

Anti-Gouging Laws, Shortages, and COVID-19: Insights from Consumer Searches

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Abstract

Existing anti-gouging laws in several US states prohibit large price increases in the wake of emergencies. Statewide emergency declarations following the COVID-19 pandemic's rapid onset activated these laws, creating a natural experiment that we exploit. We compare the changes in search behavior before and after activation across states with and without these laws using data from Google Shopping Trends during the early stages of the pandemic. We focus on hand sanitizer and toilet paper, two staples predominantly bought in stores in regular times that experienced substantial in-store shortages during the pandemic. We find robust evidence that anti-gouging laws increased searches for hand sanitizer, and some evidence of similar impacts on toilet paper. These results corroborate predictions regarding the shortage-inducing or -aggravating tendencies of anti-gouging laws, and they inform the ongoing public debate on anti-gouging laws and their potential effects during public health emergencies like COVID-19.

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I. Introduction

The onset of the global COVID-19 pandemic and associated emergency situation disrupted the availability of staple consumer goods such as toilet paper and hand sanitizer. Frequent media reports of hoarding and shortages of these goods have renewed interest in consumer behavior during public-health emergencies and rekindled the public debate about anti-gouging laws (Fabrizio 2020; Dunklin

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and Pritchard 2020). Pictures of empty store shelves, tagged with #PanicBuying, flooded Twitter. Pointing at instances of stores charging \$10 for a roll of toilet paper and \$22.99 for a twelve-ounce bottle of hand sanitizer, many social and political commentators loudly voiced concerns against these surging prices, accused “the pandemic’s shameless profiteers” (Pan 2020), and called for swift regulatory action. In sharp contrast, more than 150 economists have recently signed a petition to repeal anti-gouging laws, arguing for the necessity of these steep prices to ensure the continued availability of essential goods (Niles 2020).

In this article, we utilize insights from Google Shopping Trends to empirically examine the impact of anti-gouging laws. Exploring differences in online consumer behavior related to hand sanitizer, toilet paper, and hand lotion in February and March 2020, we identify significant differences across states with and without anti-gouging laws. We find significant increases in online shopping searches for hand sanitizer in states with anti-gouging laws. This finding is robust to accounting for a variety of confounding differences, including social distancing and demographics, even in two-way fixed effects difference-in-differences models and propensity-score matched estimation. In propensity-score matched estimation, toilet paper searches emerge to be significantly higher in states with anti-gouging laws as well. We find no effects on hand lotion, which indicates the shortages are demand driven rather than supply driven.

Given that most US consumers typically shop for cleaning supplies like hand sanitizer and toilet paper in stores (discussed below), these results imply that anti-gouging laws caused in-store shortages.

II. Background: The Anti-Gouging Debate

Anti-gouging laws—laws prohibiting “unconscionable” price increases in the aftermath of emergencies like the current pandemic or natural disasters such as hurricanes—have widespread popular and political support. Supporters deem the practice of sellers charging excessively high prices in a period of crisis as an immoral act (Snyder 2009), an unfair practice that feeds on the disadvantage of victims left at the mercy of rampant, greedy profiteering, given the sudden scarcity of essentials (Pan 2020; Snyder 2009; Brewer 2007; Hiltzik 2017). Price-gouging complaints exploded across the United States in March 2020, reflecting how consumer sentiments mirror similar fairness concerns (Dunklin and Pritchard 2020). While consumers

expect demand-driven price increases in normal times (e.g., higher gas prices in the summer), price spikes during crises induce scrutiny and suspicion of unfair practices (Culpepper and Block 2008; Ferguson et al. 2011).

Though scholars who argue against anti-gouging laws come from a variety of fields, including law, business ethics, and economics, they are united in their key concern with these laws: they prohibit the essential role of the price mechanism (Brewer 2007; Skarbek 2008; Zwolinski 2008; Mankiw 2016). Higher prices in disaster-hit areas attract scarce essentials to those areas. The free movement of prices ensures rapid replenishment of empty shelves (Culpepper and Block 2008; Skarbek 2008). Price increases motivate consumers to economize on their consumption, and producers to employ more of their resources in providing higher-priced goods (Skarbek 2008).

To curb the unbridled movement of prices, as anti-gouging laws do, is to keep shelves empty during emergencies at the time when these supplies are needed most, these scholars emphasize (Montgomery et al. 2007; Skarbek 2008). Moreover, by keeping prices artificially low and aggravating the emergency-induced shortage, anti-gouging laws lead to higher search and wait costs, which can be high enough to outweigh the apparent monetary savings to consumers from the lower prices. Montgomery et al. (2007) estimate that the economic damages in the two-month periods following hurricanes Rita and Katrina would have increased by \$1.5 to \$2.9 billion had anti-gouging laws been in place to prevent price increases.

