Empirically, I rely on a proprietary dataset from an industry-leading media-tracking company that estimates firms' advertising expenditures over major media outlets including television, print, radio, outdoors and digital, for top 50,000 advertising firms at the product category level. This third-party tracked advertising data has three advantages. First, I use it to identify real non-disclosers (i.e., firms that have advertising activities but do not disclose advertising expenses). Second, I use it to proxy for firms' underlying advertising expenditures, as the third-party tracked advertising expenditures and firms' advertising expenditures are likely to be highly correlated.⁶ Third, I use it to construct firm-level advertising rivalry measures, as the data contains information of both public and private firms.

I manually match the third-party data with Compustat/CRSP via firm names and

⁵ ASC 720-35 "The notes to financial statements shall disclose the total amount charged to advertising expense".

⁶ In the subset of firms that disclose advertising expenses, the third-party tracked advertising expenditures and the firm-level advertising expenses are highly correlated, both cross-sectionally and time-serially (correlation > 0.8).

retain firms covered by both datasets during the period of 1995-2009.⁷ By doing so, I construct a sample of firms with actual advertising activities and available disclosure choices. Using this sample, I find 54% of firms with actual advertising activities do not disclose advertising expenses. More importantly, 30% do not disclose even among firms with third-party tracked advertising expenditures exceeding or meeting the conventional materiality threshold (i.e., 1% of sales).⁸

To test my main hypothesis, I develop the firm-level advertising rivalry measure as the sum of pairwise cosine similarities between a firm and its advertising rivals in the economy, where a pairwise cosine similarity is based on the distribution of the firm's third-party tracked advertising expenditures across product categories. A firm's advertising rivalry is higher if it has more advertising rivals, advertises in more overlapping product categories, and allocates a higher proportion of its advertising expenditures in the overlapping product categories.

Consistent with the hypothesis that advertising rivalry on average discourages firms' disclosure of advertising expenses, I find a negative association between the likelihood of disclosing advertising expenses and advertising rivalry, after controlling for the materiality of advertising expenses and other voluntary disclosure determinants (e.g., capital market incentives). In contrast, other general competition measures used in prior studies are largely unassociated with the disclosure likelihood once controlling for industry fixed effects, consistent with my measures of advertising rivalry capturing a distinct dimension of competition at the firm-level.

⁷ Starting the sample in 1995 is reasonable, because the first universal accounting standards on advertising costs (i.e., SOP 93-7) became effective in June 1994, before which firms' advertising data were less comparable in the cross-section as firms had large flexibility in choosing whether capitalizing or expensing advertising costs. My sample ends in 2009 due to the budget constraint.

⁸ Before 1994, the SEC required public firms to disclose advertising costs if the item exceeds 1% of sales (Reg. 210.12-11). Financial Reporting Release (FRR) No. 44 removed this bright-line materiality threshold in 1994.

I then examine the heterogeneity in the effects of advertising rivalry. First, I predict and find that the negative association between advertising rivalry and the disclosure likelihood is less pronounced when the firm advertises on more trackable media (proxied by fewer, less diversified, and national media outlets), consistent with its advertising expenditures being less proprietary when rivals can observe its advertising activities with lower costs. Second, I predict and find that the negative association is more pronounced when the firm has more volatile underlying advertising expenditures, consistent with firm-disclosed advertising expenses being a more useful signal for rivals when its underlying advertising expenditures are more uncertain. Third, I predict and find that the negative association is more pronounced when the firm has more mature products, consistent with advertising triggering more aggressive rivals' response via a stronger business stealing effect for mature products than new products.

The main inferences hold in a variety of robustness checks. Specifically, I continue to find a negative association between advertising rivalry and the likelihood of disclosing advertising expenses when using variants of advertising rivalry measures, in a matched sample based on the entropy balancing method (Hainmueller 2012), or in a subsample of firms with material advertising expenditures. Analysis on the impact threshold of confounding variable (Larcker and Rusticus 2010) suggests that in order to overturn the inferences of advertising rivalry, a potential omitted variable would need to have a larger impact than that of any current control variables. Finally, I find a negative association between advertising rivalry and narrative advertising-related disclosures in 10-Ks.

This study contributes to the literature on firms' discretion in disclosing material information in regulatory filings (e.g., Gleason and Mills 2002; Ellis et al. 2012; Rice and Weber 2012; Ayers et al. 2015; Koh and Reeb 2015). Using the third-party data,

my study estimates that over 50% of firms with actual advertising activities do not disclose advertising expenses, and about 30% of firms with third-party tracked advertising meeting or exceeding the conventional materiality threshold do not disclose, which is surprising given that US GAAP requires public firms to separately disclose advertising expenses. The disclosure discretion introduces measurement errors in firms' advertising data, which may have implications for empirical research. For instance, it might explain the insignificant results on the value-relevance of advertising expenses in prior studies.⁹

My study also contributes to the literature on the proprietary cost of disclosure arising from product market competition. Prior studies provide conflicting evidence on this line of research, due to various empirical challenges such as difficulties in capturing the multi-dimensions of competition and a misalignment between the dimension of competition and the type of disclosure (e.g., Beyer et al. 2010, Berger 2011). To address these issues, recent studies examine more granular competition in the technological dimension (Cao et al. 2018; Ettredge et al. 2016). My study advances the literature by proposing new measures to capture the competition in the advertising dimension, and providing evidence supporting the view that proprietary cost of disclosure arises from advertising rivalry despite the materiality constraint and the visibility of advertising activities.

1.2. Literature Review and Hypothesis Development

1.2.1. Advertising Rivalry

Advertising is one of the most important competition devices that affect a firm's competitive position in the product market. Specifically, advertising is used to attract

⁹ For instance, Lev and Sougiannis (1996) and Core et al. (2003) have advertising expenses as the control variable. They replace missing advertising expenses with zero and find insignificant results in the value-relevance test.

customers and increase revenues by enhancing product awareness and strengthening brand loyalty (Bagwell 2007).

Findings from prior research in economics and marketing largely suggest that advertising on average imposes negative net externalities on product market rivals (e.g., Borden 1942; Lambin 1976; Netter 1982). Specifically, advertising mainly has a “business stealing” effect, i.e., it redistributes the market share by attracting customers from rivals, which hurts rivals’ demand (e.g., Erickson 1985; Eckard 1987; Dekimpe and Hanssens 1995). In some circumstances (e.g., for new products), advertising may have positive externalities via a “market expanding” effect, i.e., it expands the aggregated market demand by attracting new customers to the product, which mitigates the business stealing effect (e.g., Nelson 2005; Tremblay and Tremblay 2005).

Due to the negative net externality of advertising, rivals have incentives to respond to a firm’s advertising with reciprocal advertising efforts, which in turn reduce the firm’s profits. Theoretical research on advertising competition largely suggests that in equilibrium, profit-maximizing firms have excessive advertising (e.g., Stigler 1968; Dixit and Norman 1978). Specifically, similar to a Bertrand competition characterized by price war, firms compete in advertising may engage in advertising war, resulting in a prisoner’s dilemma. For example, in the 1960s, tobacco companies (e.g., Reynolds and Philip Morris) advertised heavily on TV. A firm’s advertising canceled out the effects of the others, and all firms’ profits fell by the cost of advertising. After 1970, tobacco companies ceased TV advertising due to the advertising ban. Consequently, cigarette advertising decreased and industry profits rose (e.g., Brown 1978).

Advertising rivalry is distinct from other dimensions of product market competition. For instance, firm A uses advertising to compete with firm B in the product category of coffee, while uses R&D to compete with firm C in the product

category of coffee machine. A is more likely to compete head-to-head with B than C, due to the combative nature of advertising. Thus, advertising rivalry involves a different set of rivals and has different implications for how firms compete compared to other forms of rivalry such as quantity or R&D.

Despite the economic importance, no research in accounting or finance has examined product market competition in the advertising dimension. This study fills this gap by focusing on how advertising rivalry shapes corporate disclosure policies.

1.2.2. Product Market Competition and Disclosure of Discretionary Expenses

Discretionary expenses such as advertising or R&D expenses represent intangibles expenditures that convey value-relevant information (e.g., Hirschey and Weygandt 1985; Lev and Sougiannis 1996; Core et al. 2003). Despite that GAAP requires firms to disclose material discretionary expenses, a high proportion of Compustat/CRSP firms have missing values in advertising ($\geq 75\%$) or R&D ($\geq 60\%$), suggesting potentially severe disclosure discretion.

Product market competition is arguably an important incentive for the non-disclosure, as discretionary expenses can convey valuable information for rivals to act against the disclosing firm. However, the literature provides limited evidence on how product market competition affects disclosure of discretionary expenses in financial statements, due to at least three reasons.

First, there is a lack of alignment between the dimension-specific competition and the type of disclosure. Because product market competition is multi-dimensional, findings from prior studies on price or quantity competition (e.g., Karuna 2010; Li 2010) may not generalize to advertising or R&D. Recent studies (Cao et al. 2018; Ettredge et al. 2016) recognize the importance of alignment and examine the relation between the more granular R&D-related competition and R&D-related voluntary

disclosures.

Second, measuring the intensity of competition is difficult. While earlier studies often use Compustat-based industry concentration as a proxy for product market competition, this proxy is problematic because industry concentration in theory can be positively or negatively associated with competition (e.g., Sutton 1991; Raith 2003) and measurement error can be severe when omitting private firms (Ali et al., 2009, 2014). Recent accounting studies use empirical measures such as industry PP&E or industry price-cost margins (e.g., Karuna 2007, 2010; Li 2010). However, these measures are also based on public firms only and measured at the industry-level, which may lack sufficient variation to explain firm-level discretionary disclosures.

Third, it is empirically difficult to distinguish real non-disclosers from firms with immaterial information. Koh and Reeb (2015) use patent data to show that firms with missing R&D expenses on average have more R&D outcomes than firms reporting zero R&D expenses.

Compared with R&D-related disclosure, advertising-related disclosure has attracted much less attention in accounting research. Heitzman et al. (2010) and Simpson (2008) examine the disclosure decision of advertising expenses, both of which use the setting of FRR No.44 that removes the bright-line materiality threshold. Specifically, Heitzman et al. (2010) focus on the role of materiality in firms' disclosure decision of advertising expenses, while Simpson (2008) focuses on both capital market benefits and product market costs of disclosure arising from

advertising's positive spillover.¹⁰ My study contributes to the literature by using the third-party tracked advertising data to estimate the extent to which firms with missing advertising expenses might have material advertising expenses and examine the effect of advertising rivalry on firms' disclosure of advertising expenses even when the materiality constraint is likely to be binding.

1.2.3. Hypothesis Development

My first hypothesis concerns the average effect of advertising rivalry on firms' disclosure of advertising expenses in financial statements. Due to the combative nature of advertising, the aggressiveness of rivals' response increases with advertising rivalry. I therefore predict that firms faced with intense advertising rivalry are less likely to disclose advertising expenses.

