Do political blogs matter? Corruption in state-controlled companies, blog postings, and DDoS attacks*

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Abstract

Though new media has become a popular source of information, it is less clear whether or not they have a real impact on economic activity. In authoritarian regimes, where the traditional media are not free, this potential impact might be especially important. We study consequences of blog postings of a popular Russian anti-corruption blogger Alexei Navalny on the stock prices of state-controlled companies. In an event-study analysis, we find a negative effect of company-related blog postings on both within-day 5-minute returns and daily abnormal returns. Using precise timing of blog postings and news from newswires, we reject the hypothesis that the effect of blog postings is driven by events preceding the postings. We also find that there are long-term effects of the most important posts on stock returns, trading volume, and volatility. The effect is decreasing in attention to posts of other top bloggers, increasing in visitors' attention to Navalny's posts, and is consistent with more pronounced individual, rather than institutional trading. To address potential endogeneity problems, we use distributed denial-of-services (DDoS) attacks targeted to other people's blogs as a source of exogenous variation that negatively affects blog postings, but is uncorrelated with other determinants of asset prices. We find a substantial positive effect of the DDoS attacks on abnormal returns of the companies Navalny wrote about, while placebo tests suggest that DDoS attacks themselves do not have any independent effect on stock performance. Overall, our evidence suggests that blog postings about corruption in state-controlled companies can have a negative causal impact on stock performance of these companies.

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1. Introduction

In a democracy, mass media are an important instrument for monitoring behavior of public officials, limiting corruption, and reducing political rents of the incumbents (e.g., Besley and Prat, 2006, Ferraz and Finnan, 2008, Snyder and Strömberg 2010, Acemoglu and Robinson, 2006, Bardhan, 1997, Brunetti and Weder, 2003). Perhaps the most famous case is the Watergate scandal, in which information uncovered by investigative journalists eventually forced U.S. President Richard Nixon to resign. However, in countries where the governments censor news and suppress electoral institutions, the role of mass media in providing accountability is limited. What can help to promote transparency and accountability in these regimes remains an open question.

When the government has tight control over the traditional media, emerging new media become an alternative source of independent information for citizens[1] and, potentially, an agent of political change. There is voluminous anecdotal evidence on the critical role bloggers played in the uprisings of Arab Spring and elsewhere (e.g., Lynch, 2011, Lotan et al., 2011, Sabadelo, 2011), yet systematic study of the impact of online social media in authoritarian regimes is missing.[2] In this paper, we address the following question: in a country with controlled offline media, do anti-corruption blogs make a difference?

We look at the effect of blogging about corruption in state-controlled companies in Russia. We analyze the outcomes that can incentivize the management of these companies as a first step in establishing the relationship between new media and accountability. Specifically, we study whether blog postings by popular Russian blogger, shareholder activist, and, one of the leaders of emerging opposition to President Putin's regime, Alexei Navalny, have had an impact on stock performance of the companies whose wrongdoings he exposed. We study both short-term and long-term effects of blog postings and presume that lower returns and higher volatility of stock returns can provide a disciplining effect on the behavior of top managers of state-controlled companies.

First, we show that 5-minute abnormal returns for the companies Navalny wrote about were significantly lower within few hours after Navalny's posts about them even controlling for trading day fixed effects. The effect of important postings is negative and significant within the first 5-minutes after a blog posting even if no information about company was

[1] E.g. in China censored information almost never goes through traditional media, but is available online for at least several hours. (King et al. forthcoming)

[2] Systematic evidence on the impact of new media in advanced democracies remains scarce as well (Gopinath et al., 2011, and McKenzie and Özler, 2011, are rare exceptions).

released by news agencies before that during a trading day. We show that similar results hold for daily abnormal returns, though in most cases abnormal returns go back to pre-posting levels within 2 days. The results hold if we control for mentions of these companies in other types of media (newswires, offline business newspapers, online newspapers, and blogs) and for company-month and day of the week fixed effects The magnitude of the effect is quite sizable with a daily decline of 0.5 p.p. after an average blog posting, and a daily decline of 0.9 p.p. after an important blog posting, i.e. after a posting with five or more mentions of the name of the company.

Second, in addition to short-term effects described above, we look at the longer-term effects of blog postings. Looking at long-term effects is important to understand whether blog postings can provide additional incentives to limit corruption and profit diversion for people managing state-controlled companies. We find that although there were no long-term effects of the ordinary postings, there were negative and significant long-term effects of the most important postings, as proxied by at least 5 mentions of a company in the post. Such blog entries had an effect on stock prices one-month after their posting. We also show that long-short portfolio strategy based on blog postings of Navalny significantly outperforms the market. In addition, during the month after a blog posting there was a larger volatility of stock returns and a larger trading volume. The number of transactions, controlling for trading volume, was significantly larger in both short-term and longer-term perspective. Smaller average transactions are consistent with more individual, in contrast to institutional, trading, which suggest that short-run effects of blog posting are driven by attention effects, rather than provision of new information.

We also provide evidence that the lack of attention to Navalny's blog postings substantially decreases the effect. Specifically, we show that the effect of Navalny's blog postings is decreasing in the readers' attention to other LiveJournal posts on the same day. We also show that Navalny's posts were more influential when they were mentioned in the list of top-30 most interesting posts of the day, though it is hard to draw causal conclusions from the latter result.

We provide further evidence that the impact of blogging on stock performance is consistent with the negative causal impact of blog postings.[3] Though the results presented above, allow us to exclude the hypothesis that the effect is explained by selective coverage of

[3] The presence of any causal effect of blogging is unclear as readers of the blogs self-select to choose blogs they read according to their preferences (Gentzkow and Shapiro, 2011), and, in general, there are plenty of other sources of information. Nevertheless, blogs might have a more substantial impact on people's behavior in countries where information is scarce.

observed events, mentioned in alternative media or news agencies, it is theoretically possible that the blogger was writing within 5 minutes of some negative unobserved events that were not mentioned in any other news sources. To address this possibility, we use an external shock, distributed denial-of-service (DDoS) attack on a blog service, as a source of exogenous variation. We look at DDoS attacks that made LiveJournal.com blog platform almost inaccessible for at least several hours. These attacks were, allegedly, politically motivated and targeted either specific bloggers other than Navalny or all top bloggers from the list of the most popular bloggers. Although the attacks were not specifically targeting the Navalny's blog, they affected the accessibility of the whole blog platform, and the Navalny's blog was also affected. As a result, DDoS attacks either prevented Navalny from writing a post or prevented his readers from reading his blog. However, there was no obvious reason why they might influence fundamental determinants of stock prices of the companies Navalny wrote about.

We find that DDoS attacks had a significant positive effect on daily abnormal returns of the companies Navalny wrote about, with the magnitude of the effect being larger for the companies Navalny paid more attention to (the latter result holds even with DDoS attack fixed effects). Quantitatively, the effect of DDoS attack is similar to the absence of the post or to the presence of the post with no information about the company in question. This evidence demonstrates that the difference in abnormal returns between the days Navalny wrote a blog posting and the days in which Navalny voluntarily chose not to write is the same as the difference between the days Navalny wrote a blog posting and the days Navalny could not write because of exogenous shocks.

We conducted additional placebo tests to verify that our results for DDoS attacks are not consistent with the causal effect of DDoS attacks themselves. In a placebo test we find that the effect was negative and insignificant for the state-controlled companies Navalny did not write about. In addition, we find that leads of DDoS attacks do not have any influence on stock returns even for the companies Navalny wrote about, so we can exclude existence of pre-trends. We also show that DDoS attacks before 2008, when Navalny started his activist campaign, did not have any effect on stock returns of any groups of companies in question. Finally, we demonstrate that although the difference between DDoS days and blog posting days is increasing in Navalny's attention to the companies he was writing about, it is not increasing in the amount of general news attention to these companies.

Overall, all our results are consistent with the negative causal effecto of blog postings on stock performance of state-controlled companies, and imply that there is a potential disciplining effect on the behavior of public officials who manage these companies.

The may be different reasons why blog postings have a negative effect on stock returns. On the one hand, exposure might provide new negative information about the type of managers and the amount of stealing. If exposure were not expected to change the situation, this would lead to a decrease in stock prices, as the expected cash flows to minority shareholders are revised downwards. On the other hand, exposure may decrease the amount of resources diverted by the management. However, if the diverted resources were used to bribe the politicians, this might make it more difficult to give the firms preferential treatment, in line with the literature on political connections (Ferguson and Voth 2008, Fisman, 2001, Fisman and Wang, 2013, Khwaja and Mian, 2006). In this situation, the cash flows to minority shareholders can decrease despite the reduction in the diversion of resources by the management. This might lead to a reduction in stock prices, even in the situation in which corruption exposure in new media reduces social costs. The paper is most closely related to the literature on the role of media in exposing corporate fraud (Dyck, Morse, and Zingales, 2009; Miller, 2006). Dyck, Volchkova, and Zingales (2008) suggest that in a country with poor investor protection, limited media freedom, corrupt courts, and weak democratic institutions, bringing media attention to corporate fraud is one of rare tools available for minority shareholders to protect themselves. The method used by Hermitage Capital, discussed in Dyck, Volchkova, and Zingales (2008), was to lobby foreign press. Our results suggest that there is an alternative way to do it: to write a blog.

More generally the paper contributes to the literature on media effects on political and economic outcomes. In recent years, a literature has emerged on media effects on voting behavior (DellaVigna and Kaplan, 2007, Bergen, Karlan, Bergan, 2009, Enikolopov, Petrova, and Zhuravskaya, 2011, Gentzkow 2006), public policies (Strömberg 2004, Eisensee and Strömberg, 2007, Snyder and Strömberg 2010), and ethnic hatred (DellaVigna et al. 2011, Yanagizawa 2011). Bailard (2012) and Miner (2011) study the impact of the availability of Internet on political and economic outcomes. McKenzie and Özle (2011) documented the impact of blogs of academic economists on the number of downloads of their papers. Gopinath et al. (2011), analyze how pre-release blog postings about movies affect first day sale revenues.