Note the implicit difference underlying this strong divergence of opinions. Supporters of anti-gouging laws implicitly assume that the onset of the emergency enhances the market power of store-owners and retailers (Pan 2020). Because emergency conditions erect barriers to entering the market, the competition from potential entrants that keeps regular prices in check is no longer active in the short term. Incumbents have greater control over the prices, they argue, and can afford to charge higher prices without losing customers to rivals. Those against anti-gouging laws, on the other hand, implicitly assume competition. Under emergency conditions, maintaining a functional supply line may be more expensive. Higher prices cover these costs, and facilitate a faster reallocation of resources to respond to the mounting demand (Culpepper and Block 2008).

Whether anti-gouging laws benefit those in dire need of essential supplies or restrict the availability of these products depends in part on the underlying market structure. In competitive markets, these

laws could act as binding price ceilings and cause in-store shortages. If markets are not competitive, these laws will limit colluding store owners from restricting supplies. This dependence on market structure makes the impact of anti-gouging laws an open empirical question. We address this question by comparing the variation in online search trends before and after the declaration of statewide emergencies across states with and without anti-gouging legislation.

B. Biases, Cascades, and Anti-Gouging Laws

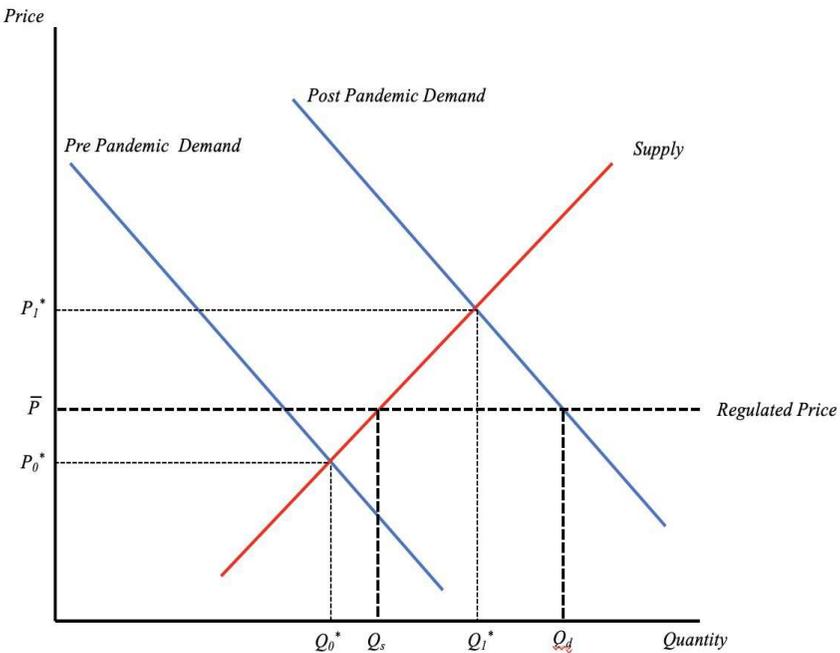
Before we can extract conclusions by exploring recent consumer search trends, we need to set expectations for baseline behavior under the unusual circumstances of a pandemic. Psychologists, economists, and others have studied why consumer behavior during emergencies may be atypical. One recent book on the psychology of pandemics argues that consumer hoarding behavior results from some consumers foreseeing the possibility of loss of control over their consumption decisions (Huremovic 2019): storing toilet paper might allow an individual to exercise more control over their consumption decisions in the future relative to not storing toilet paper. Further, such behavior by some consumers might increase the same behavior by others: if an individual observes others purchasing large amounts of toilet paper, the individual might believe that the others have hidden information and that purchasing extra toilet paper is a good choice (Huremovic 2019). Economists have observed this type of “herding” behavior in several markets and refer to it as an “informational cascade” (Bikhchandani and Hirshleifer 1992).

For our purposes, though, it suffices to note that such bias-driven behavior contributes to increased demand (see below), and in the absence of price regulations, contributes to price hikes. The rising prices, in turn, keep further hoarding in check and ensure continued availability of the products by motivating suppliers to replenish shelves. In the presence of price regulations, however, such behavior aggravates a shortage. With prices restricted from rising, hoarding or cascade buying continues unchecked until shelves run empty. Because prices do not rise, sellers have lower incentives to restock. Furthermore, even if consumers believe that anti-gouging laws will affect the availability of goods (erroneously or not), this anticipation might influence their behavior as they seek to increase control over their own future consumption decisions.

III. The Economics of Anti-Gouging Laws

The COVID-19 pandemic's sudden arrival and swift spread triggered states to declare emergencies. Public health guidelines from the CDC and WHO led to a surge in hand-sanitizer demand. Anticipation of staying at home more, whether voluntarily or by order, led to a surge in household demand for toilet paper. Consumer anticipation of higher future prices or shortages may also have contributed to higher demand. Furthermore, the psychological biases discussed above may have aggravated these demand shifts. Figure 1 shows how such a shift in demand would play out in an unregulated market and in a market with anti-gouging regulation.

