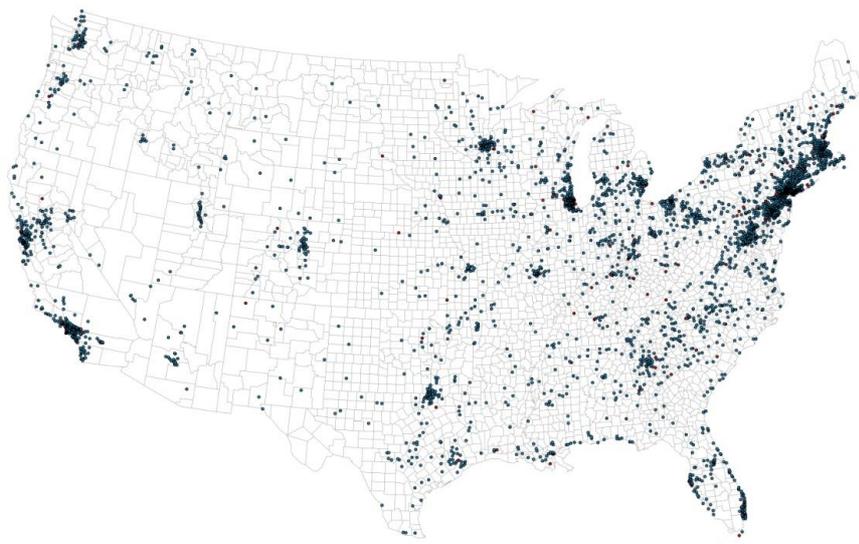


ONLINE APPENDIX: Hot Spot Analysis

To assess the effects of proximity of backdaters to non-backdaters among companies that awarded stock-option grants between 1996 and 2005, I collected data on the location (zip code) of each company's headquarters from Compustat. I then matched each company's headquarters to longitude and latitude coordinates using the Digital Social Science Center's U.S. projection zip code map.¹ The result is a 92-percent match for all companies in the sample. I then plotted the headquarters' locations on a map of the continental U.S. as shown in figure A1. To see the time sequence of lucky stock-option grants for the period of this study, see the "Figure A1" video file in this article's supplemental material.

Figure A1. The geographic location of stock-option-granting companies, 1996–2005.

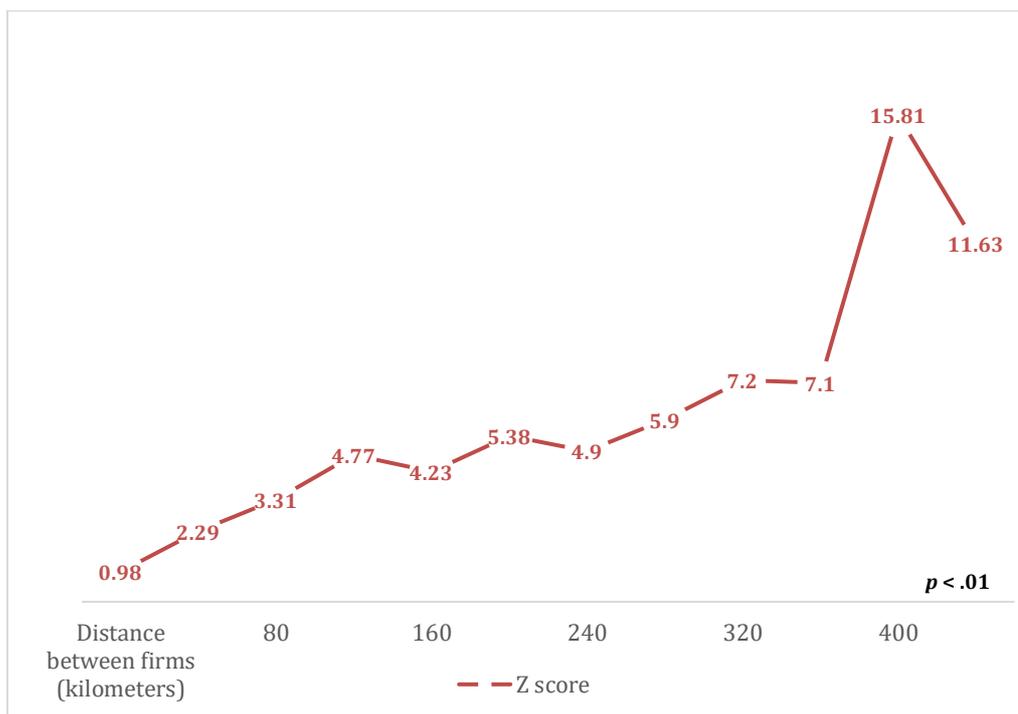


I then matched the corporate headquarters to the county-borders map to create a density map in which I calculated the frequency of backdating within each county. This process enables the use of the "hot spot analysis" method to inductively assess whether there is any geographic correlation of an event—in this case, the rate of

¹ <http://library.columbia.edu/locations/dssc.html>.

backdating in the county.² The statistic, expressed as $G_i^* = \frac{\sum_j w_{ij}(d)x_j}{\sum_j x_j}$, requires a weighing matrix w for the extent (weight) to which one company may affect another company given its geographical distance from the focal firm. To create this weighing matrix, I ran a procedure to assess the significance of geographical clustering at intervals of 40km from the focal companies that are represented on the diagonal of the matrix w . This procedure yielded a series of z scores for each interval, shown in figure A2, which peaked at 120km and 500km. I chose the higher value, 500km, to model the indifference zone in the weight matrix, a zone within which company i has a weight of 1 on “infecting” company j , irrespective of the actual distance between them. Beyond that distance, the weight of the company’s influence decreases exponentially with distance from the focal company.

