Surfacing the Submerged State: Operational Transparency Increases Trust in and Engagement with Government

Ryan W. Buell[1], Ethan Porter[2] and Michael I. Norton[3]

[1]Harvard Business School
[2]George Washington University
[3]Harvard Business School

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Abstract

As Americans' trust in government reaches historic lows, frustration with government performance approaches record highs. We propose that Americans' perceptions of government and their levels of engagement with it can be reshaped and enhanced by increasing government's operational transparency—that is, by making sure that citizens can see the often-hidden work that government performs. Across three studies, we find that revealing the "submerged state" has profound impacts on both attitudes and behavior. In Study 1, viewing a five-minute computer simulation highlighting the work performed by the government of an archetypal American town increased trust in government and support for government services. In Study 2, residents of Boston, Massachusetts who interacted with a website that visualized service requests (e.g., potholes and broken street lamps), and efforts by the city's government to address them became more trusting and supportive of government. For Study 3, we leveraged proprietary data from a mobile phone application produced by the city of Boston, through which residents can submit service requests to government. Users who received photos of government meeting their service requests were more likely to submit subsequent requests than users who did not receive such photos. Our results suggest that revealing the submerged state through operational transparency can shape both attitudes and behavior.

"An important political strategy of governments is making voters aware of benefits they are already receiving," writes Downs (1957). At least in the United States, there is ample reason to believe that government has not pursued such a strategy. Although citizens have long been generally ignorant of basic political and policy details (Converse Philip 1964; Brooks et al. 1997; Achen and Bartels 2016), they are especially uninformed about the services that government provides. A great deal of the work involved in delivering government services is typically hidden from public view (Howard 1998); this "submerged state" results in citizens failing to credit government for that work (Mettler 2011). For example, in a recent survey, 60% of citizens who claimed the Home Mortgage Interest Deduction denied that they "used a government social program," an opinion shared by large numbers of beneficiaries of student loans, veterans' benefits, Medicaid, Medicare and even food stamps; social programs which, in fact, are all provided by the government (Koch and Mettler 2012).

At the same time, trust in government has been in free fall in the United States for more than half a century. In 1958, 73% of Americans reported that they trusted their government most of the time; by 2015, that percentage had fallen to 19%—a low without precedent (The American National Election Studies 2016; Dimock et al. 2013). Large majorities of Americans believe that government wastes most of their tax money (Campbell 2009), is run for the benefit of select interests, (The American National Election Studies 2016), and is led by dishonest, unintelligent elected officials (Pew Research Center 2013). A lack of trust in government presents serious challenges to the theory and practice of democracy, undermining support for the governing process and reducing civic engagement (Putnam 1993).

We propose that citizens' deteriorating relationship with government and their lack of awareness of basic government services are interconnected. In particular, we assert that the declining levels of trust in and support for government are in part a byproduct of the provision of government services *not* being salient to citizens. Rather than being merely a political or scholastic curiosity, we argue that the submerged state wields considerable influence over Americans' attitudes towards and engagement with their government. This explanation for Americans' distrust is not discussed or tested in the extant literature, which has offered a variety of alternative explanations, including the identity of the president (Citrin and Green 1986), the party in charge of Congress (Keele 2005), political scandals (Bowler and Karp 2004), foreign policy failures (Hetherington and Husser 2012), and citizens' low evaluations of government performance (Citrin 1974). Under such accounts, lack of trust arises from the salience of ineffective and unpopular policies and politicians (Miller 1974).

Insofar as our account emphasizes what is *not* salient more than what is, it departs meaningfully from prior research. Moreover, our account yields a testable proposition: making government services more *operationally transparent*—revealing the otherwise hidden work that government performs and surfacing the submerged state—can improve attitudes towards government and increase citizens' civic engagement. We test this hypothesis with two studies, one based on lab data, and the other relying on field data. Together, they offer powerful evidence that surfacing the submerged state by making government more operationally transparent can not only change citizens' attitudes toward government, by raising their level of trust in and support for it, but also increase their level of engagement with it.

Transparency in government is traditionally trained on elected officials or public policy, as a means of resolving the principal-agent problem (Prat 2006) or increasing public knowledge of government budgeting (Barnes et al. 2016). However, a growing body of research documents the benefits of transparency trained on operations — revealing the otherwise hidden work that creates value for consumers has been shown to shape perceptions of organizations in positive ways. Consumers reward firms that make their operations transparent and punish those that do not (Buell and Norton 2011; Buell et al. 2016): observing that time has been devoted to the production of a product or service increases ratings of its quality (Kruger et al. 2004; Chinander and Schweitzer 2003), and observing an effortful process increases consumer satisfaction as well as feelings of reciprocity and gratitude (Morales 2005a).

We propose that when government increases the transparency of its operations—literally, showing its work—citizens will view government more positively and engage with it more. In Study 1, to test whether increasing operational transparency can improve attitudes toward government, we recruited a sample of 554 Americans ($M_{age} = 34.91$; 50.3% female) to view one of two videos and then answer a series of questions assessing their perceptions of government. The treatment video, an animated "Anytown," was designed to reveal the often-hidden work that government performs (Figure 1, and viewable online at `https://vimeo.com/159637364`). The video portrays the evolution of an archetypal American town from a blank landscape into a flourishing metropolis. Viewers observed the construction of basic infrastructure and municipal buildings, the development of regulatory agencies, and the implementation of government programs. The Anytown video resembles the SimCity games of the 1990s; similarly, the control video was a five-minute excerpt of another popular game from that time period, Myst.

After viewing their randomly-assigned video, respondents answered questions assessing their

attitudes toward government. We find that exposure to the *Anytown* simulation significantly alters subjects' (i) perceptions of the quality of the government's work, (ii) their support for maintaining or cutting back government programs, (iii) their perceptions of the effect government had on their daily lives, (iv) their perceptions of the wastefulness of government spending, (v) their level of trust in government, and (vi) their willingness to pay higher taxes in exchange for greater domestic government spending. On each of these issues, the simulation makes citizens view government more positively, by indicating greater trust in it and greater awareness of its role in their everyday life, and it increases their willingness to pay higher taxes.

In Study 2, to evaluate whether the results hold outside of this highly-stylized experimental setting, we partnered with the city government in Boston, Massachusetts, to test the efficacy of operational transparency in improving attitudes and engagement in a specific government domain: public service requests. 125 participants of voting age recruited from Boston and surrounding areas interacted with one of three versions of a website that visualized public service requests submitted by residents of Boston, and the city's efforts to address them. Consistent with Study 1, we find that when public service requests are made operationally transparent, respondents are more trusting and supportive of government. We further find that when transparency emphasizes the work that government isn't doing – the growing backlog of public service requests that remain unaddressed by the city – trust in and support for the government are not significantly enhanced. Interestingly however, resident perceptions are not diminished by operational transparency that reveals this backlog.

Building on these results, in Study 3, we leverage proprietary municipal data provided to us by the city of Boston, Massachusetts to examine whether operational transparency can also influence *behavior* toward government. Over a 25-month period, from October 1, 2013 to October 27, 2015, Boston residents used a smart phone app called Citizen's Connect to submit service requests to their city government. Residents submitted requests relating to potholes that needed to be filled, playground equipment that needed to be fixed, and graffiti that needed to be cleaned. We leverage a change in the app, made in September 2014, that enhanced the operational transparency experienced by the user, to identify the effects of operational transparency on subsequent engagement. We find that being exposed to operational transparency via the app led residents to submit more service request across more categories in the subsequent months. Although the increase in service requests and service categories diminishes over time, we find that the effects of operational transparency persist thirteen months after initial exposure.

Taken together, our studies suggest that when government increases the transparency of its operations — literally, showing its work — citizens will view government more positively, leading to increased engagement.

1   Trust and Operational Transparency

On President Obama's first day in office, he issued a memorandum that directed executive departments and agencies to "harness new technologies to put information about their operations and decisions online [making them] readily available to the public" (**?**). Governments around the world have made similar strides toward transparency, based on the supposition that citizens have a right to access certain kinds of information about their government (Coliver ????). Indeed, researchers have observed that increased transparency leads to better outcomes across a range of domains (Kosack and Fung 2014). Yet many transparency efforts are like Obama's, originating from the top of government. Far fewer efforts have applied transparency to the bottom of government—on the actual, nuts-and-bolts delivery of government services. In the absence of such transparency, constituent awareness of and appreciation for government services may suffer, and in turn, so might their levels of trust and engagement.