Figure 1. Effect of binding price-gouging regulation after pandemic demand shift

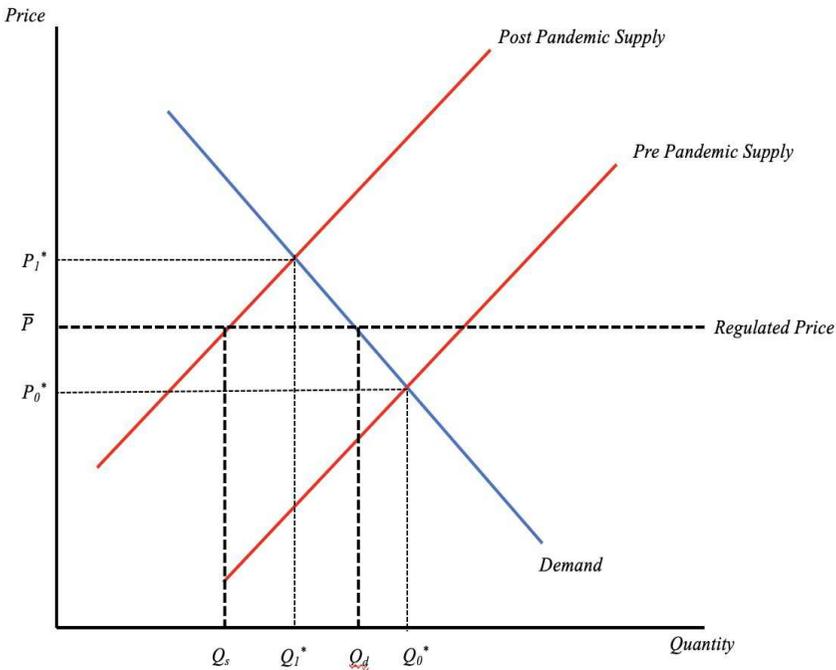


The pandemic-induced shift in demand moves the demand curve to the right from the pre-pandemic demand curve to the post-pandemic demand curve. In an unregulated market, the equilibrium price would increase from P_0^* to P_1^* and the equilibrium quantity would increase from Q_0^* to Q_1^* . However, a binding anti-gouging regulation restricts the price from increasing above \bar{P} . Consumers demand quantity Q_d at price \bar{P} , but producers only supply quantity Q_s at that price. The anti-gouging regulation leads to a shortage if the

regulated price, \bar{P} , is below the post-pandemic market clearing price, P_1^* .

The onset of the COVID-19 pandemic might also have shifted the supply curve inward for many goods if it disrupted supply chains.¹ Figure 2 shows how such a supply shift would play out in an unregulated market and in a market with binding anti-gouging regulation. In the unregulated market, the supply shift would lead the equilibrium price to increase from P_0^* to P_1^* and would lead the equilibrium quantity to decrease from Q_0^* to Q_1^* . However, if anti-gouging regulation capped the price at \bar{P} , then a shortage of size $Q_d - Q_s$ will result.

Figure 2. Effect of binding price-gouging regulation after pandemic supply shift



This analysis shows that anti-gouging laws act as price ceilings by prohibiting price increases above certain levels during emergencies. Prior economic analyses have shown that shortages will lead consumers to invest more in search (Weitzman 1991; Deacon and Sonstelie 1989). We would expect higher levels of consumer searches to result from increased demand and/or decreased supply in all

¹ See, for instance, Seric et al. 2020.

states—even in states without anti-gouging regulation. However, a comparison of changes in searches across states with and without anti-gouging regulation can isolate the additional searches resulting from shortages caused by the regulation. This insight motivates the differences-in-differences and matching strategies we discuss and implement in the following sections.

Furthermore, we can distinguish between supply shocks and demand shocks by also running these analyses on hand lotion, the demand for which should not have increased as a result of the pandemic. But a supply-side disruption, especially one resulting from emergency conditions erecting entry barriers, will influence all products irrespective of demand-side effects. A divergence of observed impacts on hand lotion and hand sanitizer will indicate that our results are primarily driven by changes in demand.

II. Methods

The following four subsections present our empirical methods and data. We apply empirical methods that control for heterogeneity in preexisting consumer searches across states, and control for time variation within states by comparing states with and without price-gouging regulation.

A. Connecting the Dots: Anti-Gouging Laws, in-Store Shortages, and Online Search Trends

In regular times, the large majority of US customers purchase household supplies like hand sanitizer, hand lotion, toilet paper, and disinfecting wipes in stores rather than online.² This general tendency indicates that a sudden spike in online searches for “hand sanitizer in stock near me,” for instance, could reflect an in-store shortage in customers’ usual shopping destinations, a spike in prices in these stores motivating a search for cheaper alternatives, or an overall increase in online shopping to avoid risk of exposure, among other things. All of these could increase search trends in all states. However, if anti-gouging laws cause in-store shortages, we should observe a larger increase in searches in states with active anti-gouging legislation. This idea motivates our difference-in-differences and matching strategies.