The paper is also related to emerging literature on the causal impact of mass media on financial markets (Engelberg and Parsons 2011, Peress 2011), who use either incidence of extreme weather that delayed newspaper delivery or newspaper strikes as the sources of exogenous variation. More generally, the paper is related to the literature on the role of media in asset prices, pioneered by Dyck and Zingales (2003) and Tetlock (2007). Meschke and Kim (2010) show that markets were responsive to CEO appearances for interviews at CNBC,

and the patterns of trade are consistent with individual rather than institutional trading. Griffin, Hirschey, and Kelly (2011) find that asset prices react more to news in developed markets, as compared with emerging markets. Our findings can explain why it is the case: in many emerging markets media freedom is limited, and large companies have too much power to allow negative news about themselves to be published in traditional media. In these countries, most probably sensitive information can be published only in blogs.

The rest of the paper is organized as follows. Section 2 provides some background information on the LiveJournal blog service and Alexei Navalny's blog. Section 3 describes data, Section 4 outlines our methodology, while Section 5 presents graphic evidence. Section 6 is the main section: it contains empirical results, and reports robustness checks. Section 7 concludes.

2. Background

State-controlled companies play an important role in the Russian economy. Between 2005 and 2012, their output accounted for more than 50 percent of the Russian GDP. In theory, their management is checked by the board, in which majority of the members are appointed by the government. In practice, the management of Russian state-owned companies typically enjoys a degree of freedom unheard of in privately-held companies. Though some attempts by private investors to gain by forcing the management to improve corporate governance were successful (e.g., Dyck, Volchkova, and Zingales, 2008), they often back-fired. In a well-publicized episode, William Browder, shareholder activist and the founder of the Hermitage capital fund, which exposed many corporate violations in the larges Russian companies, was denied Russian visa in 2005.

In this paper we examine the effect of blog postings by Alexei Navalny. He has a law degree and a background in business; Navalny was a member of an opposition party Yabloko before turning to shareholder activism around 2008. Navalny's blog (navalny.livejournal.com) has more than 66,000 regular followers , which makes it one of the most popular blogs in Russia (top 10 in blog ranking by Yandex, the most popular search engine in Russia). Its popularity surged after Navalny launched the "Rospil" project focused on protecting minority shareholders of large state-owned companies and, by extension, management of the taxpayers' property by the Putin government (Healy and Ramanna, 2013).. In particular, Navalny used his blog to organize large-scale petitioning and litigation campaigns related to corruption in state-controlled companies. As a result of these activities, Navalny was described by BBC as "arguably the only major opposition figure to emerge in

Russia in the past five years" in 2011[4] and Wall Street Journal have called him "the man Vladimir Putin fears most" in March 2012.[5]

Navalny has been posting his blogs on LiveJournal.com, an internet-based platform for blogs incorporated in the U.S. Initially aimed at the English-language audience, by mid-2000s it gained significant popularity in Russia, becoming the major country-wide social network. By 2005, the Russian language part of LiveJournal hosted 9 million accounts; at this time 45 percent of all blog posts in Russia were made in LiveJournal. In 2007, it was bought by a Russian media company SUP.

As a major social network, LiveJournal was the primary means of transmitting information and enhancing political debate, which was gradually phased out from Russian TV channels and major newspapers. By 2009, Freedom House ranked Russian media as "not free" (see Gehlbach, 2010, Gehlbach and Sonin, 2009, on the government control of media in Russia).

3. Data and Empirical Strategy

Data

We use data from several sources. First, we use data on Navalny's blog postings on Navalny.LiveJournal.com about specific companies between January 2008 and August 2011. We focus on this period because before January 2008 Navalny was not involved in anti-corruption campaign, and after August 2011 the content of his blog postings became almost exclusively political.

For each post we record exact time at which it became available and code its content. The coding of the content of postings, i.e. whether it contained information about courts, links to other media, letters from Public Prosecution Office, reports about shareholder meetings etc., was done independently by two research assistants and double checked by the authors of the paper. We also collected data on the number of comments for each posting. Since Navalny reported almost exclusively negative information on the companies he wrote about, we do not classify postings into positive and negative; this allows us to avoid subjective estimates of the tone of the coverage. In total, there are 318 blog postings about the companies in our dataset.

[4] http://www.bbc.co.uk/news/world-europe-16057045 (accessed on September 24, 2012).
[5] http://online.wsj.com/article/SB10001424052970203986604577257321601811092.html (accessed on September 24, 2012).

We focus on the companies Navalny owned shares in and wrote about. This baseline set of companies includes 10 companies: Transneft, VTB, Gazprom, Rosneft, Sberbank, Surgutneftegas, Lukoil, Gazpromneft, RusHydro, and Inter RAO UES. Table A2 presents basic summary statistics for blog postings by type and by company. In the analysis, we sometimes look separately at four companies to which Navalny paid special attention, which we define as having more than 75 posts about a company (Transneft, VTB, Gazprom, Rosneft).

Second, we employ data on stock prices at MICEX, Russian stock exchange, from finam.ru (intraday data), export.rbc.ru (daily data), and micex.ru (data on the number of transactions). We use data on stock prices, trading volume, and the number of transactions. In the estimation, we compute abnormal return as a predicted residual from the following equation: $r_{it} = \alpha + \beta_i r_{mt} + \gamma_i + \epsilon_{it}$, where r_{mt} is market return, and γ_i is a company fixed effect. We estimate within-day volatility as a standard deviation of close price based on 5-minute data.

Third, we use data on the dates of court hearings and court applications in which Navalny was involved from online catalog of Russian Arbitrage Court (available at http://kad.arbitr.ru/, accessed on December 8, 2011).

Fourth, we collected data on the dates of shareholder meetings of the companies in the sample from companies' websites (see Table A1 in Appendix for the list of sources).

Fifth, we use data from content analysis of the news sources covered by Yandex News, a news aggregator service of the most popular search engine in Russia. Specifically, for each day we collect number of mentions of each company and, separately, the number of mentions of each company in one article with Navalny last name. We also collected data on the mentions of companies in blogs, using Yandex blog aggregator service. We supplement news data from Yandex with news data on the mentions of companies with and without word "Navalny" from two most respectable Russian business daily newspapers, *Vedomosti* (co-sponsored by Financial Times and Wall Street Journal) and *Kommersant*. We access newspapers' content via securities.com, an online archive of media content provided by the ISI Emerging Markets.

Sixth, we collected data on DDoS attacks on LiveJournal blog service during 2003-2011 years. Using Google News and Yandex News services for specific time periods we identify the incidence and the timing of attacks using publications in online newspapers worldwide (see Table A1 in Appendix for the list of sources). We double-check our data with a worldwide list of such attacks compiled by Zukerman et al. (2010). Overall, we identify 17

episodes of such attacks 10 of which happen in or after 2008, after Navalny started his anti-corruption blogging.[6]

Finally, we use data on LiveJournal.com attendance from http://top100.rambler.ru/ and the data on top-30 blog postings in Russian blogosphere from yablor.ru.

Empirical Strategy

For our baseline results we estimate the following empirical specification:

$$AR_{it} = \gamma_0 + \gamma_1 post_{it} + \gamma_2 X_{it} + \varepsilon_{it} \quad (1)$$

Here AR_{it} is daily abnormal return of company *i* at day *t*, estimated from the market model, $post_{it}$ is a dummy variable equal to 1 if Navalny posted about company *i* at day *t*, and X_{it} is the vector of controls that includes mentions of company *i* in online newspapers, in offline business newspapers, and in blogs, and also company-year, day of the week, and year-month fixed effects. Standard errors are clustered by trading day.

Next, we look at different types of content, and estimate equation (1) with dummies for different types of postings instead of $post_{it}$. We also estimate separately the impact of real events underlying some types of postings and the impact of blog postings, to exclude potential reverse causality story.

Our next step is to use DDoS attacks as a plausibly exogenous variable that is correlated with Navalny's blog postings, but is orthogonal to other determinants of stock prices. We present the results for a reduced-form model, in which dummy for DDoS attack is used instead of a dummy for $post_{it}$ in equation (1).[7] In addition, we estimate the following interaction model:

$$AR_{it} = \gamma_0 + \gamma_1 DDoS_t \cdot interest_i + \gamma_2 DDoS_t + \gamma_3 X_{it} + \varepsilon_{it} \quad (2)$$

Here $DDoS_t$ is a dummy for DDoS attack at day *t*, $interest_i$ is a proxy for Navalny's interest in the company (e.g. log of the number of blog postings), and X_{it} is the same vector of controls as used above. Note that we use company-year fixed effects, so there is no need to separately include a direct effect of $interest_i$ into the estimated model. In some specifications, we also include fixed effects for DDoS attacks into estimation.

In addition to a reduced form model, we use a number of placebo specifications, to show that our results are consistent with causal impact of DDoS attacks, but not consistent with alternative explanations. In particular, we check whether leads or lags of DDoS attacks are associated with significant (positive or negative) abnormal returns of the companies in

[6] Note that our sample period ends in August 2011 and does not include pre- and post-election attacks in November and December of 2011.

[7] We do not estimate the IV model with DDoS attacks as an instrument and blog postings by Navalny as the endogenous variable, because the exclusion restriction is unlikely to hold.

question. We also checked whether DDoS attacks that happened before Navalny started his activity were associated with stock returns, and whether the effects of DDoS are increasing in news attention to the companies.

Finally, to capture potential long-term effects of Navalny's blog postings, we employed 30-day variables. We estimate equation (1) with $post_{it}$ being a dummy for a blog posting in the last 30 days. In addition to abnormal returns, we look at the effect of blog postings (both short- and long-term) on volume, volatility (estimated on within-day data), and the number of trades, conditional on trading volume, to capture whether smaller transactions were more likely on the days of blog postings.