Theory suggests that policy designs that make government efforts more visible elevate citizens' awareness of those efforts, while those that obscure such efforts leave citizens oblivious to the government's role (Pierson 1993). Consistent with this view, and consistent with the broader findings about the public's woefully low levels of political knowledge (Brooks et al. 1997), extent research suggests that Americans are surprisingly unaware of the services provided by government. In one recent survey of Americans, the majority reported having never used a government social program; yet when asked whether they had used any of twenty-one distinct government programs, the vast majority reported using one or more (Koch and Mettler 2012). This discrepancy arises in part because government programs are often delivered by individuals and corporations, such that the beneficiaries of these programs do not attribute them to the government—a phenomenon dubbed the "submerged state" (Mettler 2010, 2011). Research in service operations shows that when service delivery is obscured from customers' view, providers must be particularly diligent in promoting awareness of the value created by those "hidden" services (Neely et al. 2011), in order to prevent them from going unnoticed.

Even when citizens are aware that the government is engaged in service delivery, their opportunities to observe it in action may be somewhat limited. For example, residential mail delivery

and trash collection often occurs during working hours, when homeowners may be away. Traffic is typically rerouted around major construction projects, and temporary work zones are generally cordoned off from pedestrians. When service delivery is obscured from "customers," they may lack the ability to intuit the work involved in the process (Parasuraman et al. 1985), hindering their perceptions of its value.

When service instead occurs in the presence of stakeholders and they are able to observe aspects of the service delivery process, research demonstrates that such "operational transparency" can improve perceptions of the service being provided (Buell et al. 2016). For example, merely observing that time has been devoted to the delivery of a service can increase ratings of outcome quality (Chinander and Schweitzer 2003; Kruger et al. 2004). The more the process is perceived to be effortful, the higher the level of satisfaction reported by customers (Mohr and Bitner 1995); feelings of reciprocity and gratitude show similar increases (Morales 2005b). Finally, the perception that a firm assumes higher costs—as when exerting more effort—leads customers to view higher prices as less unfair (Kahneman et al. 1986).

As described above, prior research investigating the impact of operational transparency has largely focused on private-sector applications. However, facets of the government context may serve to accentuate its impact on citizens' attitudes and behaviors. For example, since visual information can dominate other types of information in forming perceptions (Ambady and Rosenthal 1993; Benjamin and Shapiro 2009; Rule and Ambady 2008; Tsay 2013, 2014), operational transparency may play an especially powerful role in influencing attitudes about government, a context that often teems with conflicting sources of information. Moreover, to the extent that operational transparency can elevate citizens' emotional investment in government, research suggests their engagement may withstand dissatisfaction, even when service subsequently fails to meet their expectations (Mattila 2001; Zeelenberg and Pieters 2004). Although considerations of public safety and efficiency may hinder efforts to engender direct contact between citizens and government service providers, research suggests that consumers and service providers need not be co-located for the benefits of transparency to emerge. When travel and online dating websites provide a visual representation of the search effort being exerted on a customer's behalf, customers report higher perceptions of service value, increased satisfaction, and increased loyalty (Buell and Norton 2011).

In this paper, we explore whether introducing this type of operational transparency into government services—literally, attempting to reveal to citizens some of the hidden work that government engages in to create value in their lives—can improve perceptions of and engagement with govern-
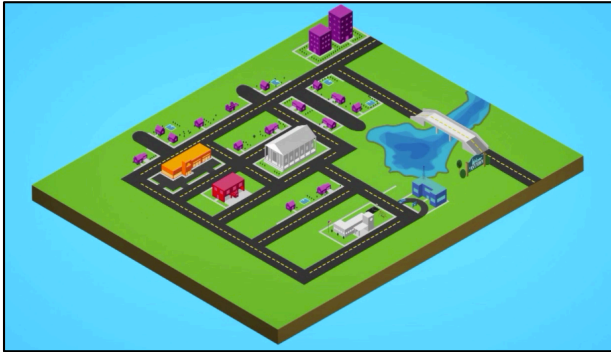
ment.

2   Study 1: Anytown

2.1   Design

We designed the Anytown simulation to reveal the submerged state as clearly and unambiguously as possible. The full video is available at `https://vimeo.com/159637364` and the script appears in the appendix. Across six scenes, the viewer watches this allegorical town evolve from a blank landscape into a flourishing metropolis. A voice over describes this process, which takes pains to highlight those aspects of the state that are often thought to be submerged, such as the Home Mortgage Interest Deduction. In the first scene, the viewer finds a green space waiting to be filled. In the second scene, the camera scrolls out, and shows the construction of basic infrastructure: pipes, roads, bridges, schools, a town hall, and a fire station. The voice over attributes these developments to the role played by the government. Figure 1 displays how the town develops throughout the Anytown simulation.

The narrator subsequently explains that the government accommodates Anytown's growing population with more roads, more plumbing, by organizing an electrical grid, and building parks and a hospital. For the plumbing and electrical items, a close-up shot is offered, to make these items accessible in viewers' heads. A similar close-up shot is presented to show the fire department extinguishing a fire.

In the subsequent scene, the government is shown confronting the problem of pollution with a regulatory solution. The narrator explains: "The air and water become polluted. In response, Anytown's government worked to make businesses to adopt practices that were more friendly to the environment. Recycling became the rule, and both businesses and individuals abided by it." As the recycling symbol proliferates throughout the city, the town becomes noticeably less polluted.

In scene five, Anytown's government is shown to be providing the most submerged benefit, according to Mettler (2010), a version of the Home Mortgage Interest Deduction. The narrator explains that, as more residents wanted to buy homes, the town government reduced the taxes of new homeowners. More residents move into Anytown, and the government increases local offerings in post-secondary education. In the next scene, in addition to expanding the town's transit infrastructure, the government tackles the problem of food safety by mandating restaurant inspections. The government is also said to be providing aid to the homeless and impoverished. According to

Treatment Video (Anytown)   Control Video (Myst)

Figure 1: Screenshots from the Anytown ("operational transparency" treatment) and Myst ("blind" control) videos (Study 1).

Mettler, surprisingly large numbers of people also have trouble crediting government for offering such benefits. The video concludes with the narrator reminding viewers of how Anytown had grown, and the role that government has played in its growth, including the provision of infrastructure, a clean environment, and basic municipal services.

Meanwhile, subjects not assigned to the Anytown condition viewed a placebo video meant to imitate the look and feel of Anytown without sharing any of its content. In this case, because the look of the Anytown video was inspired by the *SimCity* computer games of the 1990s, the placebo video was a five-minute narrated video of another popular computer game from that time period, *Myst* (Figure 1).

Anytown emphasizes certain kinds of governmental benefits, such as the Home Mortgage Interest Deduction, that are viewed as classically submerged, while also portraying government as the provider of more traditional transfer benefits. In addition, the program shows government's role in providing the public goods of a clean environment and food safety that, by definition, benefit everyone. Most of all, however, the program frames the government as being responsible for shepherding Anytown from a small splotch of land to a fully-functioning, desirable place to live.

We recruited participants via Amazon's Mechanical Turk service. A low-cost way to recruit respondents for studies, Mechanical Turk has been used across the social sciences (Berinsky et al. 2012; Kuziemko et al. 2015). Only subjects with U.S. IP addresses could participate in the study; there were no other restrictions. Respondents were told they would be paid \$.75 each to watch a five-minute video and then answer questions. Respondents randomly watched either the *Anytown* video, or an equally long excerpt of the *Myst* video.

To identify shirkers who ostensibly completed the survey but were not paying attention, consistent with Berinsky et al. (2014), we asked all respondents the following: "Debates about television shows are a pastime of American life. Everyone has a different favorite show. We want to know if you are paying attention to this survey. To show you are paying attention, ignore the question below and choose both 'The Sopranos' and "Saturday Night Live." Then, in the following line before a menu of fifteen options: "What's your favorite television show? Choose only one." Those who failed to answer this question correctly were removed from the results. In addition, to account for those respondents who had difficulty viewing the video, respondents in both treatments answered questions about the gender of the person speaking in both videos (male in both cases). In addition, to make sure that subjects actually paid attention to the video they had been assigned, subjects were asked to provide the sex of the narrator speaking at the end of the video, and to state whether

their assigned video was in black and white. Respondents who failed the attention checks were removed from the analysis.

Respondents also answered a set of standard demographic questions capturing their age, gender, race, education (on a 9-point scale from "No formal education" to "Professional or doctoral degree"), income (on an 18-point scale from "below $5,000" to "Greater than $175,000"), political ideology, and party identification. The full text of all questions appears in the appendix.

To measure subjects' trust in government, we relied upon the Pew Center for the People and the Press Trust in Government Survey (Dimock et al. 2013). This 14-question battery —the full text of which appears in Section 6.2 in the appendix—measures respondents' attitudes about government's role in their everyday lives, government's role as being positive or negative, the quality of civil service, and whether they trust government to do what is right, among other similar items. To measure respondent's attitudes toward domestic spending, subjects were asked: "Do you favor increases in the taxes paid by ordinary Americans in order to increase spending on domestic programs like Medicare, education, and highways?" (Hansen 1998) The virtue of this question is that makes the trade-off between higher spending and higher taxes explicit to the subject. We also asked about their level of trust in government spending. Relying on the ANES Trust in Government index, subjects were asked: "Do you think that people in the government waste a lot of money we pay in taxes, waste some of it, or don't waste very much of it?"