² According to an August 2019 survey of online shoppers, 84 percent of US customers buy household cleaning products in-store (GfK 2019).

However, there is one caveat to the controlled comparison we present below. Comparing changes in search trends across states with and without anti-gouging laws may underestimate the impact of anti-gouging laws on shortages if prices increase in states without anti-gouging legislation, leading consumers to search online for less expensive goods. Our empirical strategy therefore provides a lower bound of the impact of anti-gouging laws on shortages.

B. Google Shopping Search Queries as a Proxy for Online Search Trends

More than 80 percent of the world's internet searches use Google (Gordon 2017). This global dominance has made Google a centralized repository for a massive amount of consumer behavior data. Google Trends provides users' relative search volume data by different geographic units such as cities, states, and countries (Gordon 2017; Jun et al. 2018). These reports can track queries from as far back as 2004, and as recent as thirty-six hours from the time of the report.

This depth and breadth, in time and in space, of the data has attracted scholarly interests from varied fields including economics, communication, information technology, health, marketing, business, and politics (Jun et al. 2018). The almost real-time detection of breaking cultural, political, and economic trends, at a high frequency, is the key advantage of utilizing Google search data (Askitas 2015). Due to the low cost of access and large sample size, numerous recent studies have utilized Google Trends as a data source to empirically confront open questions about social trends (Woo and Owen 2019). Recent examples include utilizing the search query indices to measure intolerance (Chan 2019), mortgage default risk (Stephens-Davidowitz 2014), and racial animus (Stephens-Davidowitz 2014) to name a few.

Standard survey-based data can suffer from nonrandom self-selection of respondents, which results in biased estimates. Google Trends aggregates private search query information and avoids such biases (Askitas 2015). Furthermore, the reported trends measure the geographical popularity of a given search term *relative* to all other searches stemming from the area. The measure accounts for any factor that can influence general online shopping search volumes, including internet or cellular connectivity, size and density of population, and geographical access to in-store purchases.

C. Data

To test the impact of anti-gouging laws on online shopping search trends, we construct a novel panel data set of daily observations for all fifty US states and Washington, DC, from Google Shopping Trends for queries on “hand sanitizer,” “toilet paper,” and “hand lotion.” The sample ranges from February 15, 2020, to March 25, 2020. This range covers the initial spread of the pandemic in the United States, from the CDC’s February 21 announcement that a pandemic was likely, to the president’s declaration of a national emergency on March 21.³ These three online search trend series are our outcome variables of interest.

To this, we add state-level information on anti-gouging legislation and dates when states declared statewide emergencies.⁴ These two variables, and their interaction, are our independent variables of interest. We also add state-specific demographic information, including population density, average household size, and population racial demographics from the US Census Bureau.⁵ Finally, to account for the influences of social distancing on online shopping trends, we add in cellphone-based intrastate travel data reported by the *New York Times* on April 2, 2020.⁶ We also include day- and state-level fixed effects in a two-way fixed effect difference-in-differences model to control for unobserved state-level heterogeneity and daily national trends.

The state-specific demographic variables and the intrastate travel variable constitute our set of control variables. State-specific demographic variables account for the potential effect on demand for consumer staples such as hand sanitizer and toilet paper, and the potential effects on the manner by which consumers purchase these consumer staples. The intrastate travel variable accounts for the possibility that consumers might substitute between physical and online searches for consumer staples. For instance, a consumer who

³ Popular media regularly mentioned shortages of hand sanitizer and toilet paper. After choosing these products, our inspection of Google Trends data indicated that online searches for them spiked during this time range (see figures 3 and 4). Google’s algorithm includes closely associated search terms. The report on hand sanitizer search volumes incorporates search queries like “hand sanitizer in stock near me.”

⁴ From *Time* magazine’s “Summary of State ‘Price Gouging’ Statutes and Regulations,” December 2014.

⁵ Census data are for the year 2017.

⁶ See Glanz et al. 2020.

drives around from store to store looking for hand sanitizer might be less likely to engage in internet searches for hand sanitizer.

The search data from Google Shopping Trends indexes relative search volumes on a scale from 0 to 100. Higher values reflect a higher volume of searches from a location relative to other searches from that location. The search term with the highest fraction of searches as a fraction of total searches in that location scores a value of 100. A value of 50 for Texas for “hand sanitizer” on a given day, for instance, indicates hand sanitizer-related queries were half as popular as other searches in Texas that day. A value of 0 for any location indicates insignificant relative search volume for this term. A higher value on this scale indicates a higher proportion of all queries, not a higher absolute count of queries. This measure automatically controls for larger search incidences in more populated areas: a smaller location where 70 percent of all queries are for toothpaste will score twice that of a larger location where 35 percent of all queries are for toothpaste.