4. Graphic Evidence

Figure1 depicts the number of mentions of one of the companies Navalny wrote about, Transneft, in the Russian blogosphere, together with mentions of Navalny himself for two consecutive months in 2010. The picture aims to show that despite the fact that we focus on a single blog, it still provides a significant part of information about the company that was published in Russian blogs. The number of mentions of Navalny and of Transneft are strongly correlated and similar in magnitudes, though during this period Navalny is mentioned, on average, somewhat less often than Transneft.

Figure 2 reports how cumulative abnormal returns change from 8 hours before a blog posting to 8 hours after a blog posting. The reported coefficients are cumulative abnormal returns since the time of blog posting in a regression with 5-minute abnormal return as dependent variable, which includes trading day fixed effects. We show these results for all posts (panel A), and for significant posts (panel B), which have at least five mentions of a company in the body of blog posting. One can make two observations based on this picture. First, while there is no significant change in abnormal returns before blog postings, there is a significant drop in abnormal returns for several hours after the time of blog posting for both panels. Second, though the effect is negative and significant for all blog postings, the magnitude of a decrease is more pronounced for important blog postings. However, smaller number of important postings leads to substantially larger standard errors, which makes the difference statistically insignificant.

Figure 3 explores longer-term effects and shows cumulative abnormal returns for 2-month period around the day of blog postings. The effect of blog postings on the same day abnormal return is hardly visible, but there is a significant negative long-term effect of a blog posting, especially pronounced 20-30 days after the posting.

5. Empirical Results

Basic results

Table 1 presents the results of the effect of blog posting on cumulative abnormal returns for different time periods. We use (0; k-1) to denote the k-minutes (or k-day) period beginning with the hour (day) of the event. We use (k; 0) to denote the k-minutes (or k-day) period ending with the hour (day) of the event. Panel A of Table 1 presents the results for within-day *CAR*s based on 5-minute abnormal returns. We report the results for four hours prior to blog postings and for eight hours after blog postings. In all the regressions we control for company-month and trading day fixed effects.[8] The results indicate that *CAR*s are not significant prior to blog posting. There are also no significant *CAR*s in the first two hours after the posting, but the three-hour *CAR* of minus 0.12 p.p.is significant at 5% level and *CAR*s gradually increase in magnitude and statistical significance in the next several hours, so that the nine-hour *CAR* is already 0.31 p.p. (significant at 1% level). *CAR*s after important blog postings are also negative and their magnitude is larger, but the standard errors are also increasing, so that *CAR*s are statistically significant at 10% level only six hours after the posting.[9]

Panel B of Table 1 presents *CAR*s based on daily abnormal returns between three days before blog posting and 5 days after the posting. In all the regressions we control for company-month and day of the week fixed effects. The results indicate that the average daily *CAR* after the blog posting was minus 0.43 p.p. (significant at 10% level), but after the first day *CAR*s are smaller in magnitude and not statistically significant. Daily *CAR* after an important blog posting was minus 0.95 p.p. (significant at 5% level), while the two-day *CAR* is 1.1 p.p. (significant at 10% level). *CAR*s for longer periods are larger in magnitude, but not statistically significant.

We check the robustness of the results to the inclusion of different sets of control variables. Panel A in Table 2 presents the results of estimations for six-hour *CAR* with all the controls added one by one with the last specification in column (7) controlling for the company-month, trading day, and hour of the day fixed effects, as well as the dummy

[8] Note that as we control for company-month fixed effects, this allows us to solve an important methodological problem. Ideally, we would like to control for 4 Fama-French factors in a market model. However, such features of Russian market as low liquidity of companies not included in the MICEX index and almost complete absence of small publicly traded companies make it difficult to estimate these factors. It is possible to estimate these factors on a monthly basis, but that becomes redundant, as our results are robust to company-month fixed effects.

[9] Five-minute *CAR* right after the blog posting is also significant at 10% level, but its magnitude is even smaller than the insignificant *CAR*s prior to the blog postings.

variables for whether the company was mentioned by the major news agencies within the last 8 hours in any news report or whether it was mentioned in a news report that mentions the company at least five times. The coefficient remains remarkably stable and, if anything, the magnitude slightly increases as more controls are added.

Panel B in Table 2 provides similar analysis for the average one-day *CAR*. The full set of controls in column (7) includes company-month and day of the week fixed effects, as well as four dummy variables for whether the company was mentioned this day in online news, business newspapers, other blogs, and in news reports by news agencies. The coefficient again remains very stable and the magnitude slightly increases as more controls are added. Table 3 provides similar analysis for *CARs* after important blog postings. Overall, the results are robust to the inclusion of additional controls, which implies that it is unlikely that the results are driven by omitted variables.

Different types of blog postings

Results presented in Table 2 analyze which particular kinds of blog postings were mostly responsible for the negative effect of blog postings on stock returns documented above. In columns (1) and (2), we separate blog postings using the number of mentions of company names in blog postings. Specifically, column (1) shows that the relationship between the number of mentions (logged) and abnormal returns is negative and significant, with a coefficient implying that that the effect of doubling the mentions of a company is associated with a 0.25 p.p. drop in a company's abnormal return. Column (2) shows that this effect is concentrated among the posts with at least 5 mentions of the company, associated with average 0.9 p.p. decline significant at 1% level, with the effect of posts with a smaller number of mentions being not significant. Column (3) demonstrates that the effect of the number of mentions is not driven by the length of the posts, as the corresponding coefficient is not significant.

Column (4) looks at the effect of blog postings with different content. Specifically, the specification includes dummies for posts about court hearings, court applications, shareholder meetings, calls to action, posts about letters from Persecution Office, posts with other important information, and other types of posts. In this analysis, the only significant coefficients are for dummies for posts about court hearings and the posts about shareholder meetings. The magnitudes of these coefficients is quite large, with posts about court hearings being associated with a 2.05 p.p. drop in daily abnormal return, and the posts about shareholder meetings being associated with 1.50 p.p. drop in daily return. However, it remains unclear if the observed correlations are the effects of events themselves or the effects of blog postings about the events.

Blog postings and real events

Table 3 tries to separate the effect of blog postings and the effect of real events. In addition, it compares the effect of real events that are covered in Navalny blog with the effect of real events that are not covered. To do that, we use data on the dates of actual court hearings in which Navalny was involved and shareholder meetings. Columns (1), (2), (5), and (6) show that while there is a negative and significant effect of blog postings about these events, there is no significant drop or increase in the abnormal return on the days of court hearings or shareholder meetings. These results provide evidence in favor of causal effect of blog postings, but still do not rule out selective coverage, i.e. it could be that the author of the blog is writing only about significant events in his blog.

As a next step, we try to separate real events to be posted about from real events that were covered in the blog, by taking advantage of the fact that sometimes Navalny wrote in his blog about an event on the next day. Columns (3) and (4) show that court hearings to be covered are indeed different from the court hearings that were not covered, though it could be due to the fact that in the majority of cases Navalny wrote about court hearings on the same day as the hearing happened. Columns (7) and (8) show that for either type of shareholder meetings there is no significant effect of the meeting itself, but the coefficient in (5) implies that there is an effect of blog postings about these meetings.

Short-term vs long-term effects

In addition to looking at short-term effects, we also look at cumulative effects of a blog posting month after the posting. Specifically, we look at the effect of an ordinary and an important blog posting on stock returns and other outcomes, such as trading volume and volatility. The results of this estimation are presented in Table 6. First two columns show that while there was a substantial effect of Navalny's blog postings within a day after a posting, this effect disappears on a longer time horizon. This evidence is also in favor of Navalny's effect being an attention effect. However, the long-term effect of important postings (with at least 5 mentions of a company name), reported in column (4), persists and remains significant even after 30 days after blog post was written. In addition, on a longer time horizon one can observe that Navalny's posts were associated with a larger trading volume (column 6) and with a larger intra-day volatility (column 8).

Finally, we look whether the effect of blog postings is consistent with more individual, in contrast to institutional, trading. Unfortunately, we do not have direct data on individual or institutional trading, but we can test it indirectly by using data on the number of transactions conditional on trading volume. Columns (9) and (10) report within day and within month

effects of blog postings on the number of trades, controlling for a trading volume. The results imply that there were more transactions for a given trading volume both during a day and during a month after Navalny's blog postings, consistent with a smaller average size of each transaction and more individual trading.

Overall, the results of this section imply that blog postings can indeed affect the outcomes that are presumably important for decision makers in state-controlled companies, such as monthly cumulative returns and stock volatility, and, as a result, can provide additional incentives to management of the companies.

To further evaluate the long-term effects and economic magnitude of the impact of Navalny's blog postings on stock prices, we consider three separate zero-cost strategies. Specifically, we follow a strategy, which at each the start of each calendar month goes short one unit of capital across all stocks of companies that were mentioned in an important Navalny's blog posting in the previous quarter and goes long one unit of capital across all stock of companies in a comparison groups, about which there were no blog postings by Navalny in the last quarter. We consider three alternative comparison group: (1) all the firms included in the MICEX stock index; (2) all the state-owned companies included in the MICEX stock index; (3) ten companies Navalny wrote about. Portfolios are equally weighted, so that at any time, the strategy is short $1/N_B$ units of capital across N_B companies about which Navalny have written in his blog and long$1/N_{NB}$ units of capital across N_{NB} companies about which Navalny have not written in his blog.

Table 7 reports results for these three strategies using time series regressions for a one-factor model. All three strategies demonstrate significantly positive monthly alphas that range from 1.6% for the comparison portfolio based on ten companies Navalny wrote about (with insignificant beta of 0.06) to 5.0% for the comparison portfolio of state-owned companies (with insignificant beta of 1.28) and Sharpe rations that vary from 0.

Figure 4 provides further comparison between the strategies' relative performance over the four-year sample period. The figure shows what would have happened to the value of a $1 invested in each of the strategies on June 1st, 2008 (the month following the first important blog posting). For comparison, we also include the cumulative value of investing in the market, in excess of the risk-free rate. Consistent with the results presented in Table 7, all three strategies turn out to be a much more profitable investment as compared with investment in the market.[10]

[10] In the analysis we ignore transaction costs of rebalancing portfolios, but since rebalancing occurs only once a month, the effect of transaction costs is likely to be small.