We also wanted to know subjects' views on tax progressivity, and so we asked them to choose their preferred tax rate from among three plots of different hypothetical tax rates (a progressive rate, a flat rate, and a regressive rate). To gauge whether *Anytown* had differential effects on the different levels of government, we presented subjects with feeling thermometers for local, state and federal government. And to see whether the video made subjects more willing to contribute actual tax dollars to government, at the end of the survey we described a raffle for a $100 Amazon gift card they could win—and we asked them if they won how much they would volunteer to pay in taxes out of the gift card. The full text of all questions appears in section 6.2 of the appendix.

2.2 Results

As summarized in Table 1, OLS models revealed that Anytown respondents were more likely to perceive government agencies and departments as doing a better job ($\beta = 0.26$; $p < 0.01$), support the maintenance of government programs ($\beta = 0.28$; $p < 0.001$), view government as having a larger effect on their day-to-day lives ($\beta = 0.21$; $p < 0.05$), and view government as having a

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Trust in Government Spending	Support for Tax Increases	Perception of Government Performance	Maintenance of Government Programs	Government's Effects on Daily Lives	Government's Positive Role	Composite Trust
Transparency	0.67***	0.28***	0.26***	0.27***	0.21**	0.22**	0.24**
	(0.083)	(0.082)	(0.086)	(0.078)	(0.009)	(0.087)	(0.08)
Age	-0.008**	-0.004	-0.002	0.004	0.01**	-0.0005	0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Income	0.015	-0.02	0.02*	-0.02**	-0.02	0.024**	0.02
	(0.011)	(0.01)	(0.01)	(0.01)	(0.01)	(0.012)	(0.02)
Female	0.12	0.0002	0.05	0.11	-0.18**	-0.06	0.08
	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(0.087)	(0.08)
White	-0.04	0.03	-0.20*	-0.02	-0.04	-0.16	-0.24**
	(0.11)	(0.09)	(0.11)	(0.10)	(0.11)	(0.11)	(0.1)
Education	0.05*	0.0004	0.05	-0.04	-0.03	0.06	0.03
	(0.03)	(0.032)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)
Not Strong Republican	0.18	0.31	0.51*	0.11	-0.26	0.46*	0.19
	(0.27)	(0.26)	(0.29)	(0.29)	(0.28)	(0.28)	(0.28)
Leans Republican	0.13	0.41*	0.02	-0.15	-0.16	-0.31	-0.11
	(0.28)	(0.23)	(0.23)	(0.26)	(0.26)	(0.26)	(0.23)
Undecided/Independent	0.14	0.59**	-0.16	0.04	0.01	-0.14	-0.16
	(0.26)	(0.24)	(0.25)	(0.28)	(0.25)	(0.25)	(0.23)
Leans Democrat	0.36	0.86	0.10	0.38	-0.12	0.09	0.22
	(0.29)	(0.26)	(0.28)	(0.28)	(0.28)	(0.27)	(0.24)
Not Strong Democrat	0.32	0.91	0.05	0.45	-0.23	0.22	0.09
	(0.29)	(0.27)	(0.29)	(0.29)	(0.29)	(0.28)	(0.25)
Strong Democrat	0.57**	0.85	0.54*	0.71**	-0.29	0.22	0.64***
	(0.28)	(0.27)	(0.28)	(0.31)	(0.27)	(0.27)	(0.25)
Liberal	0.08	-0.11	0.19	-0.05	-0.23	0.05	0.33**
	(0.15)	(0.18)	(0.18)	(0.16)	(0.18)	(0.16)	(0.17)
Slightly liberal	-0.33	-0.43**	0.03	-0.46**	-0.40**	-0.15	-0.06
	(0.17)	(0.20)	(0.19)	(0.18)	(0.20)	(0.18)	(0.18)
Moderate	-0.03	-0.47**	0.14	-0.53***	-0.50***	-0.11	0.02
	0.17	(0.21)	(0.19)	(0.19)	(0.19)	(0.19)	(0.18)
Slightly conservstive	-0.07	-0.63**	-0.05	-0.73***	-0.36	-0.08	-0.25
	0.23	(0.27)	0.22	(0.27)	(0.25)	(0.24)	(0.22)
Conservative	0.17	-0.59**	-0.12	-0.79***	-0.16	-0.39	-0.13
	(0.25)	(0.27)	0.23	(0.28)	(0.23)	(0.25)	(0.22)
Extreme conservative	-0.21	-0.50	-0.35	-10.19***	-0.006	-0.62**	-0.32
	(0.31)	(0.33)	(0.34)	(0.39)	(0.36)	(0.32)	(0.28)
Constant	-10.40***	0.40	-0.53	0.24	0.604	-0.89	-0.09
	(0.45)	(0.51)	(0.63)	(0.48)	(0.63)	(0.53)	(0.557)
Observations	551	551	549	551	551	550	544
R-squared	0.24	0.28	0.19	0.34	0.14	0.2	0.25

Table 1: Exposure to the "operational transparency" treatment increases several measures of support for government (Study 1). All responses have been standardized. To facilitate interpretation, responses have been rescaled so greater numbers indicate greater trust and support for government. We note that all results are substantively similar in baseline models that withhold pretreatment covariates, but we include them in our primary analysis to account for the possibility of failures of random assignment. *, **, and *** signify significance at the 10%, 5% and 1% levels, respectively, relative to the control.

positive effect on their lives ($\beta = 0.22$; $p < 0.05$). Respondents assigned to the treatment also felt that government wastes less of their tax money ($\beta = 0.67$; $p < 0.001$), and were more likely to favor tax increases to support greater domestic spending ($\beta = 0.27$; $p < 0.001$). Finally, Anytown respondents scored higher on a composite trust score, consisting of an average across all available Pew items ($\beta = 0.23$; $p < 0.01$). The models account for the wealth of covariate data collected, and are estimated with state-fixed effects.

In the spirit of transparency central to this paper, we note that we did not observe significant effects across all our dependent variables. Asking subjects if they wished to voluntarily donate some of their potential earnings to taxes, and asking them to choose among hypothetical tax rates, may have been bridges too far. Yet the numerous effects we did observe cleared conventional thresholds of significance, and were rather large in size.

Increased operational transparency exerts a causal impact on improved trust in government and support for increased government spending—even when such increases would result in higher taxes. To put the size of the treatment effects in perspective, compare the ideological gap in the control group—the differences in responses between liberals and conservatives—with the size of each observed effect. Respondents in the control group who identified as slightly to extremely conservative reported a mean composite trust score of -0.46, while control respondents who identified as slightly to extremely liberal reported a mean composite trust score of 0.10. The 0.56 absolute difference between ideological control responses is reduced 41% by the treatment ($\beta = 0.23$). A similar pattern is observed for respondents' support for tax increases to increase domestic spending; the gap between liberals and conservatives in control is 0.87, which the treatment ($\beta = 0.27$) reduces by 31%. Being exposed to Anytown reduces polarization between subjects, on issues on which there is otherwise a stark ideological difference.

3 Study 2: The Daily Brief

3.1 Design

To evaluate whether the results hold outside of this highly-stylized experimental setting, we partnered with the city government in Boston, Massachusetts, to test the efficacy of operational transparency in improving attitudes and engagement in a specific government domain: public service requests. In Boston, resident-submitted service requests vary in nature, identifying neighborhood issues such as potholes, damaged signs, and graffiti. Like many dimensions of government perfor-

mance, there exists considerable variation in the city's capacity to address public service requests in a timely manner. During our period of analysis, the median service request in Boston was resolved within three days, while a backlog of requests remained unaddressed for far longer. Hence, public service requests are an ideal domain for testing the effects of revealing what the government is *and is not* doing to create value for citizens.

To deliver operational transparency, service requests were retrieved on a daily basis from the city's databases and displayed graphically on a website called the Daily Brief. On the website, each service request was represented by a pushpin, overlaid on a map of the city, indicating its location. By clicking on each pin, website visitors could see the title, photo, address, and description of the corresponding issue, along with a timestamp indicating when it was submitted to the city, and the period of time that had elapsed since submission. Pushpins were color-coded based on the status of each request.

Requests that were "opened yesterday," were represented with orange pins, requests that were "closed yesterday," were represented with blue pins, and the remaining "open" requests were represented with red pins. In addition, a tally summarizing the total number of requests in each category was displayed at the bottom of the screen.

125 voting-age Boston residents ($M_{age} = 23.1$ years; 47.2% female) were recruited to view one of three randomly-assigned versions of the Daily Brief website. Participants in the "blind" condition saw a version of the website without any pushpins, merely viewing the tally of service requests in each category. Remaining participants were assigned to one of two transparency conditions. Participants in the "functional transparency" condition saw the same website as participants in the blind condition, but with the addition of pins representing recently opened and closed requests. Finally, participants in the "dysfunctional transparency" condition saw the same website as participants in the functional transparency condition, but with the inclusion of pins representing the substantial backlog of open service requests that had not yet been resolved (Figure 3). After viewing the experimental stimuli, participants responded to the questions about government attitudes used in the first study (Dimock et al. 2013).