This prediction is in line with the prior theoretical work. If the proprietary cost of disclosing advertising expenses increases with advertising rivalry, theory would predict a negative relation between advertising rivalry and the disclosure of advertising expenses, holding constant the level of advertising expenditures and other disclosure costs and benefits (e.g., capital market incentives for disclosure) (Verrecchia 1983).

More specifically, this prediction is consistent with disclosure theories regarding the effect of competition among existing rival firms (e.g., Darrough 1993; Clinch and

¹⁰ Simpson (2008) has two major problems: (1) Simpson (2008) assumes that firms' disclosure of advertising expenses becomes purely voluntary after FRR No.44, which is not true since GAAP still explicitly requires public firms to disclose the amount of advertising expenses. As a result, her findings on voluntary disclosure incentives could be simply driven by immateriality. (2) Simpson (2008) estimates the main variables of interest (e.g., advertising spillover) based on the data in the pre-FRR No.44 period, which may contain severe measurement errors. Specifically, FRR No.44 became effective in the same year as SOP 93-7, before which firms had relatively large discretion in terms of capitalizing or expensing advertising costs; thereby firms' advertising expenses may not be comparable in the cross-section prior to FRR No.44, which makes Simpson (2008)'s results less reliable.

Verrecchia 1997). Due to the combative feature of advertising rivalry, the proprietary cost of disclosure is likely to increase in advertising rivalry for any given level of advertising expenditures. When the advertising rivalry is more intense, firms with high advertising expenditures (i.e., higher than rivals' expectation) are less likely to disclose in order to avoid signaling their aggression and triggering rivals' reciprocal actions. Firms with low advertising expenditures (i.e., lower than rivals' expectation) are also less likely to disclose in order to avoid signaling their weakness and triggering rivals' predatory actions.

This prediction may not be supported empirically due to two factors: materiality constraint and visibility of advertisements. I discuss each factor and argue that advertising rivalry still affects firms' disclosure of advertising expenses despite these two factors.

First, as GAAP requires firms to disclose material advertising expenses, competition should not affect the disclosure decision as long as the materiality constraint is binding (Heitzman et al. 2010). However, prior studies suggest that managers have leeway to disclose material information in regulatory filings (e.g., Ellis et al. 2012; Rice and Weber 2012; Ayers et al. 2015; Koh and Reeb 2015). There are three potential reasons for the leeway. First, there is no bright-line materiality threshold, so the evaluation of materiality involves some discretion subject to managers', auditors' and the SEC's professional judgments (Acito et al. 2009, 2016). Second, subjective components in the accounting standards allow managers some flexibility in classifying or aggregating financial statement items (e.g., McVay

2006).¹¹ Third, the expected noncompliance costs of failing to disclose could be low (e.g., Ellis et al. 2012).¹² For instance, auditors may be less concerned about the non-disclosure of advertising expenses since it does not directly affect the bottom line. Auditors and the SEC may also be unaware of the firms' compliance with the disclosure requirement.

Second, to the extent that rivals can accurately estimate a firm's advertising expenditures, the disclosure decision is inconsequential. However, at least three points suggest that advertising expenses provide useful information to rivals. First, search costs prevent rivals from tracking all types of advertising activities, especially direct-mail and cooperative advertising (e.g., Gow et al. 2017). Second, even if rivals can track all types of advertising activities, they are unlikely to accurately estimate the dollar amount of advertising expenditures such as the costs of designing advertisements. Third, advertising expenses disclosed in audited financial statements are largely considered credible and thus can confirm rivals' information from other sources (e.g., Ball et al. 2012). Moreover, acquiring information from financial statements is less costly than tracking a firm's advertising activities.¹³

In spite of the tension, I hypothesize that firms faced with more intense advertising

¹¹ Advertising costs may be classified as other types of expenses or as a direct reduction of revenue. For instance, firms may classify the costs on printing coupons as either advertising or SG&A expenses, presumably depending on whether the coupons are classified as advertising or as promotional materials. In the case of cooperative advertising arrangements where a firm agrees to reimburse a reseller for a portion of the advertising costs incurred by the reseller, the firm may record this sales incentive as an adjustment of the selling prices. Alternatively, the firm may record the costs as advertising expenses if the firm can justify that it receives or will receive the documentation of the advertising costs from the reseller (Emerging Issues Task Force No. 01-9).

¹² A search of the SEC comment letters revealed very rare instances of firms targeted for enforcement actions as a result of failing to report advertising expenses, suggesting low observed costs of noncompliance.

¹³ Following Lev and Sougiannis (1996), I find that among disclosers, advertising expenses are positively associated with one-year ahead operating income after controlling for the third-party tracked advertising, consistent with advertising expenses containing incremental information about firm fundamentals (untabulated).

rivalry are less likely to disclose advertising expenses in their financial statements, either on the face or in the footnotes (in the alternative form):

H1: Advertising rivalry is negatively associated with the likelihood of disclosing advertising expenses.

My next three hypotheses focus on the heterogeneity in the effects of advertising rivalry due to the variation in the related proprietary cost: advertising media trackability, advertising expenditures volatility, and product maturity. First, the more trackable media outlets the firm uses, the less proprietary the information conveyed by advertising expenses. Specifically, when the firm advertises on fewer or less diversified media, it is less costly for its rivals to observe its advertisements. Additionally, a national media outlet is more visible than a local media outlet because the former allows a wider audience, especially geographically distant rivals, to easily follow the advertisements (e.g., Genztkow and Shapiro 2008; Gurun and Butler 2012). I therefore expect the proprietary cost of disclosure to be smaller when the firm advertises on more trackable media outlets (i.e., fewer, less diversified or national media).

H2: The negative association between advertising rivalry and the likelihood of disclosing advertising expenses is less pronounced when firms advertise on more trackable media outlets.

In the absence of firms' disclosures, rivals might estimate a firm's advertising expenditures by observing historical advertising activities or acquiring costly information from other sources. The more volatile the firm's underlying advertising expenditures, the less precisely rivals can estimate its advertising expenditures, and the more useful firm-disclosed advertising expenses would be for rivals to revise their expectations. This prediction is consistent with the Bayesian theory and prior

empirical findings that investors and analysts rely more on firm-reported earnings to revise their forecasts when ex ante uncertainty of earnings is high (e.g., Yeung 2009; Sheng and Thevenot 2012). I therefore expect the proprietary cost of disclosure to be larger when the firm's underlying advertising expenditures are more volatile.

H3: The negative association between advertising rivalry and the likelihood of disclosing advertising expenses is more pronounced when the firm has more volatile underlying advertising expenditures.

Prior research in economics and marketing suggests that advertising has different degrees of externalities on rivals along product life cycle. Specifically, when a product is new, advertising may attract new customers to the product and thus expand the market-wide demand, which mitigates the business stealing effect (e.g., Roberts and Samuelson 1988). When a product is mature and well known to customers, advertising primarily attracts rivals' customers and has little impact on the market-wide demand (e.g., Dekimpe and Hanssens 1995). As rivals' responses tend to be more aggressive when advertising has a stronger business stealing effect, I expect the proprietary cost of disclosure to be larger when the firm's product is more mature:

H4: The negative association between advertising rivalry and the likelihood of disclosing advertising expenses is more pronounced when the firm has more mature products.

1.3. Research Design

1.3.1. Empirical Model

I use a probit model to estimate the effect of advertising rivalry on the binary disclosure choice. Specifically, I estimate the following regression model:

$$\text{Disclosure}_{it} = \alpha_1 \text{AdRivalry}_{it} + \sum_{j=2} \alpha_j \text{Controls}_{jit} + \text{Industry FE} + \text{Year FE} + \varepsilon_{it} \quad (1)$$

where *Disclosure* is the disclosure choice for firm *i* at the end of year *t*, *AdRivalry*

is the advertising rivalry for firm i in year t , *Controls* is a vector of firm-year level control variables, *Industry FE* are industry fixed effects (at the four-digit SIC level) and *Year FE* are year fixed effects.¹⁴ Firm fixed effects are not included primarily due to the little within-firm variation of the dependent variable (less than 5% firm-years have non-zero changes in *Disclosure*). All continuous variables are winsorized at 1% and 99% percentiles. Standard errors are clustered by firm (Petersen 2009).¹⁵ My first hypothesis predicts a negative coefficient on *AdRivalry* ($\alpha_1 < 0$).

1.3.2. Measures for Disclosure Decision

The dependent variable *Disclosure* is a binary variable that equals one if firm i discloses advertising expenses in financial statements (on the face or in the footnotes) in year t , and zero otherwise. Empirically, I first require firms to be covered by both Compustat/CRSP and the third-party tracked advertising dataset, to ensure that my sample firms are subject to GAAP's disclosure requirement and have non-zero advertising activities. I then identify disclosers versus non-disclosers based on firm-disclosed advertising expenses recorded in Compustat fundamental annual file, i.e., $Disclosure = 1$ if firm i has non-missing *xad* in year t , and $= 0$ if *xad* is missing.¹⁶

1.3.3. Measures for Advertising Rivalry

Following a similar intuition as the product similarity measure in Hoberg and Phillips (2016), I construct a measure for advertising rivalry using the following two steps.

First, I calculate the pairwise cosine similarity between firm i and firm j 's vectors

¹⁴ The main results are robust when including industry×year fixed effects.

¹⁵ The main results are robust if clustering standard errors by industry or double clustering by firm and year.

¹⁶ Manual check for a random sample of 150 firms' 10-Ks suggests a high accuracy rate (> 95%) for non-financial firms' advertising expenses recorded in Compustat.

in year t : $S_{it}=(S_{it,1},S_{it,2},\dots,S_{it,k},\dots,S_{it,924})$ and $S_{jt}=(S_{jt,1},S_{jt,2},\dots,S_{jt,k},\dots,S_{jt,924})$, where the k^{th} element of each vector ($S_{it,k}$ or $S_{jt,k}$) equals the firm's *ratio* of its third-party tracked advertising in product category k to its total advertising expenditures:¹⁷

$$w_{ijt} \equiv \cos(\theta_{ijt}) = \frac{S_{it}S'_{jt}}{\sqrt{S_{it}S'_{it} \times S_{jt}S'_{jt}}} = \frac{\sum_{k=1}^K S_{it,k}S_{jt,k}}{\sqrt{\sum_{k=1}^K S_{it,k}^2} \sqrt{\sum_{k=1}^K S_{jt,k}^2}}$$

Second, I sum up the pairwise similarities between firm i and all the other J firms in the economy in year t , where the economy consists of all firms covered in the third-party tracked database (i.e., top 50,000 advertising firms in year t , including both public and private firms), and take the natural logarithm to arrive at a firm-year level measure of advertising rivalry (a numerical example is provided in Appendix B):

$$\text{AdRivalry}_{it} = \log\left(1 + \sum_{j=1}^J w_{ijt}\right)$$

In addition, I construct several variants of *AdRivalry* based on different sets of rival firms:

$\text{AdRivalry}_{it}^{\text{public}}$: The total advertising similarity summed over public rival firms

$\text{AdRivalry}_{it}^{[x,y]}$: The total advertising similarity summed over the set of public rivals with pairwise similarity in the range of $[x, y]$ percentiles. For instance, $\text{AdRivalry}_i^{[0,2]}$ is measured as the sum of pairwise similarity scores between firm i and its public rivals in the top 2% percentile in terms of similarity scores, which captures the rivalry from the closest public rivals.