Interactions with attention proxies

In this section, we examine how the effect on stock returns depends on the attention paid to Navalny's blog by Internet users. In particular, we present the results of estimation of equation (1) with a dummy for blog posting interacted with a proxy for attention to other posts and for attention to Navalny's posts. Specifically, we look whether the effect is different for those days for which there is a popular blog post, attracted a large number of comments, and for those days, when Navalny's post was in the list of Top-30 LiveJournal posts of the day. These results are presented in Table 8. Column (1) implies that the effect of Navalny's postings was especially large (0.62 p.p.), if it was considered a Top-30 post. Column (2) suggests that the impact of a blog posting was smaller if they were written during the days when postings of other bloggers attracted a lot of attention, proxied by the largest number of comments to an alternative blog posting. Numerically, the effect of a blog posting becomes insignificant if the number of comments to some other important post approaches 1000, which is around 25 percentile of the sample.

Overall, the results of this section are consistent with a hypothesis that the effect of Navalny's blog posting is increasing in attention of LiveJournal.com visitors.

Exogenous variation and DDoS attacks

The evidence so far implies that there is correlation between Navalny's blog postings and abnormal stock return following these postings. To find out if this relationship can be interpreted as causal, we present the results of estimation of equation (1) with DDoS attack as an independent variable. We expect the sign of this coefficient to be positive, as DDoS attack implies that there was no negative information about the company from Navalny. Note that Navalny was writing something in his blog on most of the days in the sample, though not all of his posts were about Russian state-owned companies.

Figure 4 shows how the audience and page loads of LiveJournal.com are different in the days of DDoS attacks, in contrast to the days without DDoS attacks. Though the decrease in the number of unique visitors attempting to visit LiveJournal.com during DDoS attacks is not significantly (see Figure 5B), the decrease in the number of page loads is statistically significant (see Figure 5A). This implies that DDoS attacks have substantial influence on the exposure to LiveJournal.com posts.

Though, according to local and international press, these attacks were clearly politically motivated, they presumably were unrelated to the state-controlled companies we are considering in the paper. Attacks in 2008-2009 were supposedly targeted at *suxumu*, a

Russian-language blogger located in South Ossetia region in Georgia. Attacks in 2011 were targeted to all top bloggers, most of whom do not write about politics.

In February 2012, a group of anonymous hackers published a collection of private emails of leaders of Kremlin-related youth organizations and government officials, including the Minister for Youth Affairs Vassily Yakemenko. The content suggests that the state-sponsored organizations were responsible for some of the DDoS attacks on web-sites of Russian media during that period. So far, there has been no direct evidence that Alexei Navalny's blog was a target for DDoS attacks by these groups, though there is evidence that Navalny himself was a target of a slander campaign.

Although it could be the case that DDoS attacks were used by the Russian government in times when it perceived a threat to its political prospects, this effect would bias our results downwards.

We expect DDoS attack to be equivalent to the absence of postings or to the presence of a posting unrelated to state-controlled companies. To test whether it is the case, in addition, to DDoS variable, we also include the dummy for no post of Navalny in a given day and the dummy for the presence of Navalny's post not mentioning the company in question.[11]

Table 9 shows the effect of DDoS attacks on abnormal returns of different groups of companies. Column 1 shows that during DDoS attack, daily abnormal returns of the companies from a baseline sample (sample of the companies Navalny wrote about) were significantly higher by 0.56 p.p., as compared with the rest of time period, at 5% significance level. This column also shows that the effect of DDoS attack is comparable in its size to the effect of the absence of posting (0.50 p.p.) and to the effect of postings about anything except the company in question (0.48 p.p.), with F-statistics for Wald test implying that the hypothesis of equality of the coefficients cannot be rejected. This is consistent with assumption that the investors interpret DDoS attack as the event similar to the absence of postings about a company.

Column 3 reports that the effect of DDoS attacks is especially significant (at 1% level) in "high-attention" sample, the sample of companies Navalny wrote about. Numerically, the coefficients of both DDoS attacks (0.51 p.p.) and dummies for no postings about companies (0.53 p.p. and 0.63 p.p.) are similar to those for a baseline sample, reported in column (1).

Column 3 shows that abnormal returns of the companies Navalny did not write about were not significantly higher during DDoS attacks. The numerical coefficient is 0.13 that is

[11] Note that the results without these additional variables are very similar to those presented. We chose to omit these results to save space.

approximately four times lower as compared with the companies from the baseline or the high attention samples, with the standard error being larger than the coefficient. This is an important placebo specification that is consistent with our interpretation of DDoS coefficient.

Column 4 reports another placebo test and shows that abnormal returns of state-controlled companies which Navalny did not own and did not write about were not significantly different in times of DDoS attacks. The coefficient for DDoS attack even changes its sign and becomes negative, though remains insignificant. This test allows us to reject the hypothesis that DDoS attacks were just helpful for all state-controlled companies as they could, presumably, demonstrate the strength of the government to the markets.

Overall, the results in Table 9 present evidence in favor of the causal impact of blog postings on stock returns.

Effect of DDoS attacks on different companies

Table 10 show the coefficients from the estimation of model (2) which examines how the effect of DDoS attacks depends on the amount of attention Navalny paid to a company. Navalny's interest in the company is measured either using three different proxies: dummy for a baseline sample of companies Navalny was writing about; dummy for high-attention sample; or the logged number of posts Navalny wrote about this company in 2008-2011. During DDoS attacks, the effect of being in a baseline or high attention sample is approximately 0.35 p.p., with the plain effect of DDoS attack being insignificant for companies Navalny did not write about (columns 1 and 2). Columns 5-6 imply that the positive effect of DDoS attacks is increasing in the number of posts Navalny wrote about the company, and corresponding coefficients are positive and significant at 1% level. Note that the specifications in columns 2,4, and 6 include DDoS attack fixed effects, to control for any other potential day-specific factors that might be associated with asset prices.

It could be the case that the companies that Navalny wrote about are generally more newsworthy than other companies, and any external shock to information environment makes the stocks of these companies more volatile. However, the results of Table 11 indicate that it is not the case. If we use measure of attention paid to the companies by on-line media, instead of the attention of Navalny's blog postings, the results of DDoS attacks disappear, despite the fact that there is a substantial intersection between companies that Navalny wrote about and the companies that online media were most focused on. Thus, the results suggest that Navalny's attention is not just a proxy for general media attention.

Placebo tests

Note that we have already discussed some placebo results from Table 9 that show that there is no effect of DDoS attack for all the companies from MICEX index with no posts of Navalny about them, and, similarly, there is no effect of DDoS attacks for state-controlled companies not mentioned in Navalny's blog. In this section, we present two additional placebo tests consistent with causal interpretation of relationship between postings and abnormal returns.

First, we show that the effect of DDoS attack disappears if we take leads or lags of DDoS attacks, implying, in particular, that some important positive events were not preceding DDoS attacks in our sample (Table 12). In fact, abnormal returns were even smaller the day before DDoS attacks (column 3), but this effect is not significant, with a standard error being 1.5 times larger than the coefficient.

Second, we show that pre-2008 DDoS attacks (Table 13) do not have any positive significant impact on stock returns for all groups of companies considered in Table 9. Regardless of whether Navalny wrote about these companies later, the coefficient for pre-2008 attacks is not significant and even negative in all the specifications.

Overall, the results in Tables 12-13 are consistent with causal impact of Navalny's blog postings on stock returns.

Robustness checks

We tried a number of alternative specifications to investigate sensitivity of our results. First, we estimated our baseline results with bootstrapped, rather than clustered, standard errors. We also tried to cluster standard errors by company-year than by trading day in a daily sample. Our results remained very similar.

Second, we checked whether our results were robust to the inclusion of the lead of Google Search Volume Index that Da et al. (2011) found to be related to stock performance. They were.

Last, but not the least, instead of inclusion of different dummies, we experimented with a traditional, "out-of-sample", event study design, where normal returns are computed for a time period before blog postings, and abnormal returns are computed as out-of-sample prediction. We find that for some reasonable lengths of window this approach generates similar results.

6. Conclusion

In authoritarian countries, the means to hold politicians and public officials accountable are limited, because traditional media is often censored, politics is not competitive, and electoral fraud prevents political turnover. Our results imply that posting in online social networks can affect the stock performance of state-controlled companies, and, as a result, can become an unusual alternative mechanism to put additional checks on the behavior of government officials even without a major change of the government.

We show that there are two types of effects. First, there is a short-term attention effect, which is limited to several hours after the blog posting and diminishes if some other interesting postings are made available at the same time. Second, there is a longer-term effect of blog postings that is more consistent with the information story. Longer-term effects imply that blog postings can provide incentives for the managers of state-controlled companies to behave well.

Our results imply that there is a causal effect of blogging on stock performance. These results, however, are likely to be specific to emerging markets. Further research is needed to investigate whether similar results hold for other times and places, and whether new media can promote accountability through different mechanisms and in other circumstances.

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Figure 1. Mentions of Navalny and Transneft in the whole Russian blogosphere.

