Internet Flaming: Stock Price Reactions and Corporate Response

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Received 20 July 2019; received in revised form 27 September 2019; accepted 26 November 2019

Abstract

This study investigates the influence of Internet flaming and corporate responses on stock prices, and the factors that affect stock price fluctuations during flaming. We conducted an event study analysis using 154 flaming events targeting Japanese listed companies from 2009 to 2018. The results show that stock prices drop significantly due to the flaming, and whether the effect dies down in the short term depends on responses of the flamed companies. The stock prices of flamed companies tend to decline significantly if they apologize or delete comments. However, this decline does not continue after a couple of days. By contrast, if they object to the flaming or provoke, their stock prices start to decline a few days after the outbreak of the flaming and continue to further decline. We also find that newspaper publications do not substantially affect the stock price of the flamed company.

Keywords: Flaming, stock price, internet, event study, Japan, firm behavior

1. Introduction

The prevalence of the Internet enabled companies to leverage social networking services (SNS) to increase consumer awareness about their products and services. Consumers using SNS can immediately spread information on a company to a wide audience. However, such information can either be positive or negative, increasing both the benefits and the risks for the company. In particular, inappropriate acts or remarks on the Internet tend to generate criticism and flaming against the company, adversely impacting their business. With the increase in such occurrences, it becomes important for corporate managers to learn how to react appropriately to such Internet flaming.

In this study, we investigate the influence on stock prices of Internet flaming and corporate responses, and the factors affecting stock price fluctuations during flaming. According to previous studies, flaming tends to have negative effects on stock prices of the targeted company (Adachi & Takeda, 2016; Tanaka, 2017). However, to the best of our knowledge, our study is the first to investigate how a company can respond to prevent the spread of negative information and mitigate consumer anxiety and distrust. We conduct an event study analysis using 154 flaming events targeting Japanese listed companies in the period from 2009 to 2018.

We find that the stock price drops significantly due to the flaming and whether the effect dies down in the short term depends on the responses of the flamed companies. When a company makes an apology or deletes comments, its stock price tends to decrease significantly immediately after the outbreak of the flaming. However, the drop does not continue further after a few days. In contrast, when the company shows objection or provocation, its stock price starts to decline in a few days after the flaming outbreak and continues further. Contrary to the findings of prior studies, the effect of newspaper publications does not substantially affect the stock price of the flamed company. We believe that our results can help companies consider measures to prevent flaming and decide what to do if they have been flamed.

2. Background and Literature Review

Prior to the Internet age, the verb "to flame" appeared in the early 1980s, when Siegel et al. (1986) defined "flaming" as "the expression of strong and inflammatory opinions." Flaming has been observed since the early 2000s in Japan, where Ijichi (2009) and Tashiro (2008) define it as "a rush of comments and trackbacks such as criticism, blame, libel, and slander greatly exceeding the site administrator's assumption." Among the major communication tools on the Internet, flaming tends to occur in SNS, blogs, and bulletin boards. In particular, more the SNS users, the more are the flaming incidents on the Internet. Hirai (2012) claims that Internet flaming began to be recognized around 2006 in Japanese SNS such as "mixi" or "2chan," and then, with the spread of smartphones, moved to Twitter in 2011.

A great deal of research on Internet flaming has been done in the field of psychology, with Alonzo and Aiken (2004) and Moor et al. (2010) as examples. However, there are still few studies on the targets of Internet flaming. Adachi and Takeda (2016) and Tanaka (2017) have analyzed a few of those with regard to the economic impact of flaming.

Adachi and Takeda (2016) examine common features of flamed companies, the effect of Internet flaming on stock prices, and the factors that affect stock price fluctuations at the time of the Internet flaming occurrence, based on data of 194 flamings between 2006 and 2013, provided by Eltes Corp. Using a probit model, they find that companies are more prone to be flamed the more frequently they report a loss, the smaller their sales growth is, and the larger their size. Their event study analyses show that the group appearing in newspapers on or before flaming is affected immediately before and after the flaming occurrence, whereas the group appearing in newspapers after the flaming appears to be affected approximately one or two weeks after the flaming outbreak. In addition, the group that does not appear in newspapers does not exhibit significant results. Then, Adachi and Takeda (2016) perform a multiple regression analysis, showing that the stock price at the outbreak of the flaming falls significantly if a company appears in newspapers on or before the outbreak of the flaming. In addition, the larger the scale of the flaming is, the longer it takes for the flaming to die down. Furthermore, the stock price drops significantly due to flaming, the more inefficiently the company is managed, the higher its growth potential is, the longer it has existed, and the larger it is.