1.3.4. Measures for Control Variables

Materiality

I control for the materiality of advertising expenses using two proxies following

¹⁷ I assume that the distribution of a firm's third-party tracked advertising expenditures across product categories is the same as the distribution of its total underlying advertising expenditures across product categories.

Heitzman et al. (2011): i) Ratio of third-party advertising expenditures to firm sales (*Kantar/Sales*), a proxy for the magnitude of advertising expenses, and ii) earnings response coefficient (*ERC*), a proxy for the informativeness of advertising expenses which is estimated by regressing quarterly stock returns on the seasonal change in price-deflated earnings per share.

Operating Complexity

To control for the direct cost of financial reporting such as costs associated with tracking, analyzing and recording advertising expenses, I include operating complexity proxied by the number of business segments (*NumSegment*).

Product Market Competition

In the main specification, I control for Compustat-based competition measures following Li (2010). Specifically, I use principal component analysis of nine segment-level (the four-digit SIC level) variables to construct three measures: Competition from potential entrants (*EntrantComp*), competition among existing rivals (*ExistComp*), and industry profitability (*IndProfitability*). In the additional analysis, I further control for other commonly used competition measures: i) Text-based product similarity: A measure for competition among existing rivals based on how similar the products are, measured as the sum of pairwise cosine similarities between a firm's and other firms' product descriptions in 10-Ks (*ProductSimilarity*) (Hoberg and Phillips 2016); ii) Text-based product fluidity (*ProductFluidity*): A measure for competition from newly entrants, measured as the sum of pairwise cosine similarities between a firm's product descriptions and other firms' annual change of product descriptions in 10-Ks (Hoberg et al. 2014).¹⁸ iii) Sales similarity (*SalesSimilarity*): A measure for competition among existing rivals based on how similar firms' revenues are

¹⁸ *ProductSimilarity* and *ProductFluidity* are directly obtained from www.hobergphillips.usc.edu.

distributed across four-digit industry segments (Bloom et al. 2013).

Capital Market Incentives

I control for capital market incentives of discretionary disclosure documented in prior literature (e.g., Li 2010; Ali et al. 2014; Merkley 2014): i) General firm characteristics: firm size (*LogMV*), leverage (*Leverage*), and market-to-book (*MB*), ii) performance and uncertainty: profitability (*ROA*), volatility of stock returns (*Std(Ret)*), and volatility of earnings (*Std(Earn)*), iii) new issuance of equity or debt (*NewIssue*), iv) information demand: analyst following (*Analyst*), and v) a high litigation risk industry dummy (*Litigation*).

Firm Disclosure Convention

In order to control for firm-specific disclosure and reporting conventions, I include the following two variables: i) Log of the number of non-missing items in Compustat (*LogNonMissing*), a proxy for the firm's general disclosure quality (Chen et al. 2015), and ii) performance-matched discretionary accruals (*PMDAccruals*) (Kothari et al. 2005).¹⁹

I do not include lagged disclosure decision, i.e., lagged dependent variable, because both the dependent variable (*Disclosure*) and the variable of interest (*AdRivalry*) are highly serially correlated. In this case, including lagged dependent variable would lead to substantial downward bias for the estimates of the variable of interest and current econometric techniques such as Arellano-Bond estimation do not fix this downward bias (Achen 2000). Nevertheless, results are qualitatively the same when including lagged disclosure decision (i.e., the coefficient on *AdRivalry* remains negative and statistically significant at the 1% level).

Industry Disclosure Convention

¹⁹ The main results are robust if using firm's disclosure of R&D expenses as a proxy for its disclosure convention.

To control for industry disclosure convention and also the peer effect (i.e., available information regarding advertising expenses from industry peers), I control for four-digit SIC fixed effects in all regression analyses. Untabulated robustness tests show that the main results are robust when controlling for the percentage of disclosers within the industry, the number of industry peers and also the number of advertising rivals for a given firm.

1.3.5. Measures for Advertising Trackability

I use three measures to capture how easily rivals can track a firm's advertising activity: i) Media Number (*MediaNumber*), measured as the number of unique media outlets used by a firm. ii) Media Concentration (*MediaHHI*), measured as the Herfindahl-Hirschman Index based on the share of each media's advertising, i.e., the sum of squares for the ratio of advertising in each media to the firm's total media advertising. iii) National media (*National*), a dummy that equals one if a firm advertises on any national media, i.e., any media outlet that is not classified as local radio, local magazine or outdoor by the third-party company, and zero otherwise.

1.3.6. Measures for Advertising Expenditures Volatility

I measure the volatility of advertising expenditures as firm-specific standard deviation of third-party tracked advertising expenditures scaled by firm sales over the sample period, assuming the third-party tracked advertising expenditures are highly correlated with firm-level total advertising expenditures. Due to the relatively short sample period, I use the entire sample period to estimate firm-specific advertising volatility, assuming the volatility reflects a relatively persistent firm strategy on advertising.

Additionally, I use two other proxies for the volatility of advertising expenditures:

The standard deviation of the unscaled third-party tracked advertising expenditures, and the standard deviation of the firm sales given the positive link between advertising expenditures and sales.

1.3.7. Measures for Product Maturity

Since a product is more mature when it reaches the later stage of its life cycle, I use firms' product life cycle to measure firms' product maturity. As a firm can operate in multiple product markets, I construct proxies for firm-level product life cycle by aggregating segment-level life cycles, assuming that products are relatively homogeneous within an operating segment. Specifically, I measure segment-level product life cycle in three ways: i) the segment median value of a composite measure based on firm-specific life cycle indicators (*ProdMaturity1*): Firm age, firm sales growth, and firm dividend payout ratio (Anthony and Ramesh 1992). ii) A composite measure based on segment-level life cycle indicators (*ProdMaturity2*): Industry sales growth and industry new entry rate (Parsons 1975). iii) A segment-level cash flow-based life cycle measure (*ProdMaturity3*) (Cantrell and Dickinson 2015).

1.3.8. Entropy Balancing Matched Sample

Since firms' disclosure of advertising expenses lack time-series variation, I primarily rely on cross-sectional variation to estimate the effect of advertising rivalry. Thus, it is important to control for systematic differences between firms with high versus low advertising rivalry. In particular, a linear model may not fully control for non-linear correlations between advertising rivalry and control variables. To reduce endogeneity concerns arising from model dependence, I perform a matched sample analysis (e.g., Imbens 2004).

Specifically, I first dichotomize the continuous advertising rivalry by assigning a

firm to a treated group if its advertising rivalry is above the sample median, and to a control group if otherwise. I then use the entropy balancing method described in Hainmueller (2012) to balance the covariates across treated and control groups, and use this matched sample in regression analysis. Compared with propensity score matching schemes that discard observations (e.g., one-to-one nearest neighbor matching) or involve tedious reweight/balance interactions (e.g., kernel matching), the entropy balancing method adjusts covariate distributions efficiently via a reweighting scheme that can preserve the full sample size and increase the robustness of results (Zhao and Percival 2017). Nevertheless, I also conduct a propensity score matched sample analysis and find quantitatively the same results (untabulated).

One disadvantage of using the matched sample analysis is that it requires a binary treatment (i.e., high vs. low advertising rivalry), which disregards valuable information in the continuous variable of advertising rivalry. So I mainly use this matched sample to supplement my main tests. The cutoff of high vs. low is also to some extent arbitrary. I check the results using the cutoff of top quartile, i.e., assign a firm to the treated group if its advertising rivalry is in the top quartile, and find quantitatively the same results (untabulated).

1.4. Data and Sample

1.4.1. Advertising Data

Third-party tracked advertising data is provided by Kantar Media, part of Kantar which is an industry leading media-tracking company.²⁰ Kantar basically estimates advertising expenditures via two steps: (1) tracks firms' advertisement occurrences over major media outlet including TV, print, radio, outdoors and digital, and (2)

²⁰ The advertising data source was formally known as TNS Media, which has been a standard data source in the marketing literature. Kantar's parent company WPP Group acquired TNS in 2008 and rebranded it as Kantar Media.

multiplies each advertisement occurrence by its related rate provided by advertising agents to obtain a dollar amount estimate.²¹

The Kantar advertising data covers estimated annual advertising expenditures for top 50,000 advertising firms over a 15-year period from 1995 to 2009.²² The data is available at the calendar quarter level and the product category level, where the product category is based on the Kantar classification that is more granular than the four-digit SIC classification (a total of 924 product categories in my sample, compared with a total of 454 four-digit SIC industries in Compustat).²³

I match Kantar with Compustat via firm name using three steps. First, for each firm in Compustat/CRSP, I use the fuzzy matching algorithm in SAS to find the candidate name matches from Kantar. Second, I manually check the candidate matches and keep the accurate one. Third, for each unmatched firm in Compustat/CRSP, I manually search the keyword of the firm name in Kantar, and keep the accurate matches.²⁴

For the firms covered by both Kantar and Compustat/CRSP, I align the calendar-

²¹ In estimating the rate for each advertisement occurrence, Kantar considers various factors such as the size and the media channel of the advertisement. Kantar does not take into account volume discounts or sales commissions, which might introduce measurement errors especially for firms with stronger ex ante bargaining power with advertising agents. Results are robust in subsamples with high vs. low firm-specific bargaining power proxies (i.e., firm size, Kantar-tracked advertising expenditures, and the industry concentration) (untabulated).

²² In the subset of firms that disclose advertising expenses, Kantar-tracked advertising expenditures on average represent 56% of firms' total advertising expenses. The untracked portion mainly consists of: (1) production costs of advertisements that are in proportion with tracked advertising activities, and (2) costs for non-tracked advertising activities. Since my key measures rely on the correlation between the tracked advertising and firms' total advertising expenditures, the untrack portion is unlikely to impair the internal validity. I acknowledge that my results may not be generalized to firms that mainly use non-tracked advertising, mostly direct-mail or cooperative advertising.

²³ For instance, the Coca-Cola Company has product categories such as regular carbonated soft drinks, dietary carbonated soft drinks, fruit juices, and carbonated & flavored waters.