We encode statewide anti-gouging legislation as a binary variable (Law). We set Law equal to one for states with anti-gouging legislation, and zero for those without any such legislation. We encode statewide emergency declarations also as a binary variable (Declared). Declared equals zero for a state before its emergency declaration and equals one thereafter.

We encode the *New York Times* intrastate travel data into a five-category scale: no travel (white) scores 0, some travel (light orange) scores 0.25, moderate travel (orange) scores 0.5, moderately high travel (red) scores 0.75, and very high travel (dark red) scores 1. To permit interpretation of the estimated impacts as percent changes, we apply a natural log transformation to all our nonbinary continuous variables. This transformation also benefits estimation by reducing influences of outlying observations.

D. Estimation Strategy

We use five regression models and a nearest-neighbor propensity-score matching strategy to estimate the impact of anti-gouging laws on online searches. We apply these estimation strategies to three products: hand sanitizer, toilet paper, and hand lotion.

First, we apply ordinary least squares (OLS) to estimate the equation

$$y_{s,d} = \beta_0^o + \beta_1^o Law_s + \sum_{i>1} \beta_i^o x_{i,s} + \varepsilon_{s,d}^o, \quad (1)$$

where $y_{s,d}$ is the log of the Google Trend measure of the product of interest in state s on day d , β_0^o is a time- and state-invariant constant term, β_1^o is the effect of anti-gouging laws, $\sum_{i>1} \beta_i^o x_{i,s}$ is a set of time-invariant control variables and their coefficients, and $\epsilon_{s,d}^o$ is a mean zero error term. We estimate equation (1) only using data after a state of emergency is declared, so β_1 is the observed difference in logged Google Trends in states with and without anti-gouging laws after those laws go into effect. In the absence of control variables, equation (1) simply provides a t -test for the difference in mean logged Google Trends for a consumer product after the onset of anti-gouging laws between states with and without these laws.

The estimates provided by equation (1) can suffer from some problems. For example, they do not account for preexisting differences in Google Trends across states with and without anti-gouging laws, although inclusion of time-invariant control variables may alleviate this issue to some degree. They also do not account for changes in Google Trends over time that are unrelated to anti-gouging laws. For example, a change in market structure resulting from barriers to entry caused by the pandemic could increase online searches for consumer staples if retailers suddenly acquire market power and charge higher prices. However, such impacts should be independent of price-gouging laws, because price-gouging laws predate the COVID-19 pandemic.

For these reasons, we also estimate the effect of anti-gouging laws using a difference-in-differences strategy by estimating the equation

$$y_{s,d} = \beta_0^d + \beta_1^d Law_s + \beta_2 Declared_{s,d} + \beta_3 Law_s \times Declared_{s,d} + \sum_{i>1} \beta_i^d x_{i,s} + \epsilon_{s,d}^d, \tag{2}$$

where β_0^d now represents the preexisting difference in Google Trends before the emergency declaration, β_2 represents the impact of an emergency declaration in all states irrespective of whether they have an anti-gouging law or not, and β_3 is the effect of anti-gouging laws on Google trends. The coefficient β_3 is the difference-in-differences estimate of the effect (Greene 2017). This coefficient captures the impact of the laws by comparing the changes in search trends before and after the emergency across states with and without anti-gouging laws. We also estimate equation (2) with two-way (date and state) fixed effects, which improves precision of the difference-in-differences estimate by controlling for *all* state-invariant heterogeneity and date-specific national trends.

Given our design, as long as the search trends before the emergency declaration would have continued without the emergency (the “parallel trends” assumption), our difference-in-differences approach consistently estimates the impact of the price-gouging laws. But in case this assumption is violated, which is a possibility given that consumers can anticipate shortages and start reacting before the declaration, we also apply a nearest-neighbor propensity-score matching strategy to estimate the effect of anti-gouging laws on Google Trends (Rosenbaum and Rubin 1983). This strategy involves matching states using time-invariant covariates including household size, average travel, population density, and racial demographics. This strategy restricts the analysis to only the post-declaration phase and compares states with anti-gouging laws to states that do not have anti-gouging laws but are close matches along these other dimensions.

III. Results

We begin our exposition of results with figures 3 and 4, which present non-parametric point estimates and 95 percent confidence intervals of Google Shopping Trends during the onset of the COVID-19 pandemic in the United States. We obtain these estimates by fitting free polynomials to the trend data. Figure 3 shows relatively larger Google Shopping searches for hand sanitizer in states with anti-gouging laws, while figure 4 shows a much smaller difference associated with Google Shopping Trends for toilet paper. Figure 3 also indicates that shoppers in states with anti-gouging laws anticipate in-store shortages for hand sanitizers and start searching for online sources before the statewide emergency declaration that triggers the laws. These figures are consistent with the results from the estimation of equations (1) and (2) presented below.