Responses were standardized and an exploratory factor analysis was conducted. The factor analysis revealed nine questions that measured participants' trust in government ($\alpha = 0.83$), and two questions that measured support for government programs ($\alpha = 0.74$).

A. Blind
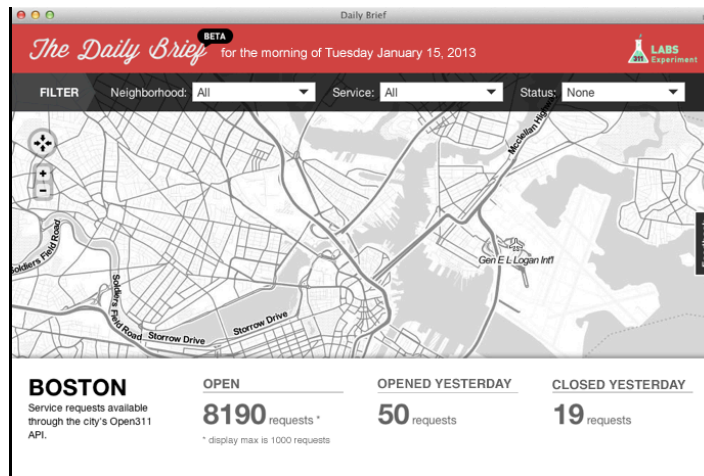
B. Transparency revealing recently opened and recently closed requests
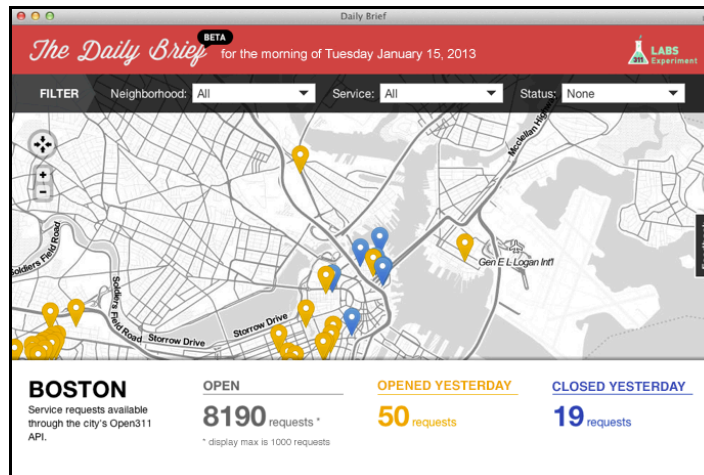
C. Transparency that additionally reveals the significant backlog of all open service requests
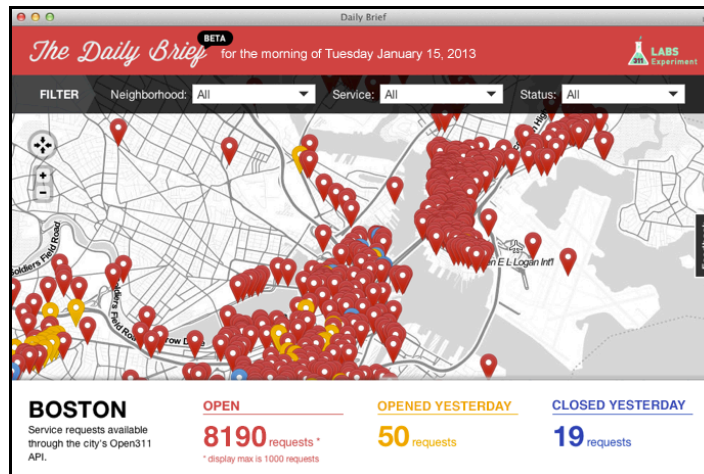
Figure 2: Screenshots from the Daily Brief, illustrating the blind, functional transparency, and dysfunctional transparency conditions (Study 2).

3.2 Results

Entering the transparency conditions into regressions modeling our composite measures for trust and support for government programs revealed that transparency that revealed recently opened and closed service requests increased trust ($\beta = 0.33$, $p < 0.05$) and support for government programs ($\beta = 0.36$, $p < 0.05$). Transparency's effect on trust was negatively moderated when transparency revealed the work that government was not doing. In particular, participants who experienced transparency into the growing backlog of open service requests, observing the work that government was and was not doing, were marginally less trusting ($\beta = -0.26$, $p < 0.10$) though no less supportive ($\beta = -0.15$, $p = NS$) of the government than participants who only experienced transparency into the recently opened and closed service requests. This pattern of results, in which participants observing transparency into the work that government was doing perceived the government more favorably than participants in the other conditions, persisted on average across individual items as well.

To what extent did trust in government brought about by increased operational transparency lead to greater support for government programs? To answer this question, we conducted a causal mediation analysis (Hicks and Tingley 2011; Imai et al. 2010). We found that the average causal mediation effect, the change in support for government programs that was due to the transparency-induced change in trust, was 0.102 (confidence interval: 0.013, 0.233). This effect accounted for 28.1% of the total effect of transparency on support for government programs.

Taken together, these results suggest that showing what the government is doing increases citizen trust and in turn, support for government; showing what government is not doing (e.g. reported potholes that go unfilled) may not – though we note that full transparency does not decrease attitudes below the baseline "blind" condition.

4 Study 3: Citizen's Connect

4.1 Design

The pattern of responses in Studies 1 and 2 suggests that elevating the submerged state by increasing operational transparency can have profound effects on subjects' attitudes toward government. Can it also change their behavior toward government? To answer this question, we relied upon proprietary data from the city of Boston, Massachusetts. Between October 1, 2013 and October 27, 2015, Boston residents submitted service requests to the government through "Citizen's Connect,"

	(1) Trust	(2) Trust	(3) Support	(4) Support	(5) Support
Transparency revealing recently opened and closed requests	0.288**	0.325**	0.375*	0.358**	0.256
	(0.142)	(0.137)	(0.190)	(0.173)	(0.168)
Transparency revealing backlog of all open requests	-0.233	-0.257*	-0.178	-0.149	-0.068
	(0.141)	(0.144)	(0.188)	(0.146)	(0.148)
Trust					0.315***
					-0.109
Female		0.096		0.007	-0.023
		(0.121)		(0.141)	(0.139)
Age		-0.020		0.029**	0.035**
		(0.012)		(0.014)	(0.014)
Minority		-0.089		-0.071	-0.043
		(0.117)		(0.133)	(0.129)
Income		-0.005		-0.075***	-0.074***
		(0.022)		(0.027)	(0.027)
Missing Income		0.083		0.444*	0.417*
		(0.189)		(0.252)	(0.249)
Political orientation		-0.009		-0.357***	-0.354***
		(0.054)		(0.055)	(0.054)
Not political		0.368		-0.946*	-1.062*
		(0.284)		(0.483)	(0.546)
Active		-0.005		-0.002	-0.001
		(0.008)		(0.008)	(0.008)
Time on site		-0.003**		-0.004***	-0.003***
		(0.001)		(0.001)	(0.001)
Constant	-0.120	41.828	-0.200	17.691	4.518
	(0.099)	(58.187)	(0.147)	(60.326)	(57.718)
Observations	125	125	125	125	125
R-squared	0.037	0.109	0.029	0.398	0.445

Table 2: Operational transparency increases trust in government and support for government programs (Study 2). Trust and support are highest in the functional transparency condition when residents can see active service requests that were recently opened and closed. *, **, and *** signify significance at the 10%, 5% and 1% levels, respectively, relative to the baseline "blind" condition. Adding the backlog of unfulfilled service requests does not enhance trust or support for government, but neither does it diminish it.

a smart phone application that transmits inquiries for resolution to the city's Public Works Department. Resident-submitted descriptions at the time of this study included: "broken playground equipment needs a bolt"; "annual enormous pothole at the end of the Westbound exit ramp, left lane"; and "graffiti on Allied Waste dumpster." Each submission captured by the application included a photo of the issue, a title, a description, and an approximate address verified by the phone's GPS.

Historically, residents who submitted service requests through Citizen's Connect received a "closed" badge appended to their original submission when the issue was resolved. Leveraging insights reported in Study 2, on September 25, 2014, the city launched a new version of the application that could also distribute images of the work performed and/or the city workers that performed it when the request was closed—forms of operational transparency that our earlier results suggested could influence resident perceptions. Might it shape their behaviors as well?