²⁴ Two main reasons for unmatched firms: (1) the Compustat firm is the parent or subsidiary of a Kantar firm. In this case, I discard the firm to ensure that the Kantar data and the firm-disclosed advertising data are for the same level of firms. (2) The Compustat firm does not advertise on any of the tracked media outlets.

year Kantar data to the fiscal-year firm-disclosed data. Specifically, I sum up the Kantar advertising for the four quarters closest to the fourth fiscal quarter to arrive at the annual Kantar advertising. For instance, if a firm ends its fiscal year 2005 in March 2006, I sum up its Kantar data for calendar quarters covering the 12 months from April 2005 to March 2006 to obtain its annual Kantar advertising expenditures for the fiscal year 2005.

1.4.2. Sample Selection and Description

Table 1 Panel A shows the sample selection. My sample starts with 26,284 firm-years for Compustat/CRSP firms (with positive sales and total assets) that are manually matched with the Kantar dataset over the 15-year period 1995-2009. I exclude 5,493 observations for firms from regulated utilities industries (SIC code: 4900-4999) or financial industries (SIC code: 6000-6799) due to their different reporting environment. I further remove 3,649 observations with missing values in main variables, resulting in a sample of 17,142 firm-years. Lastly, I drop 1,556 observations from the four-digit SIC industries with zero variation in *Disclosure* in order to use the industry fixed effects, resulting in a final sample of 15,586 firm-years (or 2,794 firms). My sample represents about 60% of Compustat/CRSP population in terms of market capitalization and 80% in terms of advertising expenses.

Table 1 Panel B reports the sample distribution by disclosure choice for three groups: i) Compustat/CRSP firms with positive sales and total assets (excluding financial industries and regulated utilities industries), ii) my sample of firms with underlying advertising activities (15,586 firm-years), and iii) a subsample of firms for which advertising expenses are likely to be material (i.e., the ratio of Kantar advertising to sales no less than 1%).

Row (1) shows that about 69% firm-years (or 80% firms) in the Compustat/CRSP population (non-financial or regulated utilities) have missing values in advertising

expenses.²⁵ Column (1) shows that there are still more than half (54%) firms in my sample with non-zero advertising activities do not disclose advertising expenses. This percentage even remains about 30% for firms with Kantar-tracked advertising expenditures exceeding or meeting the conventional material threshold.²⁶ In untabulated results, I further find non-disclosers on average have higher (lower) materiality than firms that report zero (positive) advertising expenses in their financial statements. Overall, these results indicate significant discretion in firms' disclosure of advertising expenses even if the materiality constraint is likely to be binding.

²⁵ For comparison, about 38% firm-years have missing R&D expenses.

²⁶ This percentage is likely to be a conservative estimate since the Kantar-tracked advertising expenditures are smaller than firms' total advertising expenditures.

Table 1: Sample Selection and Description

This table presents the sample selection and description. Panel A reports the sample selection process. Panel B reports the sample distribution by disclosure type for three samples: (1) Compustat/CRSP population (excluding financial industries and regulated utilities industries), (2) the main sample of this study (i.e., firms covered by both Compustat/CRSP and Kantar), and (3) a subsample of firms with likely material advertising expenses (i.e., firms with the ratio of third-party tracked ad spending to sales no less than 1%). Panel C reports the sample distribution by industry sectors defined by two-digit SIC. Please see Appendix A.1. for variable definitions.

Panel A: Sample Selection

Selection Criteria	#Firms	#Firm-years
Firms that are covered by both Compustat/CRSP and Kantar during fiscal years 1995-2009 (with positive sales and assets)	4,487	26,284
Less: Firms that are from regulated utilities industries (SIC4: 4900-4999) or financial industries (SIC4: 6000-6799)	(803)	(5,493)
Less: Observations with missing data on key variables	(590)	(3,649)
Less: Four-digit SIC Industries with no variation in disclosure	(300)	(1,556)
Final Sample	2,794	15,586

Panel B: Sample Distribution by Disclosure Choice

	%Non-Discloser (1)	%Discloser (Adv/Sale)	
		(2) $\geq 1\%$	(3) $< 1\%$
1 Compustat/CRSP Population	68.69	20.17	11.14
2 Sample with Kantar data > 0	53.55	33.02	13.43
3 Sample with <i>Kantar/Sales</i> $\geq 1\%$	30.26	66.85	2.89

Panel C: Sample Distribution by Industry

Two-digit SIC	N (1)	% (2)	%Compustat (3)	%Non-Discloser in Industry (4)
Agriculture and Forestry	47	0.30	0.36	76.60
Mining	24	0.16	4.95	83.33
Construction	265	1.70	1.41	45.28
Manufacturing	7,782	49.93	51.07	59.25
Transportation and Communications	1,040	6.67	6.61	54.90
Wholesale	588	3.77	4.46	67.52
Retail	2,139	13.72	7.79	23.75
Services	3,652	23.43	23.22	55.94
Other	49	0.32	0.13	81.63
Full Sample	15,586	100.00	100.00	53.55

Table 1 Panel C presents the sample distribution by industry sectors defined at the two-digit SIC. Columns (1) and (2) show that manufacturing industries have the highest frequency (50%), followed by services (23%) and retails (14%). Columns (2) and (3) suggest that the industry distribution of my sample is comparable to that of the Compustat/CRSP population. Column (4) shows that non-disclosers are well populated within each industry sector.

1.5. Empirical Results

1.5.1. Descriptive Statistics

Table 2 Panel A reports the summary statistics of variables. Panel A shows that, 46% of the firm-years with underlying advertising activities disclose advertising expenses. $AdRivalry$ is on average much larger than $AdRivalry^{public}$, suggesting that private firms are a non-negligible source of competitive pressure. $AdRivalry^{[0,2]}$ is on average larger than $AdRivalry^{[3,5]}$ and $AdRivalry^{[6,100]}$, consistent with advertising rivalry from close rivals being more intense than from distant rivals. In terms of advertising media, an average firm uses 4.72 different types of media outlets, has a media HHI of 0.68 and a national media percentage of 53%.²⁷

Compustat-based competition measures ($ExistComp$, $EntrantComp$, and $IndProfitability$) are estimated at the segment level and then aggregated to the firm level by taking the weighted average across all segments for a firm (Li 2010; Karuna 2010). Text-based competition measures ($ProductSimilarity$ and $ProductFluidity$) are directly obtained from the Hoberg and Phillips' online database. Summary statistics for other variables, including product life cycle indicators, are comparable to those in

²⁷ Advertising media are classified by Kantar to 18 types of media outlets including: Network television, spot television, cable television networks, syndicated television, Spanish-language network television, local radio, national spot radio, network radio, magazine, Sunday magazine, local magazine, Spanish-language magazine, business publication, newspaper, national newspaper, Spanish-language newspaper, outdoor and internet display.

Table 2: Descriptive Statistics

This table presents the descriptive statistics for my sample. Panel A reports the summary statistics for the variables. Panel B reports pairwise Pearson (Spearman) correlations for the competition measures above (below) the diagonal. Please see Appendix A.1. for variable definitions.

Panel A: Summary Statistics (N = 15,586)

	Mean	STD	p10	p25	p50	p75	p90
<i>Dependent Variable</i>							
Disclosure	0.46	0.50	0.00	0.00	0.00	1.00	1.00
<i>Advertising Rivalry Variables</i>							
AdRivalry	5.44	1.43	3.37	4.45	5.59	6.59	7.20
AdRivalry ^{Public}	2.99	1.28	1.31	2.07	2.92	3.99	4.78
AdRivalry ^[0,2]	2.71	1.01	1.28	2.02	2.78	3.59	3.87
AdRivalry ^[5,5]	1.29	1.50	0.00	0.00	0.44	2.63	3.82
AdRivalry ^[6,100]	0.88	1.35	0.00	0.00	0.03	1.48	3.32
<i>Advertising Media Trackability Proxies</i>							
MediaNumber	4.72	4.18	1.00	1.00	3.00	7.00	11.00
MediaHHI	0.68	0.30	0.26	0.39	0.70	1.00	1.00
National	0.53	0.50	0.00	0.00	1.00	1.00	1.00
<i>Other Competition Variables</i>							
ExistComp	0.92	0.97	-0.28	0.24	0.86	1.58	2.30
EntrantComp	-0.50	1.42	-2.44	-1.09	0.09	0.47	0.62
IndProfitability	-0.23	0.81	-1.25	-0.48	-0.07	0.22	0.56
SalesSimilarity	3.50	1.41	1.62	2.46	3.48	4.50	5.38
ProductSimilarity	2.87	2.64	1.00	1.25	1.86	3.39	16.63
ProductFluidity	6.14	2.94	1.38	3.94	5.65	7.79	15.20
<i>Other Control Variables</i>							
Kantar/Sales	0.01	0.04	0.00	0.00	0.00	0.01	0.03
ERC	3.10	9.46	-3.16	-0.27	1.32	4.78	11.62
LogMV	6.42	2.16	3.52	4.90	6.43	7.89	9.27
Leverage	0.22	0.21	0.00	0.02	0.18	0.34	0.50
MB	3.05	4.12	0.67	1.24	2.12	3.70	6.55
StdEarn	0.09	0.14	0.01	0.02	0.04	0.09	0.21
StdRet	0.15	0.09	0.06	0.08	0.12	0.18	0.27
NewIssue	0.92	0.27	1.00	1.00	1.00	1.00	1.00
Litigation	0.44	0.50	0.00	0.00	0.00	1.00	1.00
ROA	-0.01	0.20	-0.16	-0.01	0.04	0.08	0.13
Analyst	9.92	10.00	0.00	2.00	7.00	15.00	25.00
NumSegment	1.62	0.96	1.00	1.00	1.00	2.00	3.00
LogNonMissing	5.66	0.13	5.48	5.55	5.66	5.78	5.83
PMDAccruals	0.00	0.08	-0.09	-0.03	0.00	0.04	0.09

Table 2: Descriptive Statistics (Continued)**Panel A: Summary Statistics (N = 15,586) (Continued)**

	Mean	STD	p10	p25	p50	p75	p90
<i>Indicators for Product Life Cycle (four-digit SIC industry level)</i>							
Ind_Age	9.74	7.25	3.00	5.00	7.66	12.00	19.29
Ind_DividendPayout	0.03	0.08	0.00	0.00	0.00	0.00	0.14
Ind_SalesGrowth	0.14	0.12	0.04	0.07	0.12	0.18	0.28
Ind_EntryGrowth	0.01	0.09	-0.09	-0.05	0.00	0.04	0.11
Ind_CF_LifeCycle	2.15	0.70	1.00	2.00	2.00	2.96	3.00
<i>Advertising Expenditures Volatility Proxies</i>							
Std(Kantar/Sales)	0.01	0.02	0.00	0.00	0.00	0.01	0.09
Std(Kantar)	8.82	24.12	0.00	0.12	0.70	4.34	155.51
Std(Sales)	1,262.1	3,026.6	0.00	34.1	195.6	912.6	18,978.9

Panel B: Pearson (Spearman) Pairwise Correlation of Competition Measures Above (Below) the Diagonal

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) AdRivalry		0.22	0.09	-0.17	0.25	0.12	0.15
(2) ExistComp	0.22		-0.18	-0.31	0.76	0.34	0.35
(3) EntrantComp	0.05	-0.21		0.19	-0.43	-0.24	-0.31
(4) IndProfitability	-0.14	-0.28	0.18		-0.34	-0.15	-0.27
(5) SalesSimilarity	0.24	0.74	-0.49	-0.33		0.41	0.46
(6) ProductSimilarity	0.15	0.37	-0.31	-0.14	0.44		0.48
(7) ProductFluidity	0.18	0.36	-0.32	-0.26	0.49	0.45	

prior studies (e.g., Anthony and Ramesh 1992; Heitzman et al. 2010; Li 2010; Ali et al. 2014; Cantrell and Dickinson 2015).