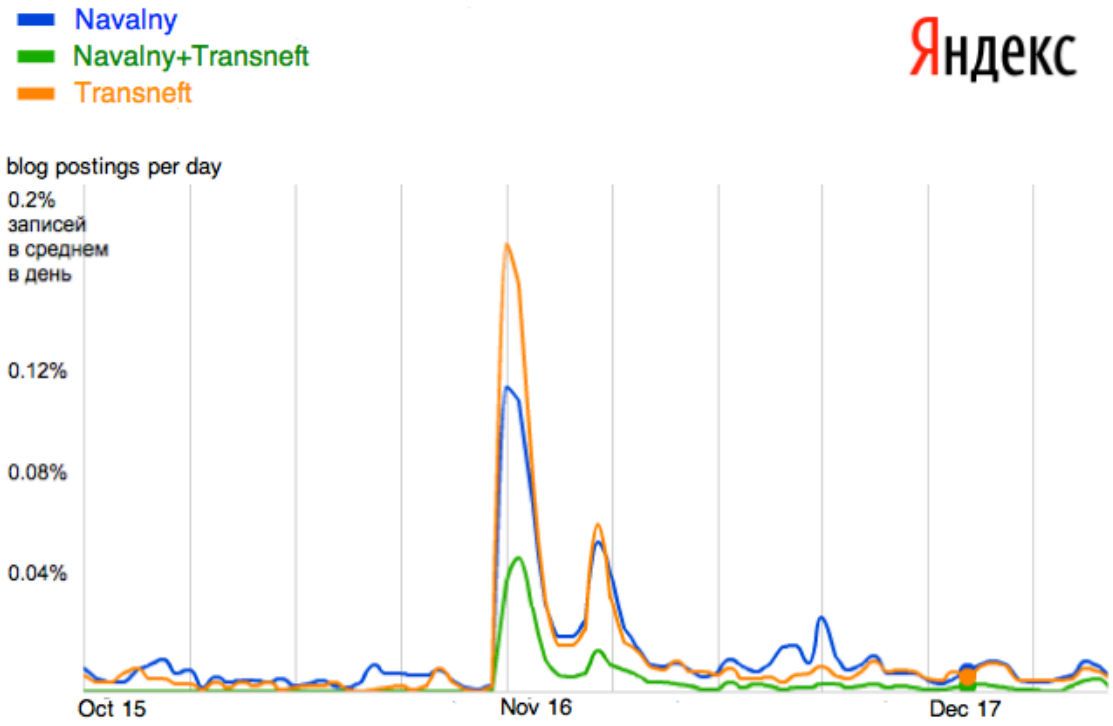
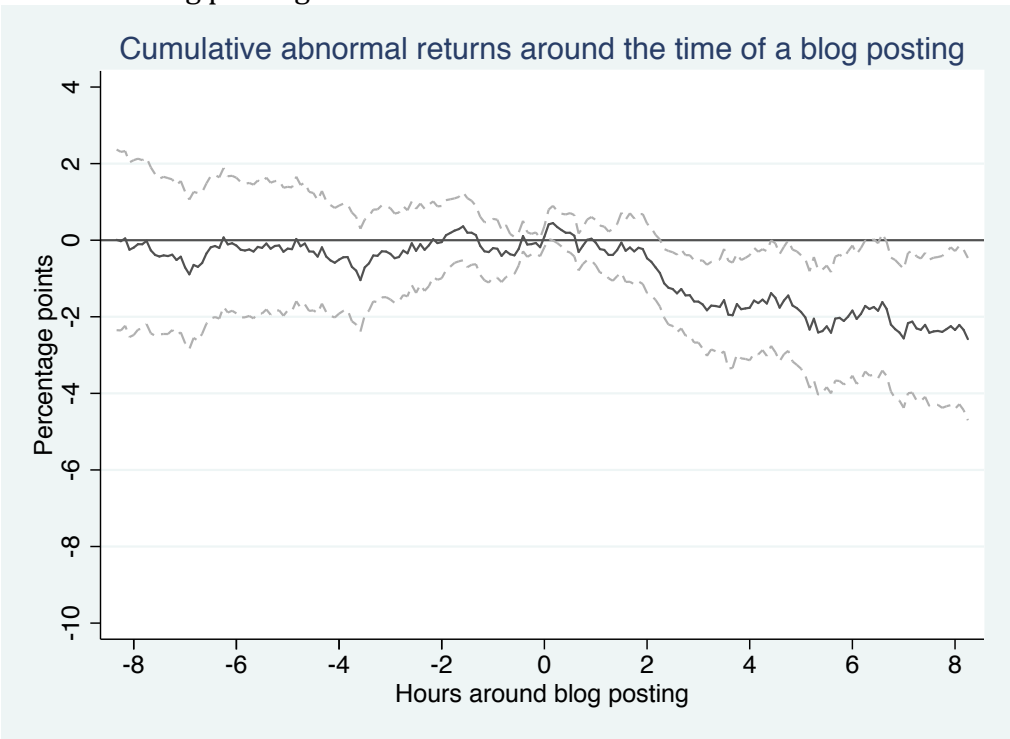


Figure 2. 5-minute abnormal returns and Navalny's blog postings. Non-trading time (evenings and weekends) excluded.

A. All blog postings.



B. Large (with 5+mentions of a company) blog postings

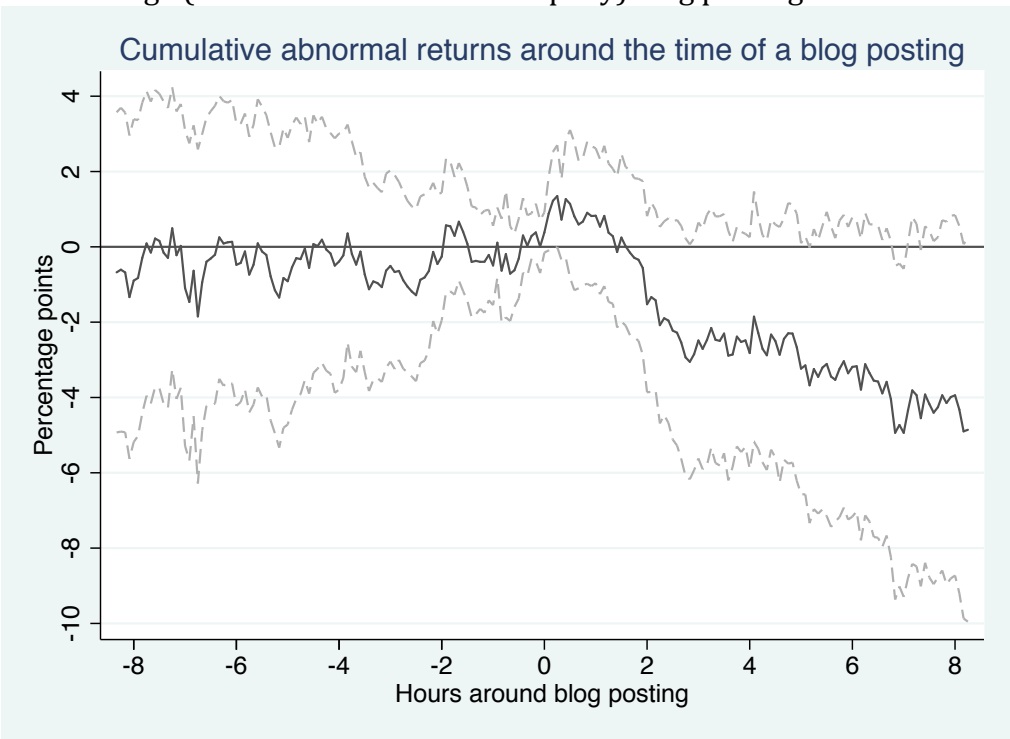
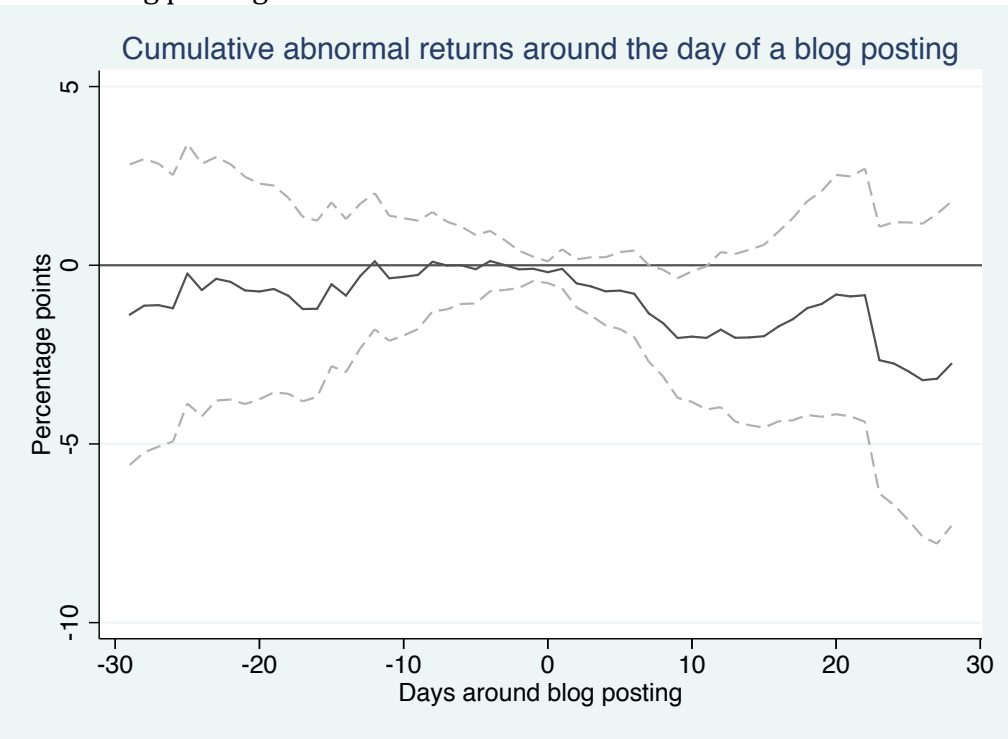


Figure 3. Daily-minute abnormal returns and Navalny's blog postings. Non-trading days excluded.