The new version of Citizen's Connect, which was automatically pushed to residents' phones through the iOS and Android platforms, diffused rapidly, achieving more than a 95% penetration rate within three months. Experiencing operational transparency required residents both to have the new version of Citizen's Connect and to make a service request that was closed by a Public Works team that happened to post a photo. This combination of requirements resulted in a staggered diffusion of the treatment that facilitated our identification strategy (Figure 4). We conceptualized transparency as a persistent treatment variable: once a resident had observed an image of requested work being performed, we counted that resident as having received the operational transparency treatment.

Figure 2 illustrates the blind and transparent conditions. Panel A is representative of the blind condition, in which a user has submitted a picture of a local sidewalk that has not been shoveled after a snowstorm. After the request is fulfilled and the sidewalk is shoveled, the user receives her original picture back, along with a message indicating that the sidewalk has been shoveled and a blue tag noting that the case has been closed. Contrast that with Panel B, which displays an example of the transparent condition — in addition to the information, the city sends the user a photo of the sidewalk that has been shoveled in accordance with their request.

We measured the effect of operational transparency on citizen engagement by assessing changes in residents' subsequent reporting behavior in response to the treatment, both in terms of the number of issues residents reported per month and the number of service categories in which residents reported (for example, categories included illegal graffiti, potholes, street lights, litter,
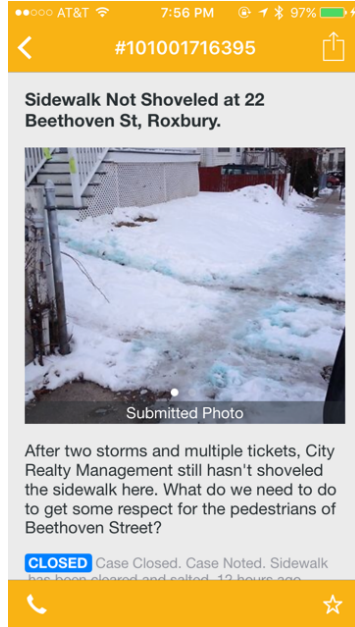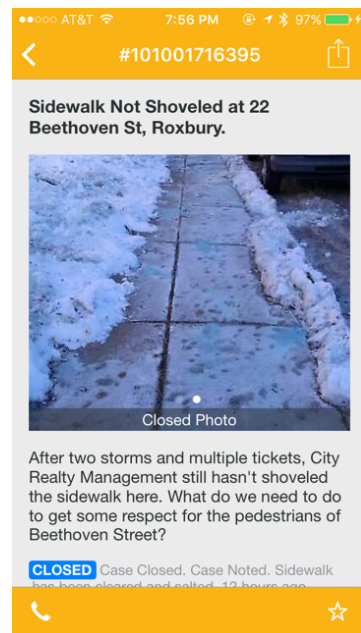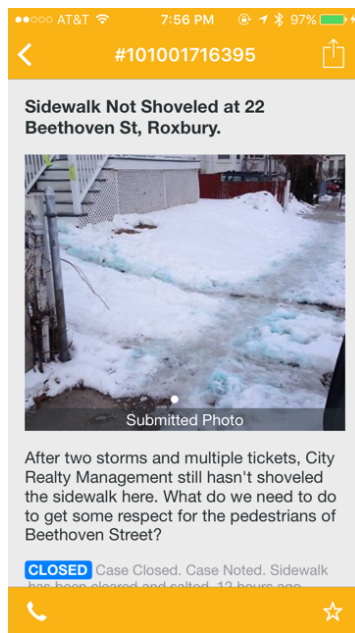
Figure 3: Screenshots from the Citizen's Connect application in the operationally transparent treatment and blind control conditions (Study 3). When an issue was resolved, residents in both conditions received a notification that the work had been completed, but those in the operational transparency treatment additionally received an image of the work that had been performed.
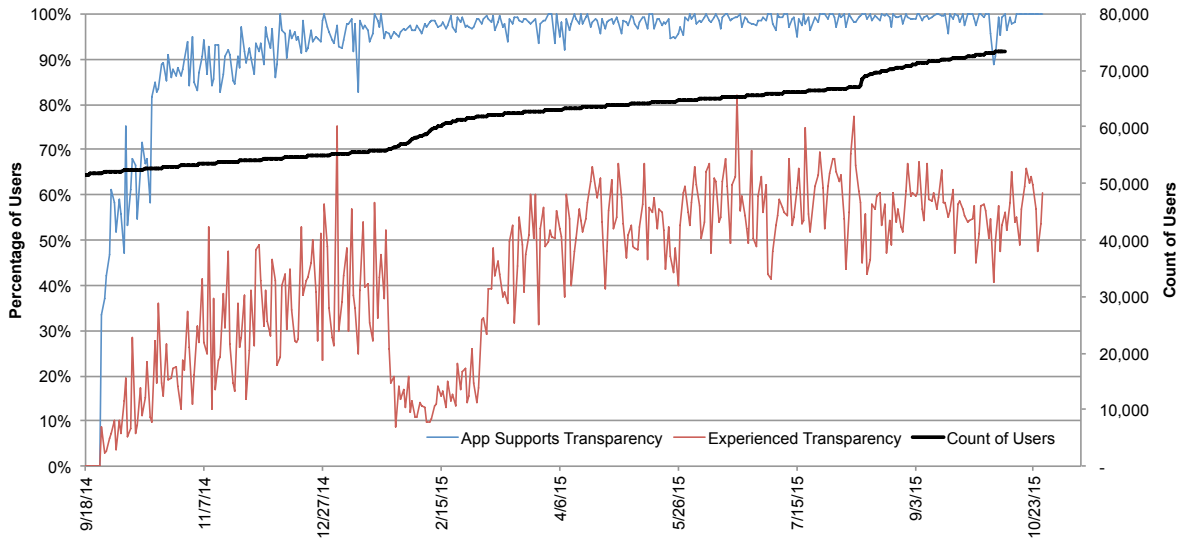
Figure 4: Percentage of reports submitted by residents in the treatment category over time as a function of Citizen's Connect adoption and diffusion of Version 3.10.1890 of the application, which supported operational transparency (Study 3).

etc.). See Table 3 for a breakdown of service requests submitted through the Citizen's Connect application during the period of analysis. The city of Boston views increased reporting as a signal of much-desired civic engagement, suggesting that residents who use Citizen's Connect "serve as the eyes and ears for government, helping us find and respond to the basics of community quality of life" (Boston 2016). Namely, when residents become more engaged by reporting more service requests, it enables the city to allocate fewer workers to the diagnosis of public service issues that need to be addressed and more workers to their resolution.

We conducted our primary analyses on a sub-sample of the data ($N = 21,786$) that excluded users who submitted 21 or more requests in a given month (the top percentile), in part because it was possible that such heavy users were government employees. All results are substantively similar when all observations are included ($N = 21,986$), and analyses conducted on the full sample are provided in the Appendix. For each analysis, we used fixed effects panel models to account for time-invariant differences between residents, and resident-invariant differences across time that may have affected the propensity to submit service requests. Bootstrapped standard errors are clustered at the resident level.

4.2   Results

As shown in Table 4, operational transparency increased citizen engagement, leading residents to submit more service requests ($\beta = 0.81$; $p < 0.001$) and in more categories ($\beta = 0.44$; $p < 0.001$) in

Request	Count	Percentage
Illegal graffiti	17,630	11.80%
Unshoveled sidewalk	10,314	6.90%
Street lights	9,984	6.70%
Pothole	8,510	5.70%
Litter	7,793	5.20%
Snow and ice control	7,424	5.00%
Broken sidewalk	4,907	3.30%
Damaged sign	4,012	2.70%
Overflowing trash can	2,853	1.90%
Illegal parking	2,800	1.90%
Student move-in issues	972	0.60%
Missed trash or recycling	494	0.30%
Dead animal pick-up	493	0.30%
Traffic signal	480	0.30%
Dead tree removal	423	0.30%
Tree pruning	325	0.20%
Needle clean-up	230	0.20%
Rodent sighting	223	0.10%
Broken park equipment	216	0.10%
Abandoned vehicle	205	0.10%
Abandoned bicycle	134	0.10%
Park lights	65	0.00%
Other*	69,443	46.30%
Total Requests	149,930	100.00%

Table 3: Breakdown of service requests (Study 2). Data represents requests submitted through the Citizen's Connect application between September 10, 2009 and October 27, 2015. Displayed categories represent categories with the greatest frequency of requests. Remaining requests are categorized as "Other."