Table 2 Panel B reports Pearson (Spearman) pairwise correlations among competition measures above (below) the diagonal. The correlations between *AdRivalry* and other existing competition measures (*ExistComp*, *SalesSimilarity*, *ProductSimilarity*) are positive (≥ 0.10), consistent with *AdRivalry* being a competition measure. On the other hand, the correlations are relatively low (≤ 0.25), consistent with *AdRivalry* capturing a distinct competition dimension. Correlations between *AdRivalry* and other independent variables are in general low (untabulated).

1.5.2. Advertising Rivalry and Disclosure of Advertising Expenses

Table 3 reports the results of estimating probit model (1). To facilitate interpretation, I report the average marginal effects of the variables. Column (1) shows the results without industry fixed effects as prior studies (e.g., Li 2010). The average marginal effect of *AdRivalry* is negative and statistically significant at the 1% level, consistent with H1. Commonly used competition measures *ExistComp*, *EntrantComp*, and *IndProfitability* have signs consistent with theoretical predictions (e.g., Darrough and Stoughton 1990; Darrough 1993).

Column (2) shows the probit regression results after controlling for industry fixed effects. Interestingly, *ExistComp*, *EntrantComp*, and *IndProfitability* are insignificant, suggesting that these measures mainly capture cross-industry variations. The average marginal effect of *AdRivalry* remains negative and significant (-0.039), suggesting that a one standard deviation increase in *AdRivalry* (1.43) reduces the likelihood of disclosing advertising expenses by 5.6%, which is comparable to the effects of other important determinants such as the materiality proxy *Kantar/Sale* ($0.861 \times 0.04 = 3.4\%$) and firm market value *LogMV* ($-0.021 \times 2.16 = 4.5\%$).

Table 3: Advertising Rivalry and Disclosure of Advertising Expenses

This table presents the results from the probit regressions for the effect of advertising rivalry on the likelihood of disclosing advertising expenses. The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interest are advertising rivalry (*AdRivalry*) and its decile rank scaled to be within [0,1] (*Decile_AdRivalry*). Control variables include existing competition (*ExistComp*), potential entrant competition (*EntrantComp*), industry profitability (*IndProfitability*), advertising materiality proxies (*Kantar/Sales* and *ERC*), firm size (*LogMV*), firm leverage (*Leverage*), market-to-book (*MB*), volatility of stock returns (*StdRet*), volatility of earnings (*StdEarn*), new issuance of equity or debt (*NewIssue*), litigation risk (*Litigation*), return on assets (*ROA*), number of analyst following (*Analyst*), number of business segments (*NumSegment*), number of non-missing Compustat items (*LogNonMissing*), and performance-matched discretionary accruals (*PMDAccruals*). Industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. *z*-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

Table 3: Advertising Rivalry and Disclosure of Advertising Expenses (Continued)

DV: Disclosure	(1)	(2)	(3)	(4)
AdRivalry	-0.052*** (-7.78)	-0.039*** (-6.16)		
Decile_AdRivalry			-0.220*** (-7.68)	-0.162*** (-6.05)
ExistComp	-0.025** (-2.27)	-0.021 (-1.06)	-0.024** (-2.21)	-0.021 (-1.05)
EntrantComp	0.023*** (2.87)	0.000 (0.03)	0.022*** (2.75)	-0.000 (-0.03)
IndProfitability	0.029*** (2.81)	-0.001 (-0.17)	0.030*** (2.89)	-0.001 (-0.13)
Kantar/Sales	1.414*** (5.09)	0.861*** (4.11)	1.425*** (5.14)	0.870*** (4.15)
ERC	0.001 (1.42)	0.001** (2.06)	0.001 (1.40)	0.001** (2.04)
LogMV	-0.027*** (-3.64)	-0.021*** (-3.12)	-0.027*** (-3.66)	-0.021*** (-3.12)
Leverage	0.033 (0.78)	-0.025 (-0.67)	0.033 (0.78)	-0.023 (-0.61)
MB	-0.002 (-1.40)	0.000 (0.27)	-0.002 (-1.30)	0.000 (0.30)
StdRet	-0.003 (-0.04)	0.036 (0.70)	-0.002 (-0.04)	0.035 (0.68)
StdEarn	0.214*** (2.98)	0.211*** (3.48)	0.212*** (2.95)	0.210*** (3.47)
NewIssue	0.005 (0.25)	-0.004 (-0.22)	0.005 (0.27)	-0.003 (-0.19)
Litigation	0.185*** (7.78)	0.030 (0.35)	0.183*** (7.71)	0.028 (0.32)
ROA	0.091** (2.56)	0.029 (0.94)	0.092*** (2.59)	0.029 (0.95)
Analyst	0.005*** (3.41)	0.005*** (3.72)	0.005*** (3.40)	0.005*** (3.69)
NumSegment	-0.012 (-1.16)	0.002 (0.24)	-0.013 (-1.25)	0.002 (0.21)
LogNonMissing	0.584*** (3.55)	0.869*** (6.37)	0.584*** (3.56)	0.868*** (6.37)
PMDAccruals	0.032 (1.05)	0.055** (2.23)	0.031 (1.03)	0.054** (2.19)
Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Pseudo R ²	0.10	0.25	0.10	0.25
N	15,586	15,586	15,586	15,586

Columns (3) and (4) replace *AdRivalry* with the decile ranked *AdRivalry* scaled to be within [0, 1] and produce similar inferences as in Columns (1) and (2). For instance, Column (4) shows that the average marginal effect of *Decile_AdRivalry* is negative (-0.162) and statistically significant at the 1% level, suggesting that the firm in the highest decile of advertising rivalry is on average 16.2% less likely to disclose advertising expenses than that in the lowest decile.

1.5.3. Analysis on Entropy Balancing Matched Sample

Table 4 reports the results for the entropy balancing matched sample analysis. Panel A shows that after entropy balancing, the treated and the control groups exhibit almost the same means for the regression variables. Panel B reports the regression results using the matched versus unmatched samples. Specifically, Column (1) shows that the disclosure likelihood is negatively associated with the dummy of advertising rivalry (*High_AdRivalry*) (-0.079) when using the unmatched sample. Column (2) shows that the average marginal effect on *High_AdRivalry* continues to be negative and statistically significant (-0.069) when using the matched sample (note that the sample size is the same, but the weight for each observation has been adjusted). Columns (3) and (4) show similar results when using advertising rivalry measures based on public rival firms. In sum, this analysis alleviates some endogeneity concerns and strengthens our confidence regarding the estimated effect of advertising rivalry.

1.5.4. Cross-Sectional Analysis on Advertising Media Trackability

To test the second hypothesis, I add the interaction term between advertising rivalry and media trackability as well as the direct effect of media trackability to the baseline model (1).²⁸ I use three proxies of advertising media trackability: Media

²⁸ I estimate the average interaction effect in a probit model following Ai and Norton (2003).

Table 4: Entropy Balance Matching

This table presents the results of Entropy Balancing (EB) matched sample analysis for the effect of advertising rivalry on the likelihood of disclosing advertising expenses. Treated firms are those that have *AdRivalry* above its median (*High_AdRivalry*). Control firms are reweighted to achieve the covariate balance via EB. Panel A reports the means of control variables across treated and control firms after EB matching. Panel B reports the probit regression results. The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interests are advertising rivalry (*AdRivalry*) and its variant based on public rival firms (*AdRivalry^{Public}*). Control variables, industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. z-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

Panel A: Covariate Balance after Entropy Balancing (EB) Matching

Variables	High_AdRivalry=1 (N=7,781)	High_AdRivalry=0 (N=7,805)	Difference	t-statistics
ExistComp	1.084	1.084	0.000	0.00
EntrantComp	-0.406	-0.407	0.001	0.03
IndProfitability	-0.314	-0.314	0.000	0.00
Kantar/Sales	0.010	0.010	0.000	-0.17
ERC	3.343	3.343	0.000	0.00
LogMV	6.266	6.266	0.000	0.00
Leverage	0.187	0.187	0.000	-0.01
MB	3.110	3.110	0.000	-0.01
StdEarn	0.094	0.094	0.000	-0.02
StdRet	0.155	0.155	0.000	-0.01
NewIssue	0.924	0.924	0.000	0.00
Litigation	0.472	0.472	0.000	-0.01
ROA	-0.009	-0.009	0.000	0.02
Analyst	9.762	9.762	0.000	0.00
NumSegment	1.572	1.572	0.000	0.01
LogNonMissing	5.659	5.659	0.000	0.00
PMDAccruals	-0.008	-0.008	0.000	0.00

Panel B: Regression Results

DV: Disclosure	(1)	(2)	(3)	(4)
High_AdRivalry	-0.079*** (-5.52)	-0.069*** (-4.49)		
High_AdRivalry^{Public}			-0.099*** (-6.75)	-0.083*** (-4.95)
EB Matched Sample	No	Yes	No	Yes
Other Controls	Yes	Yes	Yes	Yes
Industry FE, Year FE	Yes	Yes	Yes	Yes
Pseudo R ²	0.25	0.24	0.25	0.24
N	15,586	15,586	15,586	15,586

number (*MediaNumber*), media concentration (*MediaHHI*) and national media indicator (*National*).

Table 5 shows that the average interaction effects between advertising rivalry and *MediaNumber*, *MediaHHI*, and *National* are negative, positive and positive, respectively, consistent with H2 that the negative association between advertising rivalry and disclosure likelihood is less pronounced when firms advertise on more trackable media outlets (i.e., fewer, more concentrated or national media).

1.5.5. Cross-Sectional Analysis on Advertising Expenditures Volatility

To test the third hypothesis, I add the interaction term between advertising rivalry and advertising expenditures volatility as well as the direct effect of advertising expenditures volatility to the baseline model (1). I use three proxies of advertising expenditures volatility: the firm-specific standard deviations of the Kantar advertising scaled by sales (*Std(Kantar/Sales)*), the unscaled Kantar advertising (*Std(Kantar)*), and firm sales (*Std(Sales)*), respectively.