Figure 3. Hand sanitizer search trends in states with (Law = 1) and without (Law = 0) anti-gouging laws during the onset of the COVID-19 pandemic and associated emergency declarations

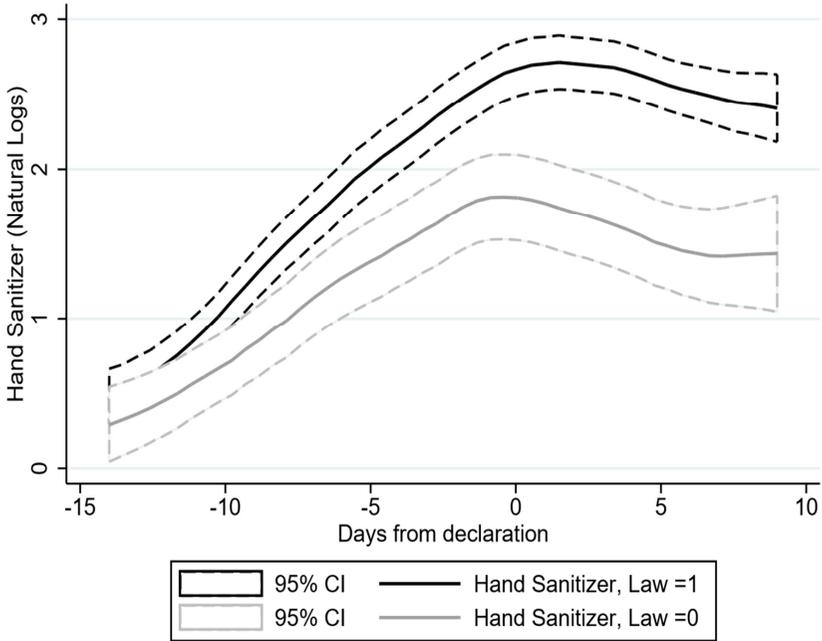


Figure 4. Toilet paper search trends in states with (Law = 1) and without (Law = 0) anti-gouging laws during the onset of the COVID-19 pandemic and associated emergency declarations

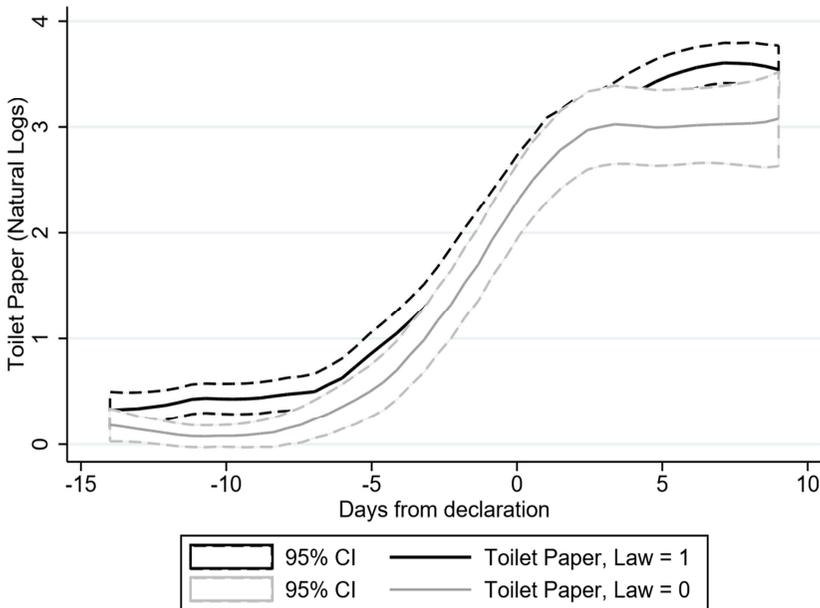


Table 1 displays the results of estimating equations (1) and (2) using Google Trends for hand sanitizer. The first column displays the results from equation (1) without control variables. The coefficient on “Law” is simply the difference-in-means of logged Google Trends for hand sanitizer between states with and without anti-gouging laws after emergency declaration. The result indicates that Google Trends for hand sanitizer were approximately 65 percent higher in states with anti-price-gouging laws and that this difference is statistically significant (p -value < 0.001). Google trends are approximately 55 percent higher (p -value < 0.001) holding travel and household size in states constant by including them as control variables (column 2 in table 1). Interestingly, higher travel is associated with lower Google Trends, indicating that consumers may be substituting between traveling to stores looking for products and searching for products online.