Tanaka (2017) examines the influence of flaming on stock prices, based on 77 occurrences of flaming on Japan's largest summary website, "NAVER" (https://matome.naver.jp/), between April 2012 and March 2016. He estimates the influence of flaming on stock prices using a fixed effect model and a GMM. The results show that stock prices fall due to the flaming. He also finds that newspaper reports make the stock price fall to some extent, but not significantly; however, even if there is no newspaper coverage, Internet flaming alone can reduce the stock price of the flamed company. He further reports a non-linear relationship between the number of views and the stock price, so that there is almost no impact on stock prices when the number of views is 20,000 or less, but up to a maximum of 4% to 5% reduction at approximately 80,000 views.

One of the major discrepancies between Adachi and Takeda (2016) and Tanaka (2017) is on the effect of newspaper publications. The former report that Internet flaming alone has no effect on stock prices while spreading information through both the Internet and newspapers negatively affects stock prices. By contrast, the latter shows that newspaper reports do not significantly lower stock prices. Tanaka (2017) argues that this difference may result from the use of different data sources, given that his samples comprise more serious flaming incidents than those of Adachi and Takeda (2016). In the present study, we update the flaming incidents extracted from NAVER to cover 2018 and reexamine the effect of newspaper articles. We also investigate stock price responses to corporate responses to flaming, which has not been examined in prior studies.

3. Hypotheses Development

Previous studies find that flaming can reduce the stock prices of flamed companies to a certain extent (Adachi & Takeda, 2016; Tanaka, 2017). This can be caused by the following three factors: First, flaming can negatively affect the brand image of a flamed company, resulting in a decline in its sales and market share. Second, it may adversely affect the reputation of flamed companies in the job market, making it more difficult for them to hire and retain talent. Third, flamed companies may incur both short-term and long-term costs to mitigate the negative influence and to prevent the recurrence of flaming. They may have to confirm the authenticity of content to consumers and the press, and reassure them. Against this backdrop, we set the following hypotheses:

H1. The stock price of a company responds negatively to flaming.

This hypothesis is consistent with the results of Adachi and Takeda (2016) and Tanaka (2017).

When flaming occurs, the corporate response can also be criticized. The criticism may arise when the company does not apologize sincerely. An appropriate apology may be able to mitigate consumers' distrust of the company, as in the case of the flaming on Tyrol Chocolate, which tweeted a formal response through their official account within three hours of the complainant tweeting the picture of a green caterpillar in their product (Saito, 2013). The official tweet stated that judging from the shipment of goods, the development of the insect, and so on, it was highly likely that the infestation had occurred after the goods' shipment and not during the manufacturing process. It then concluded with an official apology. The quick and accurate Tweet was retweeted about 10,000 times, eliciting praise for the appropriate response. Thus, we set the following hypothesis.

H2. The stock prices of companies that have offered appropriate apologies after flaming suffer a smaller negative impact in subsequent periods than those of flamed companies that did not offer apologies.

By contrast, consumers may feel insulted by or suspicious of companies that claim objection, provoke, or neglect by deleting comments without any remark. The case of Peyoung, a popular Maruka Foods product, exemplifies this. After spreading a Tweet that insects were found in Peyoung, the original tweeter got a refund after deleting the photos from Twitter. The response of Maruka Foods was regarded as a concealment, generating further criticism. In addition, the initial corporate response was also criticized because Maruka Foods claimed

innocence until several consumers tweeted that they had made similar complaints in the past. Moreover, on-site inspections by the public health center and an outsourcing organization later reported that there was a high possibility of contamination in the manufacturing process. Thus, we set the following two hypotheses:

H3. The stock prices of companies that claim innocence or make provocations after the flaming are more negatively affected in subsequent periods.

H4. The stock prices of companies that only delete comments without an appropriate apology after the flaming are more negatively affected in subsequent periods.