A. All blog postings.



B. Large (with 5+mentions of a company) blog postings

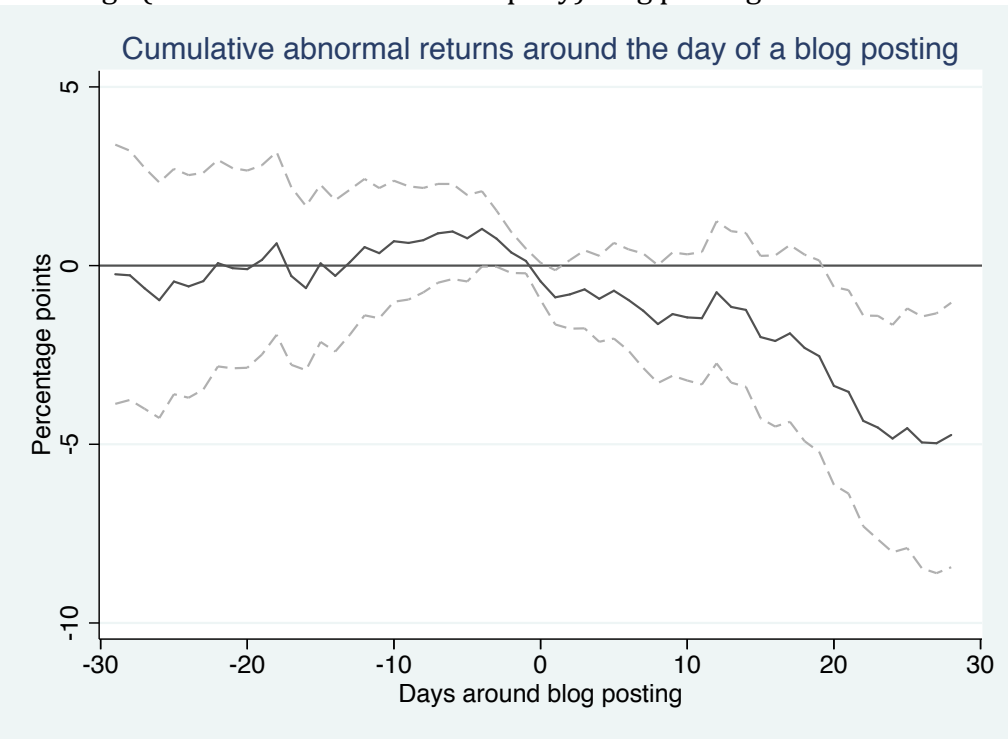
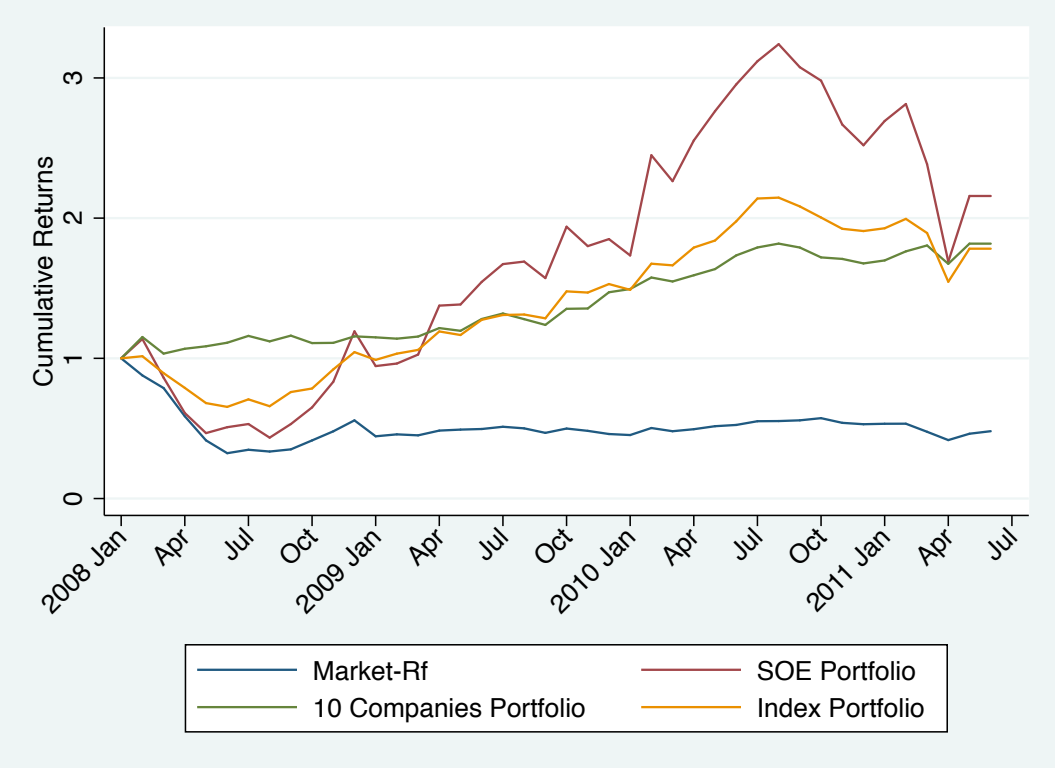


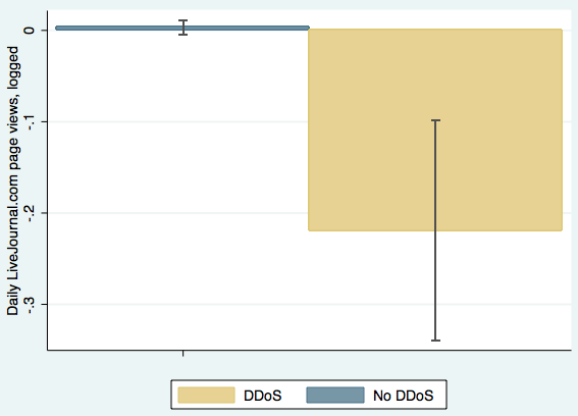
Figure 4. Strategies' Cumulative Payoffs



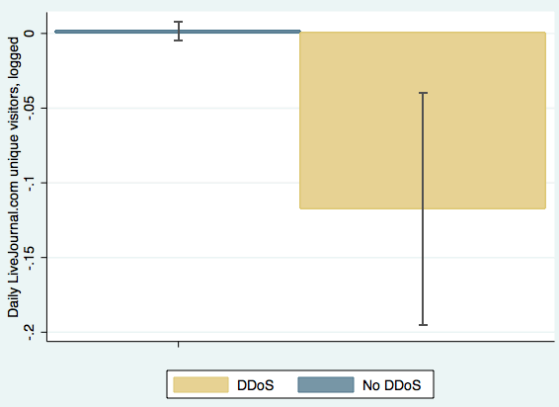
The figure plot cumulative returns over the sample period of zero-cost trading strategies that on the first day of each calendar month go short one unit of capital across all stocks of companies that were mentioned in Navalny's blog in the previous quarter and go long one unit of capital across all stock of companies in a comparison groups, about which there were no blog postings by Navalny in the last quarter. Three alternative comparison group include: (1) all the firms included in the MICEX stock index; (2) all the state-owned companies included in the MICEX stock index; (3) ten companies Navalny wrote about. Portfolios are equally weighted. For comparison, we include the cumulative market excess returns.

Figure 5. LiveJournal statistics and DDoS attacks

A. LiveJournal.com daily page views .



B. LiveJournal.com daily visitors.



Note: we report numbers after controlling for year-month and day of the week fixed effects

Figure 6. Stock returns and DDoS attacks. A baseline result and placebo tests.

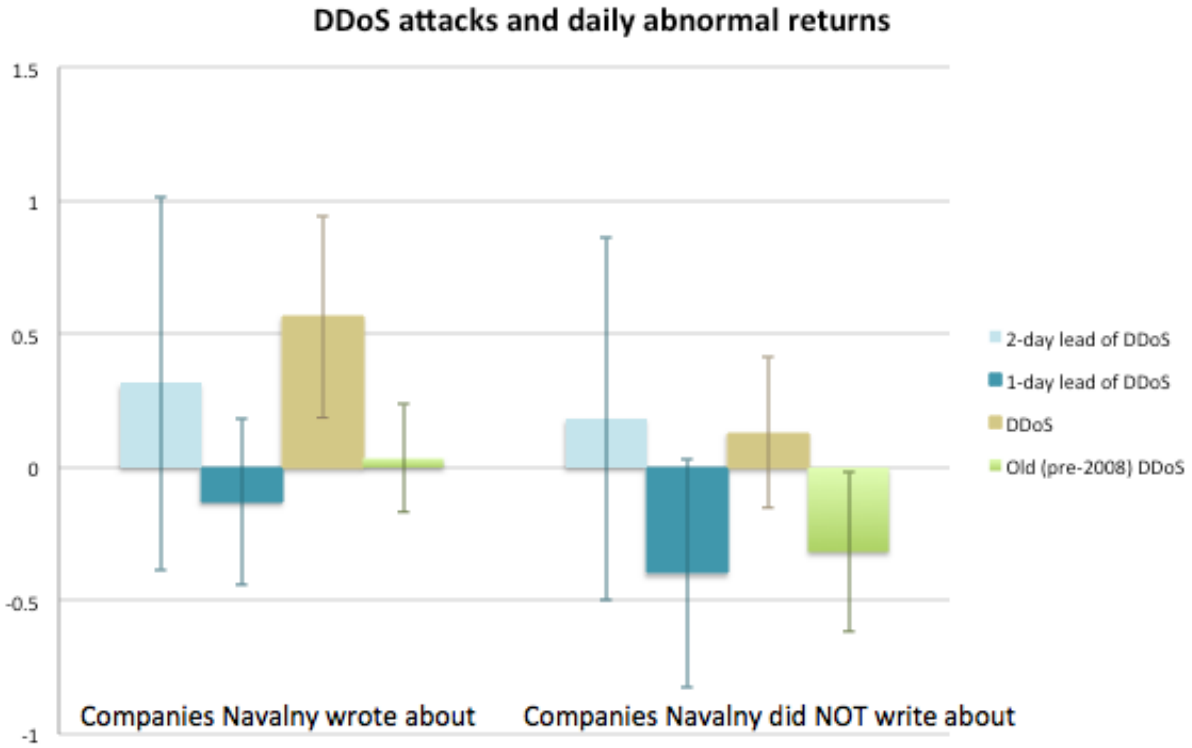


Table 1. Blog postings and abnormal returns. Baseline results.