Table 6 shows that the average interaction effects between advertising rivalry and advertising expenditures volatility proxies are negative and significant, consistent with H3 that the negative association between advertising rivalry and disclosure likelihood is more pronounced when firms have more volatile underlying advertising expenditures.

1.5.6. Cross-Sectional Analysis on Product Maturity

To test the fourth hypothesis, I add the interaction term between advertising rivalry and product maturity as well as the direct effect of product maturity to the baseline model (1). I use three proxies of product maturity based on firm-level (*ProdMaturity1*), industry-level (*ProdMaturity2*) and cash flow-based

Table 5: Cross-Sectional Analysis: Advertising Media Trackability

This table presents the results from the probit regressions for the effect of advertising media trackability on the relation between advertising rivalry and the likelihood of disclosing advertising expenses. The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interest are the interaction terms between advertising rivalry and media trackability proxies, where the media trackability proxies are decile ranked annually and scaled to be within [0,1] (*Decile_MediaNumber*, *Decile_MediaHHI*) and *National*). Control variables, industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. *z*-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

DV: Disclosure	(1)	(2)	(3)
AdRivalry	-0.013*	-0.072***	-0.055***
	(-1.67)	(-6.22)	(-6.01)
AdRivalry*Decile_MediaNumber	-0.050***		
	(-3.46)		
Decile_MediaNumber	0.540***		
	(6.81)		
AdRivalry*Decile_MediaHHI		0.058***	
		(4.26)	
Decile_MediaHHI		-0.504***	
		(-6.68)	
AdRivalry*National			0.028***
			(2.97)
National			-0.243***
			(-4.65)
Other Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Pseudo R ²	0.27	0.26	0.26
N	15,586	15,586	15,586

Table 6: Cross-Sectional Analysis: Advertising Expenditures Volatility

This table presents the results from the probit regressions for the effect of the volatility of a firm's advertising expenditures on the relation between advertising rivalry and the likelihood of disclosing advertising expenses. The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interest are the interaction terms between advertising rivalry intensity and proxies for the volatility of underlying advertising expenditures, where the volatility proxies are ranked annually to high/low and scaled to be within [0,1] (*High_Std(Kantar/Sales)*, *High_Std(Kantar)*, *High_Std(Sales)*). Control variables, industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. z-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

DV: Disclosure	(1)	(2)	(3)
AdRivalry	-0.021*** (-2.76)	-0.025*** (-3.42)	-0.032*** (-4.24)
AdRivalry*High_Std(Kantar/Sales)	-0.020** (-1.98)		
High_Std(Kantar/Sales)	0.291*** (5.20)		
AdRivalry*High_Std(Kantar)		-0.019* (-1.81)	
High_Std(Kantar)		0.218*** (3.74)	
AdRivalry*High_Std(Sales)			-0.019* (-1.79)
High_Std(Sales)			0.059 (0.95)
Other Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Pseudo R ²	0.28	0.25	0.26
N	15,586	15,586	15,586

Table 7: Cross-Sectional Analysis: Product Maturity

This table presents the results from the probit regressions for the effect of product maturity (proxied by product life cycle) on the relation between advertising rivalry and the likelihood of disclosing advertising expenses. The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interest are the interaction terms between advertising rivalry intensity and product maturity proxies, where the product maturity proxies are decile ranked annually and scaled to be within [0,1] (*Decile_ProdMaturity1*, *Decile_ProdMaturity2*, *Decile_ProdMaturity3*). Control variables, industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. *z*-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

DV: Disclosure	(1)	(2)	(3)
AdRivalry	-0.011 (-1.23)	-0.026*** (-3.24)	-0.028*** (-3.71)
AdRivalry*Decile_ProdMaturity1	-0.063*** (-4.13)		
Decile_ProdMaturity1	0.297*** (3.43)		
AdRivalry*Decile_ProdMaturity2		-0.028** (-2.57)	
Decile_ProdMaturity2		0.133** (2.09)	
AdRivalry*Decile_ProdMaturity3			-0.032** (-2.46)
Decile_ProdMaturity3			0.170** (2.30)
Other Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Pseudo R ²	0.25	0.25	0.25
N	15,586	15,586	15,586

(*ProdMaturity3*) product life cycle indicators.

Table 7 shows that the average interaction effects between advertising rivalry and product maturity are negative and significant, consistent with H4 that the negative association between advertising rivalry and disclosure likelihood is more pronounced when firms have more mature products.

1.6. Extensions and Robustness

1.6.1. Analysis on Different Competition Measures

To further differentiate advertising rivalry from other product market competition dimensions, I replace *ExistComp* with alternative measures that capture competition from existing rivals. Table 8 Column (1) shows that segment-sales based similarity (*SalesSimilarity*) is significantly negative, consistent with the notion that proprietary cost of disclosure is larger when firms generate sales in more overlapping product markets. Column (2) shows that *SalesSimilarity* becomes insignificant once controlling for industry fixed effects, suggesting that *SalesSimilarity* mainly capture cross-industry variations. Similarly, Columns (3) to (6) show that the negative effects of product similarity (*ProductSimilarity*) and product fluidity (*ProductFluidity*) are gone once controlling for industry fixed effects.²⁹

The average marginal effect on *AdRivalry* is significantly negative in all columns, suggesting that *AdRivalry* captures a distinct aspect of competition at the firm-level. Untabulated robustness checks show that *AdRivalry* remains negative and statistically significant at the 1% level when controlling for all these product market competition measures in the same regression.

²⁹ Note that *ProductFluidity* captures the threat from newly entered rivals. The positive coefficient in Column (6), however, is consistent with this measure also capturing the threat from potential entrants, as theory predicts a positive association between disclosure and entry threat (e.g., Wagenhofer 1990; Darrough and Stoughton 1990).

Table 8: Analysis on Different Competition Measures

This table presents the results from the probit regressions for the effect of various competition measures on the likelihood of disclosing advertising expenses. The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interest are *AdRivalry*, *SalesSimilarity*, *ProductSimilarity* and *ProductFluidity*. Control variables, industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. z-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

DV: Disclosure	(1)	(2)	(3)	(4)	(5)	(6)
Ad Rivalry		-0.039*** (-6.26)		-0.038*** (-6.10)		-0.040*** (-6.30)
Sales Similarity	-0.043*** (-5.12)	0.018 (1.28)				
Product Similarity			-0.008** (-2.11)	-0.003 (-0.92)		
Product Fluidity					-0.013*** (-3.84)	0.006** (1.97)
Entrant Comp	0.004 (0.46)	-0.005 (-0.45)	0.013 (1.56)	-0.005 (-0.41)	0.010 (1.17)	-0.006 (-0.50)
IndProfitability	0.035*** (3.39)	0.002 (0.30)	0.047*** (4.56)	0.001 (0.14)	0.042*** (3.99)	0.002 (0.33)
Kantar /Sales	1.683*** (5.94)	0.863*** (4.13)	1.726*** (6.11)	0.859*** (4.11)	1.756*** (6.22)	0.864*** (4.13)
ERC	0.001 (1.27)	0.001** (2.06)	0.001 (1.31)	0.001** (2.07)	0.001 (1.44)	0.001** (2.03)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.09	0.25	0.08	0.25	0.09	0.25
N	15,586	15,586	15,586	15,586	15,586	15,586

1.6.2. Analysis on Advertising Rivalry Variants

Table 9 presents the results of advertising rivalry measures based on different sets of rivals. Column (1) shows that the average marginal effect of $AdRivalry^{public}$ (-0.046) is similar to that of $AdRivalry$ (-0.039), suggesting the effect of advertising rivalry from public firms is comparable to that from both public and private firms. Columns (2) to (4) show that $AdRivalry^{[0,2]}$ has a negative marginal effect (-0.053), the magnitude of which is significantly larger than that of $AdRivalry^{[3,5]}$ (-0.037) and $AdRivalry^{[6,100]}$ (-0.032) at the 5% level.

1.6.3. Analysis on Advertising-Intensive Firms

Table 10 reports the results of model (1) in a subsample of firms whose advertising expenses are likely to be material (i.e., the ratio of Kantar advertising to sales no less than 1%). Consistent with the main findings in Table 3, I continue to find a negative (and not surprisingly, weaker) association between advertising rivalry and the likelihood of disclosing advertising expenses in this subsample. Results are robust if using the entropy balancing matched sample.

1.6.4. Analysis on Impact Threshold of Confounding Variable

To assess the potential impact of a correlated omitted variable on the effect of advertising rivalry, I perform an analysis on the impact threshold of confounding variable (i.e., ITCV) as recommended by Larcker and Rusticus (2010). The basic idea is that for an omitted variable to overturn the result of the variable of interest (i.e., the x variable), it needs to be correlated with both the x variable and the y variable. Accordingly, the ITCV is calculated as the lowest product of the correlation between x and the confounding variable and the correlation between y and the confounding variable that makes the coefficient of x statistically insignificant (Frank 2000). If the

Table 9: Analysis on AdRivalry Variants

This table presents the results from the probit regressions for the effect of advertising rivalry on the likelihood of disclosing advertising expenses, using variants of *AdRivalry*. The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interest are advertising rivalry from public rival firms (*AdRivalry^{Public}*) and its variants based on different sets of rival firms, i.e., based on how far rivals are from the focal firm (*AdRivalry^[0,2]*, *AdRivalry^[3,5]* and *AdRivalry^[6,100]*). Control variables, industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. *z*-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

DV: Disclosure	(1)	(2)	(3)	(4)
AdRivalry^{Public}	-0.046*** (-6.35)			
AdRivalry^[0,2]		-0.053*** (-5.80)		
AdRivalry^[3,5]			-0.037*** (-6.30)	
AdRivalry^[6,100]				-0.032*** (-5.55)
ExistComp	-0.022 (-1.11)	-0.022 (-1.09)	-0.022 (-1.11)	-0.025 (-1.27)
EntrantComp	0.001 (0.05)	0.001 (0.06)	0.001 (0.05)	0.003 (0.21)
IndProfitability	-0.002 (-0.24)	-0.000 (-0.07)	-0.001 (-0.21)	-0.003 (-0.43)
Kantar/Sales	0.830*** (3.94)	0.849*** (4.01)	0.856*** (4.09)	0.903*** (4.28)
ERC	0.001* (1.89)	0.001* (1.93)	0.001* (1.86)	0.001* (1.79)
Other Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Pseudo R ²	0.25	0.25	0.25	0.25
N	15,586	15,586	15,586	15,586

Table 10: Analysis on Advertising-Intensive Firms

This table presents the results from the probit regressions for the effect of advertising rivalry on the likelihood of disclosing advertising expenses in the subsample of firms that likely have material advertising (i.e., *Kantar/Sales* is no less than 1%). The dependent variable is the disclosure choice (*Disclosure*), and the main variables of interests are advertising rivalry (*AdRivalry*), its decile rank scaled to be within [0,1] (*Decile_AdRivalry*), and the dummy that equals to one if *AdRivalry* is higher than its median (*High_AdRivalry*). Control variables, industry fixed effects (at the four-digit SIC level) and year fixed effects are included. Standard errors are clustered by firm. *z*-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

DV: Disclosure	(1)	(2)	(3)	(4)
AdRivalry	-0.024** (-1.99)			
Decile_AdRivalry		-0.099* (-1.89)		
High_AdRivalry			-0.073** (-2.47)	-0.064** (-2.26)
ExistComp	0.033 (0.75)	0.032 (0.74)	0.030 (0.68)	0.028 (0.64)
EntrantComp	-0.010 (-0.34)	-0.010 (-0.36)	-0.008 (-0.29)	-0.004 (-0.12)
IndProfitability	0.007 (0.47)	0.007 (0.49)	0.007 (0.50)	-0.004 (-0.24)
Kantar/Sales	-0.099 (-0.55)	-0.094 (-0.52)	-0.101 (-0.56)	-0.144 (-0.77)
ERC	0.000 (0.18)	0.000 (0.17)	0.000 (0.18)	0.001 (0.55)
EB Matched Sample	No	No	No	Yes
Other Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Pseudo R ²	0.27	0.27	0.27	0.29
N	3,256	3,256	3,256	3,256

ITCV is high, the regression results are relatively robust to omitted variable concerns.