	(1) Monthly Count	(2) Monthly Count	(3) Monthly Count	(4) Category Count	(5) Category Count	(6) Category Count
Transparency	0.807***	0.404***	-6.980***	0.439***	0.167***	-3.312***
	(0.063)	(0.057)	(0.930)	(0.029)	(0.031)	(0.579)
First transparency month indicator		1.633***	1.660***		1.105***	1.117***
		(0.072)	(0.080)		(0.035)	(0.034)
Tenure	-0.022***	-0.021***	-0.022***	-0.018***	-0.017***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Tenure squared	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage of requests closed			1.598***			1.121***
			(0.109)			(0.083)
Percentage of requests closed²			-1.162***			-0.940***
			(0.106)			(0.068)
Transparency x Percentage closed			18.067***			8.540***
			(2.355)			(1.465)
Transparency x Percentage closed²			-10.764***			-5.105***
			(1.459)			(0.906)
Tenure	-0.022***	-0.021***	-0.022***	-0.018***	-0.017***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Tenure²	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total number of closed submissions	-0.069***	-0.062***	-0.064***	-0.029***	-0.024***	-0.026***
	(0.007)	(0.007)	(0.006)	(0.003)	(0.003)	(0.003)
Constant	0.707***	0.676***	0.271***	0.464***	0.443***	0.262***
	(0.022)	(0.022)	(0.050)	(0.012)	(0.011)	(0.026)
Observations	371,992	371,992	371,992	371,992	371,992	371,992
R-squared	0.070	0.089	0.092	0.059	0.088	0.091
Number of reporters	21,786	21,786	21,786	21,786	21,786	21,786

Table 4: Operational transparency increases resident engagement (N=371,992 monthly observations from 21,786 resident reporters, withholding high-intensity submitters) (Study 3). Residents submit more service requests, and across a broader array of categories after observing operational transparency. *, **, and *** signify significance at the 10%, 5% and 1% levels, respectively, relative to the blind treatment.

months following the treatment than in the preceding months. Moreover, although the increases in service requests ($\beta = 1.63$; $p < 0.001$) and request categories ($\beta = 1.11$; $p < 0.001$) were especially strong in the month immediately following residents' initial exposure to operational transparency, the effects persisted with significance in most of the 13 months that followed (Table 5). Overall, residents submitted an average of 59.8% more public service requests ($\beta = 0.40$; $p < 0.001$) in 37.7% more categories ($\beta = 0.17$; $p < 0.001$) following exposure to operational transparency.

Although the Anytown video used in Study 1 portrayed government as highly functional, showing work that effectively fulfilled citizens' needs, government performance in practice can be more equivocal, and our results from Study 2 suggest that revealing the work that government is not doing may not enhance resident perceptions. Must government be experienced by citizens to be

highly effective in order for the gains from operational transparency to accrue? During the period of our Citizen's Connect study, the median service request was resolved within three days, but some requests remained unaddressed far longer. Of the 92,707 service requests submitted, 12,865 remained unaddressed at the end of the study, and 90% of those had been open for 25 days or more. Consequently, Citizen's Connect offered an ideal domain for comparing the effects of transparency among residents who experienced the government to be highly effective (rapidly addressing their submitted requests) and residents who experienced the government to be less effective (addressing requests slowly, if at all).

For each resident who submitted requests, we calculated the percentage of requests submitted at least 30 days prior to the end of our sample time frame that were successfully resolved. Overall, government responsiveness was associated with an increase in citizen engagement, such that residents whose requests were successfully resolved submitted more requests ($\beta = 1.60$; $p < 0.001$) and in more categories ($\beta = 1.12$; $p < 0.001$) though at a diminishing rate: ($\beta = -1.16$; $p < 0.001$) and ($\beta = -0.94$; $p < 0.001$), respectively. We also observed a non-linear interaction between government responsiveness and transparency. Transparency was associated with the greatest increases in subsequent engagement among residents who experienced government being responsive to their requests, with such residents submitting more requests ($\beta = 18.07$; $p < 0.001$) and in more categories ($\beta = 8.54$; $p < 0.001$), again at a diminishing rate: ($\beta = -10.76$; $p < 0.001$) and ($\beta = -5.11$; $p < 0.001$): when government was perfectly responsive, the gains from transparency remained significant though attenuated. On the other hand, under relatively low levels of responsiveness, transparency was associated with diminished citizen engagement ($\beta = -6.98$; $p < 0.001$) and ($\beta = -3.31$; $p < 0.001$), respectively. (Note that due to the way transparency is operationalized, all residents who experienced transparency had at least one request successfully resolved.)

Figure 5 displays predicted incremental monthly submissions through the Citizen's Connect application by transparency and the percentage of the residents' requests resolved by the city (N=371,992 monthly observations from 21,786 resident reporters, withholding high-intensity submitters). Residents submit more service requests, and across a broader array of categories after observing operational transparency. Marginal effects were only plotted within the support of the data. 3.0% of the Citizen's Connect users who experienced transparency had less than 60% of their requests resolved by the city, and 0.4% had less than half of their requests resolved.

These results demonstrate that citizen engagement with government is enhanced when residents

	(1)	(2)
	Monthly Count	Category Count
1 month after exposure	0.990***	0.461***
	(0.068)	(0.032)
2 months after exposure	0.472***	0.190***
	(0.062)	(0.026)
3 months after exposure	0.394***	0.152***
	(0.057)	(0.031)
4 months after exposure	0.418***	0.161***
	(0.071)	(0.031)
5 months after exposure	0.389***	0.166***
	(0.072)	(0.027)
6 months after exposure	0.456***	0.170***
	(0.069)	(0.034)
7 months after exposure	0.529***	0.192***
	(0.091)	(0.037)
8 months after exposure	0.399***	0.147***
	(0.083)	(0.030)
9 months after exposure	0.451***	0.141***
	(0.091)	(0.040)
10 months after exposure	0.455***	0.162***
	(0.108)	(0.039)
11 months after exposure	0.425***	0.138***
	(0.093)	(0.041)
12 months after exposure	0.120	0.022
	(0.100)	(0.039)
13 months after exposure	0.108	0.004
	(0.116)	(0.052)
14 months after exposure	0.332	0.396
	(0.708)	(0.391)
Constant	0.171***	0.060***
	(0.014)	(0.006)
Observations	371,992	371,992
R-squared	0.425	0.645
Number of reporters	21,786	21,786

Table 5: Persistence of the effects of operational transparency on citizen engagement (Study 3). The effects of operational transparency on the count of monthly submissions and the number of categories into which users submit requests persists in the months following exposure to the treatment. *, **, and *** signify significance at the 10%, 5% and 1% levels, respectively, relative to the control. Note: Only 16 respondents experienced the transparency treatment for 14 months (12 in the subsample, withholding high-intensity submitters), having first been exposed during the last six days of September 2014.
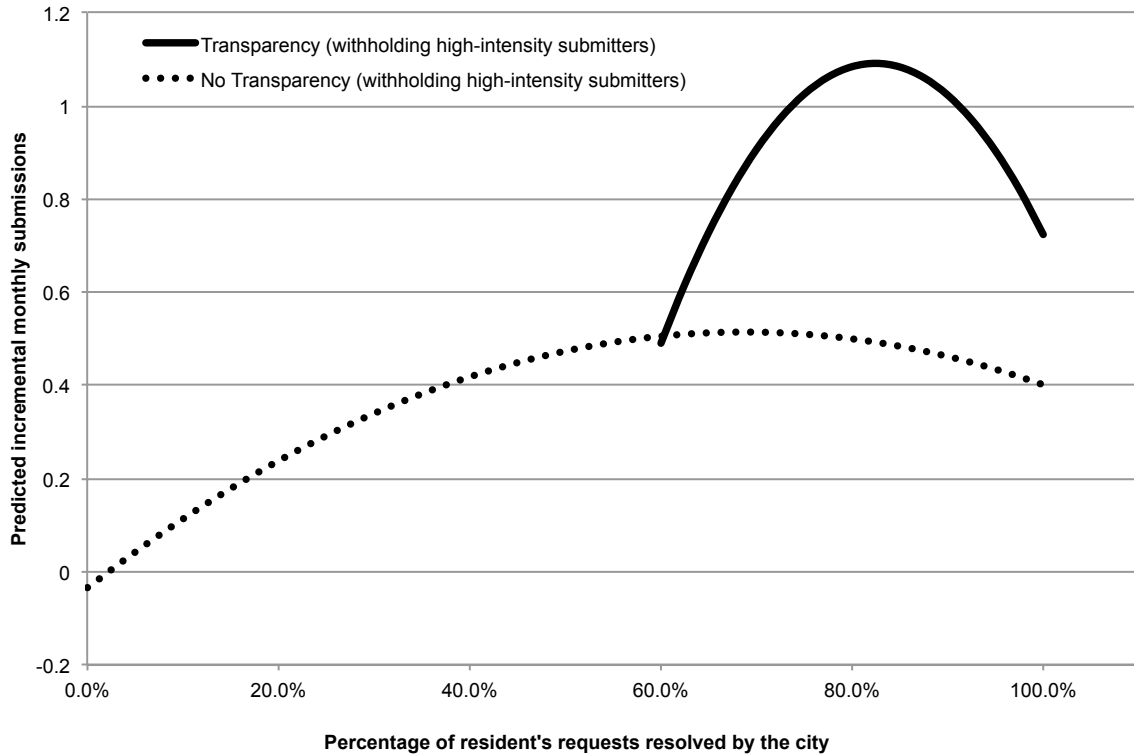
Figure 5: Predicted incremental monthly submissions for residents using the Citizen's Connect application, by transparency condition and the percentage of the resident's requests resolved by the city.

can see the hidden work that government is performing on their behalf, but that transparency alone – without results – is not a panacea for poor government performance. Interestingly however, we note that the benefits of operational transparency are maximized for residents who do not experience the government to be perfectly responsive. This pattern of results is consistent with the idea that operational transparency may be most beneficial in contexts where favorable outcomes are likely, but not necessarily assured. When performance is already perfect, revealing the hidden work that goes into its delivery, although helpful, is less beneficial than when results are likely, but less certain.