Panel A: Intraday evidence. Cumulative abnormal returns.								
Minutes around blog postings	(-240,0)	(-120,0)	(0,5)	(0,120)	(0,360)	(0,480)	(0,600)	(0,840)
All blog postings, fixed effects for company-month and trading day included	-0.078	-0.030	-0.006	-0.010	-0.116**	-0.157***	-0.222***	-0.307***
	[0.077]	[0.046]	[0.011]	[0.037]	[0.048]	[0.058]	[0.083]	[0.106]
Observations	800,806	800,806	800,806	800,806	800,806	800,806	800,806	800,806
Important blog postings, fixed effects for company-month and trading day included	-0.081	-0.057	-0.051*	-0.048	-0.265	-0.269	-0.407*	-0.573*
	[0.240]	[0.107]	[0.028]	[0.125]	[0.174]	[0.180]	[0.225]	[0.304]
Observations	800,806	800,806	800 806	800,806	800,806	800,806	800,806	800,806
Panel B: Daily evidence. Mean abnormal returns.								
Days around blog postings	(-3,-1)	(-1,-1)	(0,0)	(0,1)	(0,2)	(0,3)	(0,4)	(0,5)
All blog postings, fixed effects for company-month and trading day included	-0.194	-0.055	-0.390*	-0.071	-0.05	-0.046	-0.016	0.001
	[0.137]	[0.157]	[0.234]	[0.169]	[0.149]	[0.139]	[0.134]	[0.133]
Observations	9271	9271	9 271	9271	9271	9271	9271	9271
Important blog postings, fixed effects for company-month and day of the week	0.016	-0.003	-0.847**	-0.494*	-0.379*	-0.348*	-0.322*	-0.21
	[0.221]	[0.343]	[0.349]	[0.261]	[0.223]	[0.201]	[0.190]	[0.178]
Observations	9271	9271	9271	9271	9271	9271	9271	9271

Notes: Abnormal returns are measured in percentage points. Abnormal returns are winsorized at the 1st and 99th percentile. Our results are very similar in terms of statistical significance and slightly large in magnitdues if we do not use winsorizing. Robust standard errors adjusted for clusters by trading day in brackets. Results are robust to alternative way of treating standard errors (robust, clustered by company-year, clustered by year-month). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2. Blog postings and abnormal returns. Robustness.

Panel A: Intraday evidence. 5-minute abnormal returns.

	5-minute abnormal returns						
Dummy for 6 hours after a blog posting	-0.173**	-0.184**	-0.167**	-0.222***	-0.239***	-0.238***	-0.240***
	[0.076]	[0.075]	[0.074]	[0.080]	[0.081]	[0.081]	[0.081]
Dummy for 8 hours after a mention in news agency						-0	
						[0.000]	
Dummy for 8 hours after an important (5+) mention in news agency							+0
							[0.001]
Fixed effects	Company	Company-year	Company-month	Company-month, trading day	Company-month, trading day, hour of the day	Company-month, trading day, hour of the day	Company-month, trading day, hour of the day
Observations	800806	800567	800806	800806	800806	800806	800806

Panel B: Daily evidence. Daily abnormal returns.

	Daily abnormal returns						
Dummy for a blog posting	-0.387*	-0.405*	-0.428*	-0.433*	-0.447**	-0.416*	-0.416*
	[0.224]	[0.229]	[0.228]	[0.228]	[0.226]	[0.232]	[0.232]
Mentions in online news				0.024	0.11	0.115	0.115
				[0.040]	[0.088]	[0.106]	[0.106]
Mentions in business newspapers				-0.008	-0.028	-0	-0
				[0.093]	[0.094]	[0.107]	[0.107]
Mentions in blogs					0.014	0.043	0.043
					[0.064]	[0.071]	[0.071]
Mentions in news from news agencies						-0.009	-0.009
						[0.063]	[0.063]
Fixed effects	Company	Company-Year	Company-Year, day of the week	Company-Year, day of the week	Company-Year, day of the week	Company-Year, day of the week	Company-Month, day of the week
Observations	9271	9271	9271	9268	9018	9018	9018

Notes: Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points. We winsorize abnormal returns at the 1st and 99th percentile. Our results are very similar in terms of statistical significance and slightly large in magnitdues if we do not use winsorizing. Results are robust to alternative way of treating standard errors (robust, clustered by company-year).

Table 3. Important blog postings (5+ mentions) and abnormal returns. Robustness.

Panel A: Intraday evidence. 5-minute abnormal returns.

	5-minute abnormal returns						
Dummy for 6 hours after an important (5+) blog posting	-0.463**	-0.469**	-0.428*	-0.407*	-0.423*	-0.422*	-0.424*
	[0.223]	[0.224]	[0.219]	[0.225]	[0.226]	[0.226]	[0.226]
Dummy for 8 hours after a mention in news agency						-0	
						[0.000]	
Dummy for 8 hours after an important (5+) mention in news agency							+0
							[0.001]
Fixed effects	Company	Company-year	Company-month	Company-month, trading day	Company-month, trading day, hour of the day	Company-month, trading day, hour of the day	Company-month, trading day, hour of the day
Observations	800806	800567	800806	800806	800806	800806	800806

Panel B: Daily evidence. Daily abnormal returns.

	Daily abnormal returns						
Dummy for an important (5+) blog posting	-0.757***	-0.751***	-0.744***	-0.752***	-0.790***	-0.813***	-0.813***
	[0.280]	[0.283]	[0.285]	[0.284]	[0.285]	[0.295]	[0.295]
Mentions in online news				0.024	0.107	0.115	0.115
				[0.040]	[0.088]	[0.106]	[0.106]
Mentions in business newspapers				-0.004	-0.026	0.002	0.002
				[0.093]	[0.094]	[0.107]	[0.107]
Mentions in blogs					0.023	0.052	0.052
					[0.065]	[0.071]	[0.071]
Mentions in news from news agencies						-0.011	-0.011
						[0.063]	[0.063]
Fixed effects	Company	Company-Year	Company-Year, day of the week	Company-Year, day of the week	Company-Year, day of the week	Company-Year, day of the week	Company-Month, day of the week
Observations	9271	9271	9271	9268	9018	9018	9018
R-squared	0	0.009	0.012	0.012	0.012	0.059	0.059

Notes: Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points. We winsorize abnormal returns at the 1st and 99th percentile. Our results are very similar in terms of statistical significance and slightly large in magnitdues if we do not use winsorizing. Results are robust to alternative way of treating standard errors (robust, clustered by company-year).

Table 4. Abnormal returns and Content of Blog Postings

Dep. Var.	Daily Abnormal Returns				5-minute abnormal return			
Number of mentions of a company's name (logged)	-0.2472*				-0.009			
	[0.1328]				[0.036]			
Less than 5 mentions		0.0758				0.002		
		[0.1855]				[0.028]		
5 or more mentions		-0.9093***				-0.115**		
		[0.3308]				[0.052]		
Length of posting			-0.0000				0.003	
			[0.0002]				[0.004]	
Post about court hearings				-2.0497**				0.002
				[1.0158]				[0.061]
…court applications				-3.1195				-0.003
				[2.5120]				[0.056]
…shareholder meetings				-1.4997**				0
				[0.7154]				[0.037]
Calls to action				-0.5253				0
				[0.3489]				[0.024]
Posts about letters from Persecution Office				-0.2760				0.002
				[0.6311]				[0.052]
Posts with other important information				0.3126				0
				[0.5074]				[0.019]
Other types of posts				0.0140				0.001
				[0.3952]				[0.014]
Controls + Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9 018	9 018	9 018	9 018	800806	800806	800806	800806
R-squared	0.0207	0.0211	0.0203	0.0224	0.001	0.001	0.001	0.001

Notes: Specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Specifications (5)-(8) include control for company-month and trading day fixed effects. Specifications (5)-(8) report interactions of corresponding blog posting characteristic with a dummy for 6 hours after blog posting. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 5. Blog postings and actual events

	Daily abnormal returns							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Posts about court hearings	-2.2053*							
	[1.2199]							
Court hearings		-0.3286						
		[0.4142]						
Court hearings with subsequent postings			-2.4619*					
			[1.2888]					
Court hearings w/o subsequent postings				0.7779				
				[0.6148]				
Posts about shareholder meetings					-1.5786**			
					[0.7744]			
Shareholder meetings						-0.3076		
						[0.3708]		
Shareholder meetings with subsequent postings							-1.1292	
							[0.7918]	
Shareholder meetings w/o subsequent postings								-0.0895
								[0.3815]
Controls + Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9 018	9 018	9 018	9 018	9 018	9 018	9 018	9 018
R-squared	0.0213	0.0203	0.0213	0.0205	0.0206	0.0204	0.0204	0.0203

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 6. Returns, volume, and volatility. Short-term vs. long-term.

	Daily abnormal return		*Daily abnormal return*		*Trading volume*		*Intra-day volatility*		*Log (number of trades)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Blog posting	-0.4975**				0.0561		-11.3851		0.0321*	
	[0.2371]				[0.0447]		[22.9393]		[0.0184]	
Blog posting in the last 30 days		-0.0903				0.0273*		20.3050**		0.0280***
		[0.0831]				[0.0165]		[10.1018]		[0.0081]
Posting with 5+ mentions of a company			-0.9170***							
			[0.3278]							
Posting with 5+ mentions of a company in the last 30 days				-0.1360*						
				[0.0763]						
log (trading volume)									0.4724***	0.4738***
									[0.0099]	[0.0102]
Controls + Fixed Effects	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,018	8,928	9,018	8,928	9,018	8,928	8,618	8,528	7,024	6,994
R-squared	0.0208	0.0234	0.0211	0.0235	0.9845	0.9847	0.8282	0.8280	0.9724	0.9716

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 7. Returns of Blog Posting-Based Strategies.