Table 1. Impact of anti-gouging laws, hand sanitizer

	(1)	(2)	(3)	(4)	(5)
Law	0.652*** (5.3)	0.54*** (4.49)	0.296*** (3.77)	0.192* (2.31)	—
Travel	—	-1.645*** (-4.21)	—	-0.926*** (-4.08)	—
Avg. HH size	—	2.11 (1.41)	—	1.773* (2.18)	—
Declared	—	—	1.098*** (9.05)	1.085*** (8.95)	—
Declared x Law	—	—	0.356** (2.44)	0.391* (2.68)	0.483*** (4.62)
Constant	1.684*** (16.16)	-0.541 (-0.29)	0.587*** (9.44)	-1.367 (-1.34)	0.783*** (-3.43)
<i>N</i>	766	729	2,040	1,960	2,040
<i>R</i> ²	0.0378	0.0631	0.186	0.2	0.51

Notes: *t* statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All continuous variables are in natural logs. OLS models (1) & (2) only examine post-declaration phase. Model (5) includes state and date fixed effects as controls.

Columns 3, 4, and 5 in table 1 show the results of the difference-in-differences analysis applied to hand-sanitizer Google Trends. In these columns, the coefficients of interest are in the row labeled “Declared x Law,” which shows the estimated difference-in-differences without and with control variables: column 4 with travel and household size, and column 5 with state and day fixed effects. The difference-in-differences estimates indicate an increase in Google Shopping Trends

for hand sanitizer in states with anti-gouging laws relative to states without anti-gouging laws of between 35 percent and 50 percent. The difference-in-differences estimates without and with time-invariant controls are statistically significant, with p -values less than 0.05, 0.01, and 0.001, respectively.

The analogous results using Google Shopping Trends for toilet paper are displayed in table 2. Although the results from OLS estimation of equation (1) indicate significantly larger Google Shopping Trends after an emergency declaration, the results using the more robust difference-in-differences method (equation 2) are mixed. We find no significant effect in the standard difference-in-differences models with and without controls (columns 3 and 4), but we find that anti-gouging laws led to a 25 percent relative increase in Google Shopping Trends searches in anti-gouging states in the two-way fixed-effects difference-in-differences regression (column 5). This latter estimate is significant at the 5 percent level.

Table 2. Impact of anti-gouging laws, toilet paper

	(1)	(2)	(3)	(4)	(5)
Law	0.334** (2.76)	0.306** (2.59)	0.198** (3.23)	0.212*** (3.31)	—
Travel	—	0.663 (1.93)	—	0.297*** (1.58)	—
Avg. HH size	—	-0.222 (-0.14)	—	0.410 (0.53)	—
Declared	—	—	2.695*** (23.16)	2.790*** (24.17)	—
Declared x Law	—	—	0.137 (1.01)	0.0696 (0.52)	0.247* (2.51)
Constant	3.002*** (16.16)	3.227 (1.62)	0.307*** (6.38)	-0.274 (-0.28)	-0.396 (-1.45)
N	766	729	2,040	1,960	2,040
R ²	0.0115	0.0128	0.550	0.566	0.710

Notes: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All continuous variables are in natural logs. OLS models (1) & (2) only examine post-declaration phase. Model (5) includes state and date fixed effects as controls.

Table 3 displays the results of estimating equations (1) and (2) using Google Shopping Trends for hand lotion, and all coefficients of interest are statistically insignificant. This insignificance means that the anti-gouging impacts identified in tables 1 and 2 are driven by increasing demand for hand sanitizer and toilet paper, not by a general decrease in supply or increased entry costs into retail markets.

Table 3. Impact of Anti-gouging laws, hand lotion

	(1)	(2)	(3)	(4)	(5)
Law	0.0173 (1.19)	0.0146 (0.98)	0.00564 (0.77)	0.00188 (0.25)	—
Travel	—	-0.0285 (-0.49)	—	-0.0541 (-1.90)	—
Avg. HH size	—	0.151 (1.48)	—	0.0528 (0.99)	—
Declared	—	—	0.00463 (0.41)	0.00360 (0.30)	—
Declared x Law	—	—	0.0116 (0.72)	0.0129 (0.76)	0.00210 (0.12)
Constant	0.00987 (1.00)	-0.173 (-1.33)	0.00524 (1.00)	-0.0470 (-0.68)	0.000298 (0.02)
N	766	729	2,040	1,960	2,040
R ²	0.00136	0.00245	0.00219	0.00422	0.0449

Notes: *t* statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All continuous variables are in natural logs. OLS models (1) & (2) only examine post-declaration phase. Model (5) includes state and date fixed effects as controls.

Finally, table 4 displays the results of our nearest-neighbor propensity score matching strategy. The results displayed therein support the result from table 1 that Google Shopping Trends for hand sanitizer were significantly larger in states with anti-gouging laws after those laws took effect upon emergency declaration. The matching results indicate that Google Shopping Trends were approximately 80 percent (p -value < 0.001) higher in states with anti-gouging laws relative to similar states without anti-gouging laws after emergency declaration.

Table 4. Impact of anti-gouging laws, matched sample

	(1) Hand sanitizer	(2) Toilet paper	(3) Hand lotion
Avg. Treatment Effect	0.822***	0.413**	0.017
χ^2 -score (p -value)	5.88 (0.00)	3.00 (0.003)	0.97 (0.33)
N	729	729	729

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Matched on household size, travel, population density, and racial demographics.