As regards the impact of newspaper coverage, Adachi and Takeda (2016) find that it results in falling stock prices, whereas Tanaka (2017) finds no significant effect, but rather the opposite result. However, as noted in Section 2, the Internet and smartphones have become widespread, increasingly more people currently obtain information and news from SNS, and it is considered that they are good at information selection. According to the Institute for Information and Communications Policy (2018), the credibility of newspapers is high among other information sources including television, the Internet, and magazines. Therefore, it is thought that multiple sources of information impart a sense of credibility, as we do not need to believe everything we see on the Internet. In addition, the fact that something was published in a newspaper can also be an indicator that the misconduct that caused the flaming is more serious. This leads to the following hypothesis:

H5. The stock prices of companies whose misconduct is reported in newspapers are more negatively affected.

4. Methodology

In this study, we use an event study method to analyze the impact of flaming on the targeted company (MacKinlay, 1997). This method assumes the efficient market hypothesis, in which public information is immediately delivered to investors, and thus asset prices reflect the impact of economic events within a short time. To conduct the event study, we need to set an event day, event window, and estimation window. The event window is the period in which stock prices are affected by the event. Following Adachi and Takeda (2016), we denote the day of the flaming as the event day, $t=t_0=0$, define the event window to be from $t=t_1$ to $t=t_2$, and conduct the analysis for six windows:

$$(t_1, t_2) = (0,0), (0,1), (0,2), (0,3), (0,5), (0,10) \quad (1)$$

We use multiple event windows to guarantee the robustness of the result and also to consider the possibility that the market does not always respond immediately to flaming because of the asymmetrical information among investors. The estimation window is a period during which there is no considerable influence from the event. In this study, the estimation window was set to 250 days.

We employ a standard market model to estimate the stock prices of flamed firms based on the following least squares model:

$$R_{it} = \alpha_i + \beta_m R_{mt} + \sum_{j=1}^{N} \beta_j D_j + \varepsilon_{it}. \quad (2)$$

R_{it} is the daily return of the flamed firm's stock price and R_{mt} is the daily return of the market index, namely, the Tokyo Stock Price Index (TOPIX). We use TOPIX, the weighted average of returns of all (floating after 2005) stocks listed on the First Section of the Tokyo Stock Exchange. This index is usually employed because another index, the Nikkei 225, is a simple average of returns of limited large companies. D_j is a dummy variable, taking the value 1 in the event window and 0 in other periods. ε_{it} is an error term. The estimated coefficients $\widehat{\alpha_\iota}$, $\widehat{\beta_m}$, and $\widehat{\beta_J}$ are used to calculate the abnormal return (AR).

$$AR_{it} = R_{it} - \widehat{\alpha_\iota} + \widehat{\beta_m} R_{mt} \quad (3)$$

The cumulative abnormal return (CAR) is the sum of ARs in the event window from $t = t_1$ to $= t_2$. We then calculate the average cumulative abnormal return (ACAR) of a specific group, and statistically test the two-sided null hypothesis "ACAR = 0."

Next, a multiple regression analysis is performed using the CAR of the flamed company as the dependent variable.

$$CAR = \alpha_0 + \alpha_1 APOLOGY + \alpha_2 OBJECTION + \alpha_3 COMMENT\_DELETE + \alpha_4 NEWS + \alpha_5 \text{VIEW\_COUNT} + \alpha_6 ROA + \alpha_7 LOSS + \alpha_8 PBR + + \sum_i \alpha_i YEAR\_DUMMY_i + \sum_j \alpha_j INDUSTRY\_DUMMY_j + \varepsilon \quad (4)$$

To test H2 through H4, we create three dummy variables, APOLOGY, OBJECTION, and COMMENT_DELETE regarding company responses to flaming. APOLOGY is a dummy variable that takes the value 1 if the company has made apologies after flaming. OBJECTION is a dummy variable that takes the value 1 if the flamed company claims innocence or provokes after the flaming. COMMENT_DELETE is a dummy variable that takes the value 1 if the company deletes comments without appropriate apologies after the flaming. Based on H2 through H4, we expect a positive coefficient for APOLOGY and negative coefficients for OBJECTION and COMMENT_DELETE. To test H5, the dummy variable NEWS is created, which takes the value 1 if the company's misconduct is reported by the newspaper before or after the outbreak of the flaming. Based on H5, we expect a negative coefficient for this variable.