	Index Portfolio	SOE Portfolio	10 Companies Portfolio
Alfa	0.026***	0.050***	0.016**
	[0.008]	[0.017]	[0.007]
Mkt-Rf	0.606***	1.281***	0.055
	[0.084]	[0.218]	[0.069]
Observations	42	42	42
R-squared	0.59	0.58	0.02
Sharpe Ratio	0.47	0.39	0.27

Table 8. Abnormal returns and interactions with attention to blog postings

Dep. Var.	Daily abnormal returns	
	(1)	(2)
Blog posting x dummy for Navalny's posting in Top-30	-0.6154*	
	[0.3410]	
Blog posting x number of comments to a top non-Navalny's posting		0.4902**
		[0.2471]
Blog posting	0.3396	-3.6980**
	[0.2766]	[1.8395]
Dummy for Navalny's posting in Top-30	0.0665	
	[0.0943]	
Number of comments to a top non-Navalny's posting		-0.0008
		[0.0498]
Other controls + Fixed Effects	Yes	Yes
Observations	4 320	4 320
R-squared	0.0053	0.0055

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Column (1) also includes controls for lags of Navalny's posts being in Top-30 over the last week. Column (2) also includes controls for lags of comments to a top non-Navalny's posting over the last week.Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 9. Abnormal returns and DDoS attacks

	Daily Abnormal Returns							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Companies Navalny wrote about		Companies of primary interest of Navalny		Companies Navalny did NOT write about		State-owned companies Navalny did NOT write about	
DDoS attack	0.5718**	0.5652**	0.5341***	0.5064***	0.1289	0.1302	-0.0286	-0.0279
	(0.2294)	(0.2294)	(0.1641)	(0.1618)	(0.1700)	(0.1705)	(0.1882)	(0.1876)
Days w/o Navalny's posts		0.5040*		0.5264**		0.0614		0.03
		(0.2686)		(0.2651)		(0.1150)		-0.1398
Navalny's posts w/o mentioning a company		0.4846**		0.6250***				
		(0.2338)		(0.2280)				
Controls + Fixed Effects	Yes	Yes		Yes		Yes		Yes
Observations	9 018	9 018	3 708	3 708	15 767	15 767	5 343	5 343
R-squared	0.0209	0.0214	0.0221	0.0244	0.0211	0.0212	0.0293	0.0293

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 10. DDoS attacks, Navalny's attention to companies, and daily abnormal returns

Dep. Var.	Daily Abnormal Returns					
	(1)	(2)	(3)	(4)	(5)	(6)
DDoS attacks * dummy for companies Navalny wrote about	0.3759**	0.3568**				
	[0.1669]	[0.1659]				
DDoS attacks * dummy for companies of primary interest of Navalny			0.3558***	0.3419***		
			[0.1095]	[0.1090]		
DDoS attacks * logged number of Navalny's posts about a company					0.1196***	0.1139***
					[0.0297]	[0.0293]
DDoS attack	0.1538		0.246		0.1957	
	[0.1560]		[0.1857]		[0.1784]	
Controls + Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
DDoS attack fixed effect	No	Yes	No	Yes	No	Yes
Observations	23392	23392	23392	23392	23392	23392
R-squared	0.0179	0.018	0.0178	0.018	0.0178	0.018

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 11. DDoS attacks, news attention to companies, and daily abnormal returns

Dep. Var.	Daily Abnormal Returns			
	(1)	(2)	(3)	(4)
DDoS attacks *logged number of online news mentions of companies	0.0245	0.0245		
	[0.0531]	[0.0531]		
DDoS attacks * dummy for companies of primary interest of online newspapers			0.5200	0.5200
			[0.3341]	[0.3341]
DDoS attack	0.0237		0.1585	
	[0.5815]		[0.1397]	
Controls + Fixed Effects	Yes	Yes	Yes	Yes
DDoS attack fixed effect	No	Yes	No	Yes
Observations	23 392	23 392	23 392	23 392
R-squared	0.0178	0.0178	0.0179	0.0179

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 12. Placebo test and deferred influence test. Abnormal returns and leads and lags of DDoS attacks

	Daily Abnormal Returns			
	(1)	(2)	(3)	(4)
Sample	Companies Navalny wrote about			
DDoS attack, 2-day lag	0.3159			
	[0.4251]			
DDoS attack, 1-day lag		-0.1270		
		[0.1947]		
DDoS attack, 1-day lead			-0.0219	
			[0.3170]	
DDoS attack, 2-day lead				-0.1229
				[0.2458]
Controls + Fixed Effects	Yes	Yes	Yes	Yes
Observations	9 018	9 018	9 018	9 015
R-squared	0.0205	0.0203	0.0203	0.0199

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table 13. Placebo test. Abnormal returns and old DDoS attacks

	Daily Abnormal Returns			
	(1)	(2)	(3)	(4)
	Companies Navalny wrote about	Companies of primary interest of Navalny	Companies Navalny did NOT write about	State-owned companies Navalny did NOT write about
DDoS attack	-0.0857	-0.4099	-0.2123	-0.2843
	-0.1173	-0.3049	-0.1542	-0.3111
Controls + Fixed Effects	Yes	Yes	Yes	Yes
Observations	8 227	2 285	11 675	5 945
R-squared	0	0.0005	0.0001	0.0001

Notes: All specifications include company-year, year-month, and day of the week fixed effects together with controls for mentions in online news, business newspapers, and other blogs. Robust standard errors adjusted for clusters by trading day in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. Abnormal returns are measured in percentage points.

Table A1. Variables and sources.

Variable	Source
Shareholder meeting	http://rosneft.ru/Investors/shareholdersinfo/shareholdersmeeting/; http://www.vtb.ru/we/ir/governance/meeting/; http://www.surgutneftegas.ru/ru/press/news/; http://www.lukoil.ru/static_6_5id_2128_.html; http://ir.gazprom-neft.ru/general-shareholders-meeting; http://gazprom.ru/press/news/shareholders-meeting/; http://sberbank.ru/moscow/ru/investor_relations/shareholders_meetings/
Court hearings	http://kad.arbitr.ru/,
Court applications	http://kad.arbitr.ru/,
Blog postings	navalny.livejournal.com. Classification was done with the help of several research assistants.
Stock returns	Raw data from export.rbc.ru. Authors' calculations.
DDoS attacks	http://webplanet.ru/news/security/2008/10/27/cyxymu.html; http://www.xakep.ru/post/45763/; http://lj-maintenance.livejournal.com/120360.html http://www.pcmag.com/article2/0,2817,2351296,00.asp; http://lj-maintenance.livejournal.com/125027.html; http://www.nytimes.com/2009/08/08/technology/internet/08twitter.html; http://bits.blogs.nytimes.com/2009/08/06/twitter-overwhelmed-by-web-attack/ http://www.prohitec.ru/news_hard-2011-03-31-109735.html http://512kb.ru/content/view/48364/53/ http://512kb.ru/content/view/50304/53/ http://lj-maintenance.livejournal.com/55754.html; http://brad.livejournal.com/1873967.html http://lenta.ru/news/2007/05/24/zhzh/; http://lj-maintenance.livejournal.com/117288.html; http://www.livejournal.ru/themes/?id=398&rel_posts=1; http://www.securitylab.ru/news/296507.php

	http://lj-maintenance.livejournal.com/117288.html http://globalvoicesonline.org/2007/06/05/russia-livejournal-ddos-attacked/; http://community.livejournal.com/sup_ru/171891.html http://news.netcraft.com/archives/2006/05/03/ddos_on_blue_security_blog_knocks_typepad_livejournal_offline.html; http://lj-maintenance.livejournal.com/112766.html; http://net.compulenta.ru/267174/?r1=yandex&r2=news supplemented by data from http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/DDoS%20Public%20Media%20Reports_0.xls
Mentions in Yandex-searchable news	news.yandex.ru
Mentions in blogs	Blogs.yandex.ru
Mentions in offline business newspapers	Vedomosti and Kommersant archives at securities.com
List of state-controlled companies where Navalny is a minority shareholder	http://www.forbes.ru/column/45506-protokoly-korporativnyh-mudretsov
MICEX index	micex.ru
State ownership of companies	Standard and Poors

Table A2. Navalny's blog postings. Some summary statistics.

Panel A. Postings by company

Transneft	VTB	Gazprom	Rosneft	Sberbank	Surgutneftegaz	Lukoil	Gazpromneft	Inter RAO UES	RusHydro
103	86	83	77	37	10	7	6	3	3

Panel B. Postings by type

Ordinary posts (less than 5 mentions)	Important posts (5+ mentions)	Post about court hearings	Posts about court applications	Posts about shareholder meetings	Calls for action	Leters from Prosecutor's office	Very important posts (RA-based classification)
281	82	17	5	11	39	32	64

Table A3 . Blog postings and DDoS attacks

Dep. Var. *(all numbers are logged)*	*Number of Navalny's posts*	*Number of Navany's posts about companies*	*Number of all blog postings about companies*	*Number of news about companies in business newspapers*	*Number of news about companies in online newspapers*
DDoS attack	-0.2943*	-0.1855**	-0.2039***	-0.0114	0.0075
	(0.1561)	(0.0763)	(0.0691)	(0.0639)	(0.0661)
1-day lag of DDoS attack	0.2446*	0.0553	-0.0944***	0.0471	0.0808
	(0.1272)	(0.1152)	(0.0351)	(0.0345)	(0.0511)
2-day lag of DDoS attack	-0.0088	0.1594	0.0159	0.0518	0.0926
	(0.1210)	(0.1601)	(0.0360)	(0.0521)	(0.0810)
3-day lag of DDoS attack	0.0197	-0.0524	0.0281	-0.0440	0.1012
	(0.1238)	(0.0819)	(0.0964)	(0.0529)	(0.1012)
Day of the Week and Year-Month fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	956	956	956	956	956

Figure A1. Cumulative abnormal returns around the time of a blog posting. Trading day, company-month, and hour fixed effects are included.