Table 11 Column (3) shows that the ITCV for *AdRivalry* is -0.037, implying that the product of the partial correlation between an omitted variable and *Disclosure* and the partial correlation between the omitted variable and *AdRivalry* would need to be 0.037 in magnitude to invalidate the result of *AdRivalry*. Column (4) presents the impact of control variables on the inference of *AdRivalry*, calculated as the product of the partial correlation between the control variable and x and the partial correlation between the control variable and y . Column (5) presents a more conservative measure of the impact by using unconditional correlations. Both Columns (4) and (5) suggest that the control variable with the largest impact on the inference of *AdRivalry* is *Kantar/Sales*, with a value of -0.007 and -0.019, respectively. These values are smaller than the magnitude of ITCV (-0.037), suggesting that a potential omitted variable needs to have a larger impact than any of my current control variables in order to overturn the result of *AdRivalry*. Given that I already have strong controls such as materiality and discretionary disclosure determinants documented in prior studies, the ITCV result provides some confidence in the estimate of the effect of advertising rivalry.

1.6.5. Analysis on Narrative Advertising-Related Disclosures

To corroborate the main findings on the discretionary disclosure of advertising expenses in financial statements, I examine the effect of advertising rivalry on narrative advertising-related disclosures in firms' 10-Ks. Similar to H1, I predict a negative association between advertising rivalry and the quantity of narrative advertising-related disclosures.

I follow prior studies to construct narrative advertising-related disclosures in 10-Ks (e.g., Li et al. 2013; Merkley 2014). Specifically, I use the “regular expression”

Table 11: Analysis on Impact Threshold of Confounding Variable

This table presents the results for the analysis of impact threshold of confounding variable (ITCV). Column (1) and (2) report the average marginal effect and z-statics for the probit regression results same as Column (2) of Table 3, where the dependent variable is the disclosure choice (*Disclosure*), the main variable of interest is advertising rivalry (*AdRivalry*), control variables, industry fixed effects and year fixed effects are included. Column (3) reports the ITCV defined as the lowest product of the correlation between *AdRivalry* and the confounding variable and the correlation between *Disclosure* and the confounding variable that makes the coefficient of *AdRivalry* statistically insignificant. Column (4) and (5) report the impact statistics for control variables, calculated as the product of the correlation between *AdRivalry* and the control variable and the correlation between *Disclosure* and the control variable, based on partial correlations and unconditional (raw) correlations, respectively. Please see Appendix A.1. for variable definitions.

DV: Disclosure	(1) Average Marginal Effect	(2) z-statistic	(3) ITCV	(4) Impact	(5) Impact_raw
AdRivalry	-0.039***	-6.16	-0.037		
ExistComp	-0.021	-1.06		0.000	-0.009
EntrantComp	0.000	0.03		0.000	-0.004
IndProfitability	-0.001	-0.17		-0.000	-0.008
Kantar/Sales	0.861***	4.11		-0.007	-0.019
ERC	0.001**	2.06		0.001	0.000
LogMV	-0.021***	-3.12		0.001	-0.000
Leverage	-0.025	-0.67		0.000	0.003
MB	0.000	0.27		0.000	0.000
StdRet	0.036	0.70		0.000	0.002
StdEarn	0.211***	3.48		-0.001	0.002
NewIssue	-0.004	-0.22		-0.000	0.000
Litigation	0.030	0.35		0.000	0.011
ROA	0.029	0.94		-0.000	0.000
Analyst	0.005***	3.72		-0.001	-0.001
NumSegment	0.002	0.24		0.000	0.002
LogNonMissing	0.869***	6.37		0.003	0.004
PMDAccruals	0.055**	2.23		0.000	0.000

routine in Python to count the number of advertising-related keywords in the entire 10-K, and measure narrative disclosures as the percentage of advertising-related keywords per 10,000 words. I construct two narrative disclosure measures based on different sets of keywords: One includes the keywords “advertising”, “advertise”, “advertise”, “advertisement” and their variants with an “s” appended (*PctADV_1*), and the other includes the set of keywords in *PctADV_1* plus “marketing”, “promotion”, “sampling”, and “detailing” which are broadly related to advertising (*PctADV_2*).

Table 12 shows the results for the narrative disclosure analysis. The sample size is about 5% smaller than the main sample due to the incomplete match between EDGAR (from which 10-Ks are downloaded) and Compustat via the central index key (CIK). Panel A shows that the average number of advertising-related keywords per 10,000 words is 1.51 for *PctADV_1* and 4.22 for *PctADV_2* which is comparable to that of competition-related keywords in Li et al. (2013).

Panel B show the regression results. Narrative disclosures have much more within-firm variation than the disclosure of advertising expenses, which enables me to use firm fixed effects to control for potential unobserved firm-specific omitted variables. The results show that the coefficients on advertising rivalry are negative and significant for both narrative disclosure measures, consistent with advertising rivalry being one important determinant of the firm’s overall disclosure of advertising-related information.³⁰ Overall, these findings strengthen our confidence in the main inferences and also support the notion that the disclosure of advertising expenses is a good proxy for the firm’s overall advertising-related disclosures.

³⁰ Results are qualitatively the same if measuring narrative disclosures at the sentence level (Merkley 2014).

Table 12: Analysis on Narrative Advertising-Related Disclosure

This table presents the results for the effect of advertising rivalry on the quantity of narrative advertising-related disclosure in 10-K filings. Panel A reports the descriptive statistics of the narrative advertising-related disclosures, measured as the percentage of advertising-related keywords per 10,000 words in the firm's 10-K filing, where *PctADV_1* counts the keywords of “advertising”, “advertise”, “advertise”, “advertisement” and their variants, and *PctADV_2* counts the keywords of those in *PctADV_1* plus “marketing”, “promotion”, “sampling”, and “detailing”. Panel B reports the regression results. The dependent variables are the narrative advertising-related disclosures (*PctADV_1* and *PctADV_2*) and the main variables of interests are advertising rivalry (*AdRivalry*), and its decile rank scaled to be within [0,1] (*Decile_AdRivalry*). Control variables, firm fixed effects and year fixed effects are included. Standard errors are clustered by firm. *t*-statistics for two-tailed tests are shown in parentheses. Please see Appendix A.1. for variable definitions.

Panel A: Summary Statistics (N = 14,790)

	Mean	STD	p10	p25	p50	p75	p90
PctADV_1	1.51	2.72	0.00	0.06	0.49	1.57	4.11
PctADV_2	4.22	4.60	0.44	1.11	2.67	5.62	9.95

Panel B: Advertising Rivalry and Narrative Advertising-Related Disclosure

DV:	(1)	(2)	(3)	(4)
	PctADV_1	PctADV_2	PctADV_1	PctADV_2
AdRivalry	-0.061*** (-2.41)	-0.099** (-2.09)		
Decile_AdRivalry			-0.265*** (-2.58)	-0.388** (-2.00)
ExistComp	0.142* (1.73)	0.190 (1.31)	0.142* (1.73)	0.190 (1.31)
EntrantComp	-0.056 (-1.15)	0.093 (1.07)	-0.057 (-1.17)	0.092 (1.06)
IndProfitability	-0.021 (-0.70)	-0.075 (-1.29)	-0.021 (-0.71)	-0.075 (-1.28)
Kantar/Sales	5.280** (2.57)	11.007*** (3.13)	5.286** (2.58)	11.025*** (3.14)
ERC	0.004 (1.34)	0.013** (2.44)	0.004 (1.33)	0.013** (2.43)
Other Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj. R ²	0.79	0.73	0.79	0.73
N	14,790	14,790	14,790	14,790

1.7. Conclusion and Discussion

1.7.1. Discussion on Alternative Explanations

Agency Cost

To the extent that a firm's advertising rivalry is negatively correlated with its advertising returns, the negative association between advertising rivalry and disclosure likelihood may be explained by the agency cost of disclosure. Specifically, the higher advertising rivalry a firm has, the lower returns to the firm's advertising activities are, and thus the stronger incentives to hide the costly advertising expenses from the capital market. While I could not completely rule out this alternative explanation, I argue that this agency cost explanation is less likely to explain the main results.

At the conceptual level, advertising rivalry measure is unlikely to be correlated with agency cost of disclosure arising from advertising return. If a firm faces high advertising rivalry, it may have more advertising rivals, which may suggest a lower return to advertising. However, this type of low advertising return reflects the industry structure and the competition environment, rather than an agency problem.

At the empirical level, untabulated results show that my main results are robust when controlling for the institutional ownership (a proxy for corporate governance) and in subsamples partitioned on the institutional ownership. I leave for the future work to directly measure and control for advertising effectiveness.

Peer Effect

To the extent that advertising rivalry is determined by the number of rivals, the advertising rivalry measure may capture the availability of advertising information from peer companies. The more information the peers provides, the lower benefit of the firm-specific disclosure has, which reduces the disclosure likelihood. To mitigate this alternative explanation concern, I control for industry disclosure conventions including the percentage of disclosers within the industry and the industry fixed

effects. I also find that my main results are robust when controlling for the number of industry peers and the number of advertising rivals.

1.7.2. Conclusion

Despite its economic importance, research on advertising has received little attention in the accounting literature. This study constructs new measures of firm-level advertising rivalry and examines their effects on discretionary disclosure of advertising expenses.

Using the third-party tracked advertising data, I find that a high proportion of firms with advertising activities do not disclose advertising expenses. This percentage remains high in the subsample of firms with material advertising expenses, suggesting that firms have leeway to disclose material discretionary expenses.