Interestingly, once states are matched to demographically similar states, we also find a positive impact of anti-gouging laws on Google Shopping Trends for toilet paper. The matching estimate indicates Google Shopping Trends were approximately 40 percent (p -value < 0.01) higher in states with anti-gouging laws relative to similar states without anti-gouging laws after emergency declaration. Because this

approach matches states by demographics (among other things), it controls for household-level variation in toilet paper usage, which differs across cultures. This result indicates, after controlling for this potential variation in demand for toilet paper, that anti-gouging laws do indeed contribute to higher online searches.

Finally, the matching estimate using Google Shopping Trends for hand lotion is not statistically significant, which is consistent with our results from table 3 and our expectation that the COVID-19 pandemic should not have affected consumer demand or searches for hand lotion.

IV. Discussion

Our results indicate that anti-gouging laws significantly increased online searches for hand sanitizer during the COVID-19 pandemic in 2020. We also provide some evidence that anti-gouging laws increased searches for toilet paper during the onset of the pandemic. These results are consistent with presence of larger in-store shortages in US states that have anti-gouging laws. Further, to the extent that searching is costly, the net effect of a lower price due to anti-gouging laws will be offset by these search costs. It is not clear from our results whether total consumer welfare is increased or decreased as a result of anti-gouging laws, but the possibility of increased search costs is an issue that should be considered in future research, especially if the goods that are more difficult to find will impact consumers' health, which might be the case with hand sanitizer.

Our empirical results point to some other interesting consumer behavior during the onset of the COVID-19 pandemic and the associated shortages of consumer staple goods. Tables 1 and 2 both indicate the presence of higher online search volumes in states with anti-gouging laws *before* the laws kicked in as a result of emergency declarations (see columns 3 and 4 in row labeled "Law" in tables 1 and 2). This implies that consumers in those states had increased searches before the laws took effect.

While we cannot make a causal claim about these increased search volumes, this result speaks to the possibility that consumers in these states foresaw that anti-gouging laws could lead to shortages, and such foresight could lead to shortages before the laws went into effect. This possibility would imply that consumers are working in sophisticated ways to maintain control over their future consumption decisions.

Finally, we may have uncovered an important unforeseen consequence of anti-gouging laws that bears thoughtful consideration by policymakers. We have focused on internet searches by using Google Shopping Trends data, but consumers also might engage in physical searches by going to many different stores. The row labeled “Travel” in table 1 indicates that physical travel is negatively correlated with Google Shopping Trends for hand sanitizer. Does this mean that physical searches and internet searches for hand sanitizer are substitutes—meaning that some consumers are traveling to search for hand sanitizer? If yes, then anti-gouging laws may lead to less effective social distancing measures that have been a key response to the COVID-19 pandemic in almost every state. Unfortunately, we do not have the granularity of data necessary to measure the impact of anti-gouging laws, but future research should investigate this question as more granular state-level travel data become available.

V. Conclusion

While basic economics provides solid theoretical foundations to predict adverse effects of anti-gouging laws in the wake of emergencies, empirical evidence in this regard is scant. Understandably so: disasters that trigger anti-gouging laws in most cases tend to be localized. Causal estimates require the presence of counterfactuals—regions affected by the triggering event, but unaffected by anti-gouging laws—which can only be available if the shock permeates across several states. We exploit the exogenous variation in anti-gouging legislation triggered by the emergency declarations in response to the COVID-19 pandemic’s sudden outbreak to fill in this gap.

Using Google Shopping Trends to track web searches as a proxy for in-store shortages, we estimate the impact of anti-gouging laws on consumer searches for staple products (hand sanitizer and toilet paper) during the COVID-19 outbreak in the United States during the spring of 2020. We find a robust association between anti-gouging laws and increased shopping searches for hand sanitizer, and given our design, our estimates reflect a lower bound of the true effect.

Given the negative correlation between travel and online searches for hand sanitizer, the most likely explanation is that anti-gouging laws led to more in-store shortages and subsequently led consumers to search for hand sanitizer by other means. In estimation strategies

that control for state-specific heterogeneity, and in daily national trends, we also find higher online searches for toilet paper as a result of anti-gouging laws. These results find further support from estimated average treatment effects from propensity-score matched estimation in which we match states with and without active anti-gouging laws based on average household size, intrastate travel during the pandemic, population density, and a wide range of demographic factors.

Our results inform the recently rekindled policy debate about anti-gouging laws. The naïve appeal on moral grounds or resulting political popularity notwithstanding, economists have long argued that anti-gouging laws, which intend to restrict disaster-induced price surges, end up causing shortages. So long as empty in-store shelves lead to increased web searches for consumer products, our results confirm these shortage-inducing tendencies of anti-gouging laws.

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