5 Discussion

Although previous scholars have documented the extent to which the state is "submerged," to our knowledge, none have attempted to measure the consequences of revealing its submerged aspects. Across three studies, we provide evidence that *surfacing the submerged state* through operational transparency can transform citizens' attitudes toward government, and increase their levels of engagement with it.

Operational transparency is a concept familiar from the operations and behavioral economics

literatures. Individuals respond favorably when organizations are transparent about the hidden work that goes on behind the scenes to create value for them. We find the same is true when the organization is government, and when the consumers are citizens. Moreover, exploring the effects of operational transparency in government affords a helpful opportunity to build on earlier studies by providing a more nuanced view of when operational transparency may be more and less helpful, and how its effects on consumers can extend beyond perceptions to behaviors. We find that operational transparency can cause substantive increases in both attitudes and engagement.

In Study 1, we exposed subjects to a 5-minute computer simulation of government's role in the creation and maintenance of a generic American town. The simulation makes clear the role the government plays in building roads and pipes; securing public goods, such as a clean environment; and providing residents with benefits thought to be especially submerged, such as a tax benefit for buying mortgages. Across a range of survey measures, viewers of the *Anytown* video came to trust government more, were more willing to pay increased taxes to support increased domestic spending, and evinced greater trust in the government's use of their tax money. The effects are not only statistically significant, but substantively quite large.

Study 2 provides converging evidence by means of a website dubbed, "The Daily Brief," which visually depicts public service requests submitted by residents of Boston, Massachusetts and the city's efforts to resolve them. Voting-age residents who experienced operational transparency that revealed the hidden work that their government was doing expressed greater trust in and support for government. Residents who additionally experienced the growing backlog of service requests – the work that their government was not doing to respond to citizens – did not report the same perceptual gains; however, their perceptions and support for government were not diminished relative to residents who experienced no transparency. These results highlight how enhancing the level of government's operational transparency by ascending those aspect of government that are usually thought to be submerged can be a promising way to enhance trust in, and support for government.

In addition to enhancing perceptions, we also find that operational transparency can be an effective way to enhance citizen engagement with government. In Study 3, we turn to proprietary data from an app developed by the city of Boston that allows citizens to submit requests for service. We find that users of the app who utilized a version that maximized operational transparency were subsequently much more likely to submit more requests across a broader range of service categories. And while the effects of using the operationally transparent app decay, they hardly vanish; in fact,

they are still detectable more than one year after initial exposure. Just as enhancing operational transparency can change how people view their government, so too can it change how, and how frequently, they interact with their government.

Our results are particularly timely in light of recent technological and organizational developments that have accelerated the trend toward government operational transparency. The evolution of Open311 standards and the increasing availability of public data are reducing the technical barriers to adopting operational transparency. Coupled with the emergence of both public and private sector organizations tasked with deepening civic engagement (such as the Boston Mayor's Office of New Urban Mechanics and Code for America – organizations that were our partners in this research), these changes offer increasing opportunities to make the work of government more salient, and viscerally so, to citizens.

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6 Appendix

6.1 Demographic Questions for Anytown

Age

"Please describe your age based on the ranges provided below:"

[18-24/25-34/35-44/45-54/55-64/65-74/75 or greater]

Education "Please describe your level of education:"

[No formal education/Attended pre-high school but not high school/Attended high school but did not graduate/ High school graduate/Some college, no degree/Associate degree/Bachelors degree/Masters degree/Professional or Doctorate degree]

Race "Please describe your race or ethnicity:"

[White, non-Hispanic/Black, Non-Hispanic/Other, non-Hispanic/Hispanic/2+ Races, non-Hispanic]

Gender "Please describe your gender:"

[Male/female]

State "What is your state of residence?"

[Drop-down menu of 50 states and the District of Columbia]

Employment "Please describe your current employment status:"

[Working as a paid employee/Working: self-employed/Not working: on a temporary layoff/ Not working: Looking for work/Not working: retired/Not working: disabled/Not working: other]

Party Identification "Please describe your political party affiliation:"

[Strong Republican/Not Strong Republican/Leans Republican/Undecided Independent or Other/Leans Democrat/Not Strong Democrat/Strong Democrat]

Ideology "Please describe your political ideology:"

[Extremely liberal/Liberal/Slightly liberal/Moderate, middle of the road/Slightly conservative/Conservative/Extr conservative]

Household Income

"Please indicate your household income from the ranges below:"

[Less than $5,000 / $5,000 to $7,499 / $7,500 to $9,999 / $10,000 to $12,499 / $12,500 to $14,999 / $15,000 to $19,999 / $20,000 to $24,999 / $25,000 to $29,999 / $30,000 to $34,999 / $35,000 to $39,999 / $40,000 to $49,999 / $50,000 to $59,999 / $60,000 to $74,999 / $75,000 to $84,999 / $85,000 to $99,999 / $100,000 to $124,999 / $125,000 to $149,999 / $150,000 to $174,999 / $175,000 or more]

6.2   Anytown Script

Scene 1

Visuals: Slow pull out from Anytown welcome sign.

VO: Welcome to Anytown, USA. Anytown is just like any other town in America. Over the next few minutes, we?re going to tell you about the history of Anytown—how it started, how it developed, and how it got to where it is today.

Scene 2

Visuals: The scene pulls out to reveal a large piece of land with a river/lake. Sewer/water pipes, roads, Town Hall, houses, stores, a school, a fire department, and a police station are all built in rapid succession timing with the voice over.

VO (begin during :26): In its early days, the people of Anytown came together to form a government. This government built the pipes and sewers, so that people would have clean water to use and to drink. This government built a town hall, to give people a place to voice their opinion and take an active role in governing. It built roads, so that people could get easily from place to place. A bridge was built to make it easier to get around. Slowly but surely, more people—families and individuals—moved into Anytown. Businesses came too; the government also built a school. It built a fire station and a police station, to protect and help out the people who lived in Anytown. The government worked to serve the people of Anytown.

Scene 3

Visuals: The scene pulls out further as more land is added around Anytown. Pipes, underground electrical/power station, and roads are built in the new sections. New houses, business, a new fire

department and police station are all built. A fire truck puts out a fire. A library, hospital, and parks are then built.

VO: As time went on, Anytown grew, and the government worked to accommodate the town?s growing needs. This meant that more roads had to be built and that more connections to surrounding towns had to be made. More and more people moved into Anytown, as did more businesses. The government organized Anytown?s electrical grid and expanding the town plumbing and sewage systems. When problems arose, the government had tools to fix them. The fire department put out fires; the police department reduced crime. Schools and parks were built as well. A hospital was constructed to care for the sick and the elderly.

Scene 4

Visuals: The scene pulls out further as more land is added to Anytown. Even more roads, houses, businesses, a fire department, a police station, and a factory are built. The lake becomes polluted and smog covers the downtown area. A document with a recycle icon pops out of Town Hall. Recycle icons appear above many businesses. A recycling truck picks up. The water and smog clear up.

VO: While Anytown continued to grow, not everything was perfect. Pollution from factories filled the air with smog, and the lake became polluted as well. In response, Anytown?s government made businesses adopt practices that were more friendly to the environment. Recycling became the rule, and both businesses and individuals abided by it. Gradually, Anytown?s environment became less polluted.

Scene 5

Visuals: The scene pulls out further as a small amount of land is added to Anytown. More houses and apartments are built on the new land and in older parts of town making Anytown denser. A large university is then built.

VO: Anytown?s growth meant that more residents wanted to live in houses. Those who couldn?t afford to purchase houses turned to the government, who helped them buy the homes they wanted, by reducing the taxes of new homeowners. As a result, more people who wanted to buy homes could buy homes. Eventually, the increasing number of children caused the government to help finance a local university, so that more residents could receive higher education. The university was used not only by young people, but by older residents who wanted to acquire new skills.

Scene 6

Visuals: The scene pulls out further as a small amount of land is added to Anytown. A large highway with on and off ramps is built alongside the city exiting either side. A document with a food icon pops out of Town Hall followed by a documents with a social services/health icon.