I construct rivalry measures that capture the competition intensity in the advertising dimension. I find that these measures are negatively associated with the likelihood of disclosing advertising expenses. The inferences are robust to controlling for commonly used competition measures and to using the entropy balancing matched sample or the subsample of advertising-intensive firms. Additionally, I find a negative association between advertising rivalry and narrative advertising-related disclosures in 10-Ks, which corroborates the findings on the disclosure of advertising expenses in financial statements.

I find that results of cross-sectional analyses are also consistent with theoretical predictions. Specifically, the negative association is less pronounced when the firm advertises on more trackable media outlets, consistent with its advertising expenditures being less proprietary when rivals can observe its advertising activities with lower costs. Second, the negative association is more pronounced when the firm has more volatile advertising expenditures, consistent with firm-disclosed advertising

expenses being a more useful signal for rivals to revise their expectations when the underlying advertising expenditures are more uncertain. Third, the negative association is more pronounced when the firm has more mature products, consistent with advertising triggering more aggressive rivals' response in a mature market through business stealing.

Collectively, my findings suggest that firms consider their advertising expenditures proprietary and that concerns of product market competition discourage their disclosure of advertising expenses in financial statements despite the materiality constraint. These findings may have implications for market participants and accounting researchers who use firm-disclosed advertising expenses in gauging firms' underlying advertising activities.

APPENDIX A

A.1. Variable Definitions

Advertising Disclosure Variables

- **Disclosure:** A dummy variable equals one if the firm discloses advertising expenses on the face or in the footnote of financial statements (xad is not missing in Compustat), and zero otherwise
- **PctADV_1:** Percentage of advertising-related keywords per 10,000 words in the firm's 10-K filing, where the keywords include "advertising", "advertise", "advertisement" and their variants with an "s" appended
- **PctADV_2:** Percentage of advertising-related keywords per 10,000 words in the firm's 10-K filing, where the keywords include those in PctADV_1 plus "marketing", "promotion", "sampling", "detailing" and their variants with an "s" appended

Advertising Rivalry Variables

- **AdRivalry:** Advertising rivalry intensity, measured as the sum of pairwise cosine similarity scores in terms of third-party tracked advertising spending across 924 product categories for a firm with all other firms in the third-party tracked advertising database
- **AdRivalry^{Public}** : AdRivalry variant that is summed over public rival firms
- **AdRivalry^[x,y]**: AdRivalry variant that is summed over rivals with the similarity scores falling in the top [x,y] percentiles, where [x,y] has values of [0,2], [3,5] and [6,100]

Other Competition Variables

- **ExistComp:** Following Li (2010), ExistComp is measured as the factor loaded by the underlined variables in the principal component analysis (PCA) based on nine segment-level variables (i.e., Industry PPE, industry capital expenditure, industry R&D, industry price-cost margin, industry ROA, industry four firm concentration, industry HHI, number of firms in the industry, and market size of the industry). Segment-level variable is aggregated to firm-level by taking the weighted average across segments for a firm, where the weight is the ratio of segment sales to firm sales
- **EntrantComp:** Similar to ExistComp, EntrantComp is measured as the factor loaded by the underlined variables in the principal component analysis (PCA) based on nine segment-level variables (i.e., Industry PPE, industry capital expenditure, industry R&D, industry price-cost margin, industry ROA, industry four firm concentration, industry HHI, number of firms in the industry, and market size of the industry)
- **IndProfitability:** Similar to ExistComp, IndProfitability is measured as the factor loaded by the underlined variables in the principal component analysis (PCA) based on nine segment-level variables (i.e., Industry PPE, industry capital expenditure,

industry R&D, industry price-cost margin, industry ROA, industry four firm concentration, industry HHI, number of firms in the industry, and market size of the industry)

- **SalesSimilarity:** Sales-based similarity, measured as the sum of pairwise cosine similarity scores in terms of firm sales across a total of 454 segments, for a firm with all other firms in Compustat
- **ProductSimilarity:** Product-based similarity, measured as the sum of pairwise cosine similarity scores of 10-K product descriptions between a firm and all other firms for a given year, obtained from Hoberg and Phillips' website (www.hobergphillips.usc.edu)
- **ProductFluidity:** Product fluidity, measured as the sum of pairwise cosine similarity scores between a firm's 10-K product description and other firm's annual change in 10-K product description for a given year, obtained from Hoberg and Phillips' website (www.hobergphillips.usc.edu)

Other Control Variables

- **Kantar/Sales:** Ratio of third-party advertising spending to firm sales
- **ERC:** Earnings response coefficient, estimated by regressing quarterly stock returns on the seasonal change in EPS deflated by stock price
- **LogMV:** $\text{Log}(1 + \text{Market value of equity})$, where market value is measured as number of shares outstanding (csho)*Price (prcc_f) at fiscal year-end
- **Leverage:** Leverage, measured as the ratio of debt (dltt+dlc) to total assets (at)
- **MB:** Market-to-book, measured as the ratio of market value to book value (ceq)
- **Std(Earn):** Volatility of earnings, measured as standard deviation of earnings before extraordinary items and discontinued operations (ib) scaled by total assets over the prior five years with a minimum requirement of three observations
- **Std(Ret):** Volatility of stock returns, calculated with monthly stock return data over the fiscal year
- **NewIssue:** A dummy variable equals one if the firm has new equity or debt issues during the fiscal year, and zero otherwise
- **Litigation:** a dummy variable equals one if the firm operates in an industry facing high litigation risk, namely industries with primary four-digit SIC code 2833- 2836, 8731-8734 (bio-tech), 3570-3577 (computer hardware), 3600-3674 (electronics), 7371-7379 (computer software), 5200-5961 (retailing), 4812-4813, 4833, 4841, 4899 (communications), or 4911, 4922-4924, 4931, 4941 (utilities), and zero otherwise
- **ROA:** Return on assets, measured as the ratio of earnings before extraordinary items and discontinued operations to total assets
- **Analyst:** Number of analysts who issued at least one earnings forecast for the firm-

fiscal year

- **NumSegment:** Number of business or operating segments
- **LogNonMissing:** $\text{Log}(1 + \text{Number of Non-missing items in Compustat Fundamental Annual})$
- **PMDAccruals:** Performance-matched discretionary accruals, measured as the difference between the total accruals and the expected accruals based on ROA-adjusted modified Jones model as in Kothari et al. (2005)

Advertising Media Trackability Proxies

- **MediaNumber:** The number of unique media used by a firm
- **MediaHHI:** Herfindahl-Hirschman Index of the third-party tracked advertising over media types
- **National:** A dummy variable equals one if the firm advertises on national media, i.e., any medium that is not classified as local radio, local magazine or outdoor by Kantar, and zero otherwise

Advertising Volatility Proxies

- **Std(Kantar/Sales):** Firm-specific standard deviation of third-party tracked advertising expenditures scaled by sales over the sample period
- **Std(Kantar):** Firm-specific standard deviation of third-party tracked advertising expenditures over the sample period
- **Std(Sales):** Firm-specific standard deviation of firm sales over the sample period

Product Maturity Proxies

- **ProdMaturity1:** First measure of firm-level product maturity, measured as the weighted average of segment-level life cycle, which is measured as the sum of the ranks of the industry median of three firm-specific indicators: Firm age, firm sales growth, and firm dividend payout ratio (Anthony and Ramesh 1992)
- **ProdMaturity2:** Second measure of firm-level product maturity, measured as the weighted average of segment-level life cycle, which is measured as the sum of the ranks for two industry-level indicators: Industry sales growth, and industry new entry rate (Parsons 1976)
- **ProdMaturity3:** Third measure of firm-level product maturity, measured as the weighted average of segment-level life cycle, which is measured as industry-level cash-flow based product life cycle (Cantrell and Dickinson 2015)

A.2. Numerical Example of AdRivalry

One illustrative example for firms A, B, C, D and E's advertising across product categories V, W, X, Y and Z:

	V	W	X	Y	Z	Pairwise Cosine Similarity Scores				Sum
A	0.20	0.40	0.40	0.00	0.00	(A,B)= 0.40	(A,C)= 0.18	(A,D)= 0.13	(A,E)= 0.89	1.60
B	0.00	0.20	0.20	0.60	0.00	(B,A)= 0.40	(B,C)= 0.75	(B,D)= 0.83	(B,E)= 0.40	2.38
C	0.40	0.00	0.00	0.60	0.00	(C,A)= 0.18	(C,B)= 0.75	(C,D)= 0.98	(C,E)= 0.00	1.91
D	0.30	0.00	0.00	0.70	0.00	(D,A)= 0.13	(D,B)= 0.83	(D,C)= 0.98	(D,E)= 0.00	1.94
E	0.00	0.40	0.40	0.00	0.20	(E,A)= 0.89	(E,B)= 0.40	(E,C)= 0.00	(E,D)= 0.00	1.29

Take firm A as an illustration. The cosine similarity between A and B is $(A,B)=\frac{0.2\times 0+0.4\times 0.2+0.4\times 0.2+0\times 0.6+0\times 0}{\sqrt{0.2^2+0.4^2+0.4^2}\sqrt{0.2^2+0.2^2+0.6^2}}=0.40$, which is a proxy for B's response to A's one unit advertising. Similarity, responses from A's other advertising rivals are proxied by their pairwise cosine similarity scores: (A, B)=0.40, (A, C)=0.18, (A, D)=0.13 and (A, E)=0.89. The firm-level advertising rivalry score for A is the sum of pairwise similarity scores between A and all its rivals, i.e., 1.60 (=0.40+0.18+0.13+0.89). Similarly, the advertising rivalry scores for B, C, D, and E are 2.38, 1.91, 1.94, and 1.29 respectively. The intensity of advertising rivalry is jointly determined by the following factors.

i. The more overlapping product categories the firms advertise, the more intense the advertising rivalry between two firms. In this example, A has two overlapping product categories with B (i.e., W and X) while has only one overlapping product category with C (i.e., V), so the competition pressure from B (proxied by the similarity between A and B, i.e., (A, B) = 0.40) is larger than that from C (i.e., (A, C) = 0.18).

ii. The higher proportion of advertising expenditures allocated in overlapped product categories, the more intense the advertising rivalry between two firms. In this example, C allocates 40% of its total advertising expenditures in the overlapping product category with A (i.e., V) while D allocates 30% in the overlapping product category with A (i.e., V), so the competition pressure from C (i.e., (A, C) = 0.18) is larger than D (i.e., (A, D) = 0.13).

iii. The larger the number of advertising rivals in the economy, the more intense the advertising rivalry for a firm. In this example, A has a total of four advertising rivals (B, C, D and E) while E has two advertising rivals (A and B), so the advertising rivalry for A (i.e., 1.60) is larger than E (i.e., 1.29).

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