VIEW_COUNT is the natural logarithm of the articles' number of views. Tanaka (2017) reports that there is almost no impact on stock prices when the number of views is 20,000 or less, but up

to a maximum of a 4% to 5% reduction at approximately 80,000 views. The remaining variables are ones that control firm-specific characteristics. ROA, LOSS, and PBR are obtained for flamed firms from Toyo Keizai's Kaisha Shikiho CD-ROM. ROA is the return on total assets, LOSS is a dummy variable that takes the value 1 if the firm records a net loss, PBR is the price book-value ratio. We also include year and industry dummy variables.

5. Data

As explained in Section 2, Adachi and Takeda (2016) and Tanaka (2017) use different data to examine the effect of Internet flaming. The former employs flaming data provided by a Japanese venture specializing in online reputation management Eltes Co. The latter constructs flaming data from the curation site "NAVER," based on articles tagged with "flaming." We follow the data collection method of Tanaka (2017) and extend the data. One of the advantages of using "NAVER" is that we can collect the data on the number of views, which can measure the scale of Internet flaming.

Between 2009 and September 2018, there were 5,890 articles tagged with "flaming" in NAVER. Following Tanaka (2017), we first remove 2,503 flaming incidents whose scale of Internet flaming is significantly less than 10,000. We then exclude 2,944 flaming incidents targeted on non-corporate entities. We also eliminate 145 incidents in which the flamed companies are unlisted or delisted at the time of flaming, and 112 duplications. Finally, we exclude 32 cases in which the date of flaming occurrence is not determined, or where the adjusted R^2 takes a negative value when we estimate equation (2). The above criteria generates our final sample, comprising 154 flaming data.

The distribution of our sample is as follows. As for the industry distribution, more than 70% of the flamed companies belong to the information and communication, retail, and service industries. With regard to the number of views, relatively small samples with less than 40,000 views account for nearly 50% of the total, while samples with more than 100,000 views contribute 20% to the total.

There are events other than Internet flaming (Confounding Event, hereinafter CE) that may affect stock prices. Therefore, the contents of newspaper articles are considered as CE when the contents obtained from Nikkei Telecon 21 by searching for the company name in the period 3 days before and after the flaming outbreak day fall into the following two classifications: (i) New products and services and (ii) Corporate performance, such as a brief note on settlement accounts and sales. Thus, CEs are found in 57 flaming incidents.

We also use Nikkei Telecon 21 to examine the effect of newspaper articles. When searching for newspaper articles, the name of the flamed company is set as a search keyword and the search target period is set to 10 days before the flaming breakout. Twenty-two of the 154 flamings had news coverage in the newspaper, of which 4 articles were reported before the flaming outbreak, 4 on the same day as the outbreak, and 14 after the outbreak.

6. Results and Discussion

Table 1 presents the event study results for all events and events with and without CE. In all event windows, the ACAR of all samples is negative, especially in (0, 0), showing significant results at the 5% level. As a robustness check, Table 3 also shows results with and without CE. Without CE, ACAR is negative in all event windows and significantly negative in (0, 0) at the 10% level. These results are consistent with H1, as well as the results of Tanaka (2017), indicating the negative impact on the stock price immediately after the flaming outbreak. We then compare the ACAR of samples without CE and those with CE. In all event windows, the ACAR of the group without CE is more negative than that of the group with CE. However, Welch's t-test shows that the ACAR of the two groups is not significantly different in any event windows. Thus, we do not eliminate ACAR with CE in the subsequent analyses.

Table 1: Average Cumulative Abnormal Returns for Flamed Companies

		(0,0)	(0,1)	(0,2)	(0,3)	(0,5)	(0,10)
ALL events	ACAR	-0.364	-0.398	-0.344	-0.071	-0.497	-0.496
N=154	J-statistics	-2.081**	-1.608	-1.135	-0.202	-1.160	-0.856
Without CE	ACAR(a)	-0.440	-0.503	-0.392	-0.329	-0.652	-0.562
N=97	J-statistics	-1.838*	-1.485	-0.945	-0.686	-1.113	-0.708
With CE	ACAR(b)	-0.235	-0.219	-0.262	0.368	-0.233	-0.385
N=57	J-statistics	-0.980	-0.648	-0.631	0.768	-0.397	-0.485
Welch's t-test	(a)-(b)	-0.205	-0.283	-0.130	-0.697	-0.419	-0.177
	t-statistics	-0.771	-0.714	-0.274	-1.200	-0.603	-0.176

Note: ** and * indicate statistical significance at the 5% and 10% levels, respectively.