VO: People all over wanted to live and work in Anytown. It was a desirable destination, and to account for the booming interest in their town, the government worked to build a highway to adjacent towns. This meant that people could get back and forth as fast possible. The government also worked to make sure that the food that residents were eating was safe. They evaluated the town restaurants, making sure they kept to standards of hygiene and cleanliness. To be sure, not everything was perfect. There were homeless people and elderly residents who needed assistance. When and where it could, the government stepped in and offered aid.

Consider how far it had come: In the beginning, Anytown was small and populated by only a few people. These people came together and formed a government. Over time, the government worked to provide services that people needed. Clean drinking water. Roads. Schools. Fire and police stations. And a small town became a larger, bustling town.

Scene 7

Visuals: The scene slowly pulls out.

VO: Thank you for learning about Anytown. We hope you?ve found the experience interesting. We now have a few questions.

6.3 Citizen's Connect Full Sample Analysis

As described in the exposition of the manuscript, we conducted our primary analyses for Study 3 on a sub-sample of the data ($N = 21,786$) that excluded users who submitted 21 or more requests in a given month (the top percentile), in part because it was possible that such heavy users were government employees. We note that all results are substantively similar when all observations are included ($N = 21,986$). The figure and tables below provide comparisons of the results in the full and focal samples.

	(1)	(2)	(3)	(4)	(5)	(6)
	Monthly Count	Monthly Count	Monthly Count	Category Count	Category Count	Category Count
Transparency	0.667***	0.130	-6.890***	0.316***	0.041	-2.990***
	(0.184)	(0.134)	(1.761)	(0.059)	(0.046)	(0.562)
First transparency month indicator		2.452***	2.488***		1.255***	1.271***
		(0.173)	(0.214)		(0.041)	(0.049)
Percentage of requests closed			1.220***			1.043***
			(0.189)			(0.068)
Percentage of requests closed²			-0.919***			-0.910***
			(0.171)			(0.070)
Transparency x Percentage closed			17.650***			7.662***
			(5.027)			(1.494)
Transparency x Percentage closed²			-10.766***			-4.698***
			(3.315)			(0.958)
Tenure	-0.034***	-0.031***	-0.032***	-0.022***	-0.021***	-0.021***
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Tenure²	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total number of closed submissions	-0.006	-0.004	-0.004	-0.006	-0.005*	-0.006**
	(0.017)	(0.011)	(0.013)	(0.004)	(0.003)	(0.003)
Constant	0.694***	0.662***	0.377***	0.458***	0.441***	0.300***
	(0.049)	(0.044)	(0.058)	(0.016)	(0.011)	(0.032)
Observations	375,889	375,889	375,889	375,889	375,889	375,889
R-squared	0.010	0.022	0.023	0.037	0.066	0.068
Number of reporters	21,986	21,986	21,986	21,986	21,986	21,986

Table 6: Operational transparency increases resident engagement (N=375,889 monthly observations from 21,986 resident reporters) (Study 3). Residents submit more service requests, and across a broader array of categories after observing operational transparency, though the effects are attenuated relative to the focal sub-sample, which withholds high-intensity submitters. *, **, and *** signify significance at the 10%, 5% and 1% levels, respectively, relative to the blind treatment.

	(1)	(2)	(3)	(4)
	Monthly Count	Category Count	Monthly Count	Category Count
1 month after exposure	0.990***	0.461***	1.526***	0.523***
	(0.068)	(0.032)	(0.168)	(0.038)
2 months after exposure	0.472***	0.190***	0.489***	0.182***
	(0.062)	(0.026)	(0.145)	(0.034)
3 months after exposure	0.394***	0.152***	0.263*	0.102***
	(0.057)	(0.031)	(0.140)	(0.030)
4 months after exposure	0.418***	0.161***	0.273*	0.081**
	(0.071)	(0.031)	(0.151)	(0.031)
5 months after exposure	0.389***	0.166***	0.002	0.028
	(0.072)	(0.027)	(0.181)	(0.041)
6 months after exposure	0.456***	0.170***	0.095	0.083*
	(0.069)	(0.034)	(0.168)	(0.044)
7 months after exposure	0.529***	0.192***	0.535***	0.138**
	(0.091)	(0.037)	(0.200)	(0.065)
8 months after exposure	0.399***	0.147***	0.399	0.080
	(0.083)	(0.030)	(0.305)	(0.051)
9 months after exposure	0.451***	0.141***	0.286	0.013
	(0.091)	(0.040)	(0.252)	(0.074)
10 months after exposure	0.455***	0.162***	0.334	-0.062
	(0.108)	(0.039)	(0.631)	(0.097)
11 months after exposure	0.425***	0.138***	-0.543	-0.086
	(0.093)	(0.041)	(0.524)	(0.119)
12 months after exposure	0.120	0.022	-1.372*	-0.310*
	(0.100)	(0.039)	(0.702)	(0.174)
13 months after exposure	0.108	0.004	-2.322**	-0.330
	(0.116)	(0.052)	(1.133)	(0.278)
14 months after exposure	0.332	0.396	-7.542	-1.270
	(0.708)	(0.391)	(5.282)	(0.917)
Constant	0.171***	0.060***	0.038	0.028***
	(0.014)	(0.006)	(0.031)	(0.008)
Observations	371,992	371,992	375,889	375,889
R-squared	0.425	0.645	0.134	0.511
Number of reporters	21,786	21,786	21,986	21,986
Sample	Withholding high-intensity submitters	Withholding high-intensity submitters	Full sample	Full sample

Table 7: Persistence of the effects of operational transparency on citizen engagement for the focal sub-sample ($N = 21,786$) and full sample of respondents ($N = 21,986$) (Study 3). The effects of operational transparency on the count of monthly submissions and the number of categories into which users submit requests persists in the months following exposure to the treatment. *, **, and *** signify significance at the 10%, 5% and 1% levels, respectively, relative to the control.
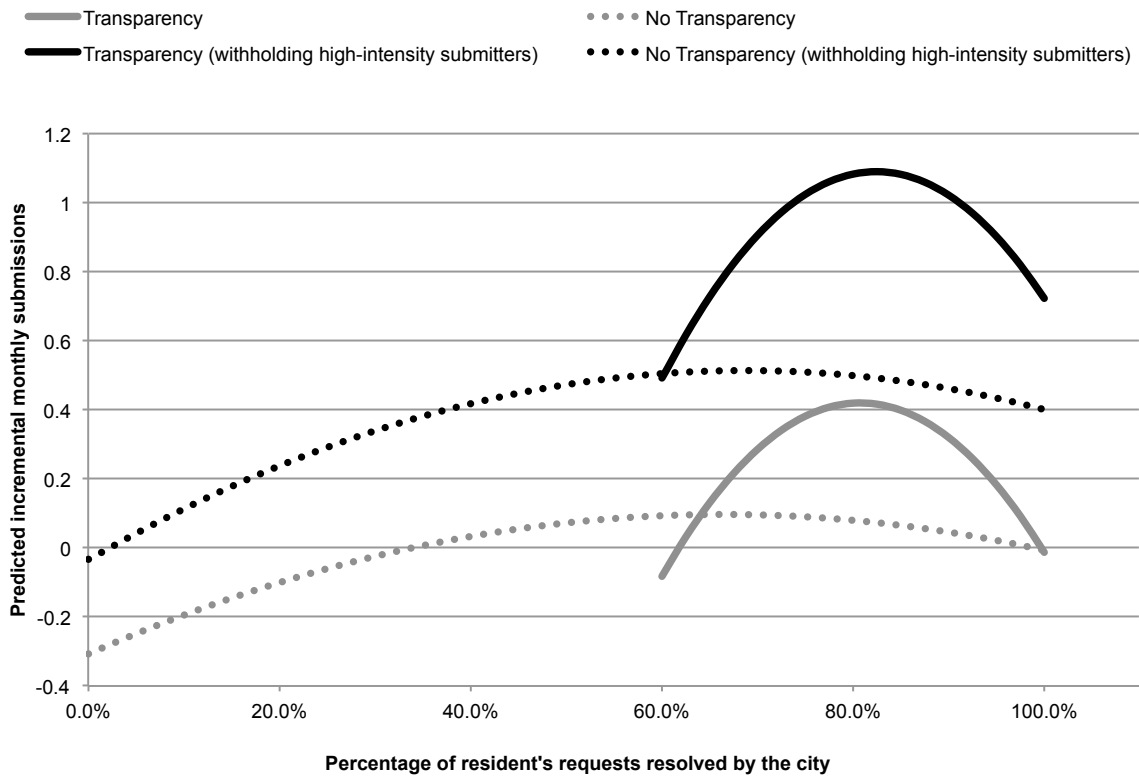
Figure 6: Predicted incremental monthly submissions for residents using the Citizen's Connect application, by transparency condition and the percentage of the resident's requests resolved by the city. Figure includes the full sample ($N = 21,986$) and the focal sample, withholding high-intensity submitters ($N = 21,786$).