Figure A2. The series of z scores for cluster significance at 40km intervals.



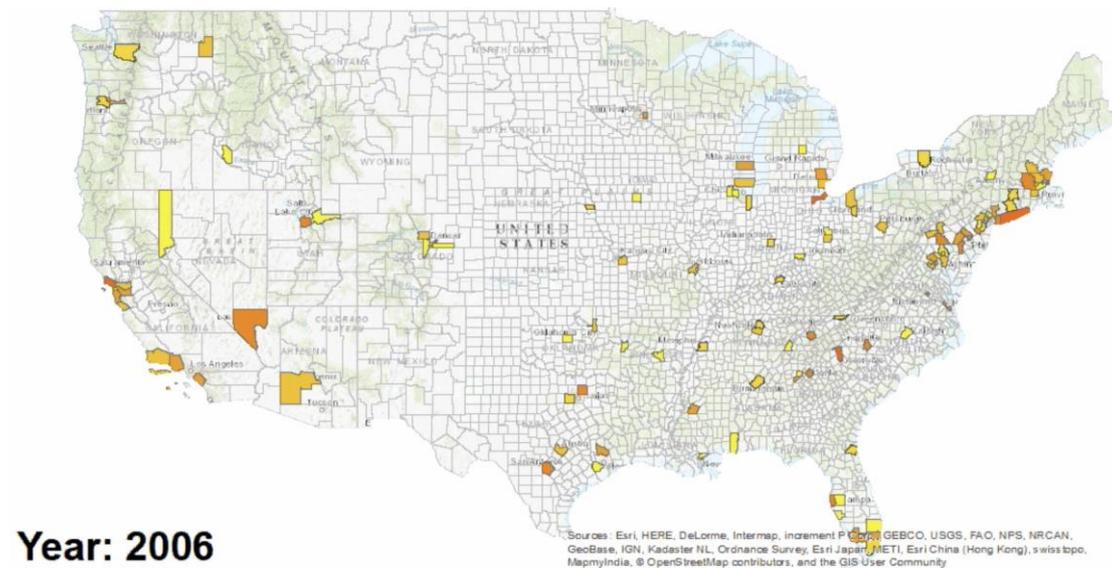
² Hot spot analysis is widely used in epidemiology to examine whether pathogens are contagious by human contact.

Figure A3 reports the hot spot analysis. For a dynamic version of the map, see the “Figure A3” video file in this article’s supplemental material. The map shows the proportions of lucky option grants assigned in the county in the one year before the date shown. The proportion of lucky grants was calculated by dividing the number of grants assigned at the best price date by the number of grants assigned in total. The map can be calculated separately for each auditor, by counting the number of lucky grants for firms audited by the auditor in the county and dividing it by the total number of grants assigned to companies audited by the same auditor in the county over the previous year. The map updates this proportion of lucky grants every month from 1996 to 2006. The color scheme reflects these values:

SYMBOLGY	Percentage of lucky grants
	0%-2%
	2.001%-5%
	5.001%-9%
	9.001%-13%
	13.001%-17%
	17.001%-22%
	22.001%-30%
	30.001%-50%
	50.001%-100%

This color scheme was chosen along the natural breaks in the data, except for the three lowest values. These represent the average number of grants that should be lucky if assigned in earnest, with two standard deviations calculated from their mean at the average county size. The interpretation of these is that any county receiving either the lowest value () or 9%–13% () or higher is unlikely to happen by chance alone.

Figure A3. Backdating hot spots clustered at the district level.



The geographical clustering analysis establishes two important results. First, it shows that there is significant clustering within geographically bounded areas that is above the threshold that would be expected if backdating was practiced by organizations independently of its prevalence in neighboring organizations. Second, it shows that the clustering of stock-option backdating occurs at a close geographical proximity. This is illustrated visually by the large heterogeneity between counties in the same state, such as New York, New Jersey, and Illinois. Importantly, it demonstrates that using aggregated, state-level data for analysis removes meaningful variance in contagion from the data.

To see the backdating activity in the same period for each of the Big Five accounting firms—Arthur Andersen, Deloitte, Ernst & Young, KPMG, and PricewaterhouseCoopers—see their video files in this article’s supplemental material. Running the same analysis at the individual auditor level allows us to see the heterogeneity in backdating proportions among offices of the same auditor, and among different auditors in the same city.