Table 2 presents the market reactions to corporate responses. In flamed companies, ACAR is negative in all event windows for the APOLOGY group, and significant results are obtained in (0, 0) at the 5% level. The ACAR of the APOLOGY group is also the smallest among the four groups. This result indicates that the initial flaming is so serious for the APOLOGY group that the company

has to issue an apology. This conjecture can be supported by the following fact: the average number of views of articles is 140,725 in the APOLOGY group, while it is 85,657 in the group that takes actions other than an apology. However, after the initial decline, ACAR does not decrease further, perhaps because the apology prevents the prolongation of negative effects.

For the group that objects or provokes (OBJECTION), although the effect is slightly positive immediately after the flaming outbreak, the result is significantly negative in (0, 2) and (0, 5). In other words, the negative influence appears a little later in the group that has objected and provoked. The magnitude of the subsequent decline is the largest among those in the four groups. Given the fact that comments on the incident are made several days after the outbreak of the flaming, the change in stock prices can be thought of as a manifestation of consumer dissatisfaction with and disbelief about those comments. For the group that deletes comments (COMMENT_DELETE), no significant results are obtained in any event window. By deleting comments quickly, it is possible that the flaming itself will die down before it spreads online. In addition, the group that does not take any of above actions also exhibits no significant results.

Table 2: Market Reactions to Corporate Responses

		(0,0)	(0,1)	(0,2)	(0,3)	(0,5)	(0,10)
APOLOGY	ACAR	-0.847	-0.698	-0.561	-0.117	-0.862	-0.877
N=49	J-statistics	-2.312**	-1.346	-0.883	-0.159	-0.960	-0.721
OBJECTION	ACAR	0.060	-1.041	-1.720	-1.091	-1.986	-1.701
N=18	J-statistics	0.129	-1.599	-2.157**	-1.185	-1.761*	-1.114
COMMENT_DELETE	ACAR	-0.805	-1.111	-0.593	-0.849	-0.957	-0.396
N=7	J-statistics	-1.360	-1.327	-0.579	-0.717	-0.660	-0.202
NO ACTION	ACAR	-0.125	-0.007	0.121	0.255	0.101	-0.001
N=80	J-statistics	-0.559	-0.022	0.313	0.573	0.186	-0.002

Note: ** and * indicate statistical significance at the 5% and 1% levels, respectively.

Table 3 presents the market reactions to the newspaper reports. The ACAR of the group reported in the newspaper is negative in all event windows, and a significant negative result is obtained in (0, 5). Similarly, no significant results are obtained except for (0, 0) for the group that has no newspaper coverage. In addition, the ACAR of the group with reports in the newspaper is more negative than that of the group without such reports. In the Welch's t-test of difference, significantly negative results are obtained in (0, 2), (0, 5), and (0, 10). These results suggest that the influence of newspaper coverage is small immediately after the outbreak of the flaming, but persists for a few days. This is consistent with the fact that newspaper coverage often occurs several days after the outbreak of the flaming. It is also natural to expect that a flaming reported in the newspaper is more serious than an unreported flaming. In fact, although the average number of views of articles on the flaming reported in newspapers is 210,880, that for the group without newspaper coverage is significantly different, at 85,229, and, clearly, only large-scale flaming affects the results.

Table 3: Market Reactions to News Reports

		(0,0)	(0,1)	(0,2)	(0,3)	(0,5)	(0,10)
With News Report	ACAR(a)	-0.592	-0.520	-1.140	-0.723	-1.916	-2.280
N=22	J-statistics	-1.378	-0.855	-1.531	-0.841	-1.819*	-1.599
Without News Report	ACAR(b)	-0.326	-0.377	-0.211	0.038	-0.261	-0.199
N=132	J-statistics	-1.705*	-1.397	-0.638	0.099	-0.557	-0.314
Welch's t-test	(a)-(b)	-0.267	-0.142	-0.929	-0.761	-1.655	-2.081
	t-statistics	-0.637	-0.271	-1.916*	-1.293	-2.243**	-2.277**

Note: ** and * indicate statistical significance at the 5% and 10% levels, respectively.

Table 4 presents the results of the multiple regression analysis based on equation (4). Note that the variance inflation factor of each explanatory variable does not exceed 10. In all the event windows, APOLOGY and COMMENT-DELETE have negative coefficients, which are statistically significant in event windows (0, 0) and (0, 1). These results suggest that flamed companies that made an apology and deleted comments suffer a large and negative effect immediately after the outbreak of the flaming. However, in the subsequent windows, the coefficients of APOLOGY and COMMENT_DELETE are not significant, indicating that the initial, strongly negative effects die down in a short time. These results are consistent with our univariate analyses. By contrast, the coefficients of OBJECTION take a significant negative value in event window (0, 2) but insignificant ones in the other windows. This result is also consistent with the univariate analysis results, showing that the stock price of the company that objected and provoked was negatively affected several days after the Internet flaming occurrence.

Among the other variables, NEWS does not have any significant coefficients in any event windows. This means that the Internet flaming alone

can reduce the stock price of the flamed company and whether newspapers report the same event does not seem to affect the stock price of the flamed company. Our results are not consistent with Adachi and Takeda (2016) but with Tanaka (2017). This result may arise from the difference in data source. While Adachi and Takeda (2016) use the data collected by Eltes, Tanaka (2017) and our study use data retrieved from NAVER, and focus only on the flaming incidents with large views. Compared to Eltes' data, our data are likely to be larger, more serious, and thus, bear more influence on investors' decision-making than newspaper publications. Unlike Tanaka (2017), however, we fail to find evidence that the stock price responses are affected by the number of views, as VIEW_COUNT does not have any significant coefficients in any event windows.

Table 4: Factors Affecting the CAR of Flamed Companies

	CAR (0,0)		CAR (0,1)		CAR (0,2)	
Variable	**Coefficient**	**t-Statistic**	**Coefficient**	**t-Statistic**	**Coefficient**	**t-Statistic**
C	1.343	1.940*	1.027	0.996	0.881	0.660
APOLOGY	-1.016	-3.105***	-0.932	-1.910*	-0.765	-1.212
OBJECTION	0.012	0.029	-0.999	-1.589	-1.638	-2.014**
COMMENT_DELETE	-1.292	-1.936*	-2.068	-2.079**	-1.636	-1.272
NEWS	0.223	0.512	0.563	0.866	-0.147	-0.175
VIEW_COUNT	0.000	0.913	0.000	0.673	0.000	-0.241
ROA	0.044	2.299**	0.049	1.728*	0.063	1.708*
LOSS	-0.456	-0.577	3.021	2.564**	0.788	0.517
PBR	-0.220	-2.520**	-0.486	-3.741***	-0.367	-2.182**
Year Dummy	YES		YES		YES	
Industry Dummy	YES		YES		YES	
Obs.	140		140		140	
Adjusted R-squared	0.170		0.202		0.073	
Akaike info criterion	3.691		4.489		5.004	
F-statistic	2.416***		2.752***		1.542*	

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

7. Conclusions

In this study, we investigate the influence of Internet flaming and corporate responses on stock prices, and the factors that affect stock price fluctuations during the flaming. We conduct an event study analysis using 154 flaming events targeting Japanese listed companies from 2009 to 2018. We find that stock prices drop significantly due to the flaming and whether the effect dies down in the short term depends on the responses of the flamed companies. When a company makes an apology or deletes comments, its stock price tends to decrease significantly immediately after the outbreak of the flaming. However, the drop does not continue further after a few days. In contrast, when the company shows objection or provokes, its stock price starts to decline in a few days after the flaming outbreak and continues further. Contrary to the findings of prior studies, the effect of newspaper articles does not substantially affect the stock price of the flamed company. We believe that our results can help companies consider measures to prevent flaming and decide what to do if they have been flamed.

Although we use Japanese data in this study and test the hypotheses developed from Japanese experiences, Internet flaming has been observed over many years across various countries (Lindgren, 2010; Linkletter et al., 2010; McKee, 2002; Moor et al., 2010; Vrooman, 2002). Considering the possibility of cultural differences playing an important role in flaming, future research is needed to examine robustness of our findings by using data from other countries.

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