# A Theory of Political Accountability and Journalism

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**Abstract**

Journalism is widely believed to be crucial for holding elected officials accountable. At the same time economic theory has a hard time providing a straightforward explanation for the phenomenon of "accountability journalism". According to the common Downsian reasoning, rational voters should not be willing to pay for information out of purely instrumental motives because the individual probabilities of casting the decisive vote are typically very low. We show that this rationale does not apply when a group of voters shares a common goal such as accountability and information is delivered via mass media. In contrast to the pessimistic Downsian view, rational voters can have a considerable willingness to pay journalists for the provision of instrumental information in these scenarios. Our model thus reconciles the rational voter approach with the common perception of journalism as a watchdog that holds elected officials accountable. We also show that competition does not lead to more information and accountability, and that entertainment can crowd out informative media content.

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# 1 Introduction

Mass media have a long tradition of providing people with information about the men and women who govern them. The 16th century Reformation movement used Gutenberg's printing press to quickly disseminate to large numbers of people information about the alleged selfish behavior of the cleric (Barzun 2001, pp. 4-11). The printing press also provided the basis for the establishment of the newspaper as the first modern mass medium, and journalists have since been considered to play a vital role in holding government accountable. Thomas Jefferson famously stated that "[...] were it left to me to decide whether we should have a government without newspapers, or newspapers without a government, I should not hesitate a moment to prefer the latter", because "once they [the people] become inattentive to the public affairs, you and I, and Congress, and Assemblies, judges and governors shall all become wolves" (Thomas Jefferson to Edward Carrington, 1787. Papers 11:48-49).

Jefferson's allusion to accountability underscores the idea that journalism plays a major role in keeping the interests of politicians aligned with those of the electorate. Because information about those in power is a prerequisite for elections to have a disciplining effect on politicians, it is no surprise that this view is commonly held to this day: in 2013 more than two thirds of surveyed Americans said that "press criticism of political leaders keeps them from doing things that should not be done" (Pew Research Center 2013). Accordingly, journalism which gathers and distributes such information has been dubbed "accountability journalism" (Bowles et al. 2013). It is believed to fulfill an important watchdog role in democratic societies, and sometimes it is even considered the "fourth estate". From this perspective, voters demand information because it helps provide the public good electoral accountability and then journalists produce this information (Hamilton 2009, Nichols and McChesney 2010, Waldman 2011).

Unfortunately, from a traditional economics angle the narrative has a major loose end. Why would rational voters be willing to pay these journalists for spending their time on accountability boosting investigations? At least since Downs (1957), the idea that rational voters pay for information in order to make a better informed voting decision has often been dismissed. The reason is that in most elections a single individual is pivotal with a probability so small that it will rarely make sense to pay for such instrumental information.

As a novel contribution our model reconciles the rational voter approach with the common perception of journalism as a watchdog that holds elected officials accountable. We demonstrate that when a group of voters shares a common goal such as accountability and when instrumental information is delivered via mass media, then individual pivot probabilities do not matter for the individual willingness to pay for information. As a consequence, voters can have a considerable willingness to pay journalists for investigations, explicitly because they help make a better voting decision. This reasoning does not stand in opposition to other motives that may also bring individuals to buy information, e.g. entertainment value. However, our approach is the first to prove that paying for the provision of political information

can plausibly be driven by the often dismissed voting motive, even with a large electorate. It thus shows that standard economic theory is compatible with the idea of voters demanding and financially sustaining considerable levels of accountability journalism, with the explicit intent of it being the guardian of accountability.

Consider a situation where voters use the past performance of an incumbent to evaluate whether or not to reelect him. It is well-known in the literature that the incumbent works harder when the monitoring of his performance is better, i.e. when the electoral decision is more informed (see Alesina and Tabellini 2007, for example). Thus, the answer to the question "Does a well-informed or an ignorant voter decide the election?" is crucial for the incumbent's incentives.

Starting from here, the idea behind our approach is simple: Assume that there are many voters who agree that more accountability is better, i.e. accountability is a valence issue. If this group of voters shares the same information, then each of them considers a situation where one of his fellow voters in the group decides the election to be equally desirable as a situation where he himself is decisive. Keeping this in mind, we introduce into the model journalistic reporting that can increase the knowledge of voters via mass media. It is a key characteristic of media coverage that all of its consumers receive the same information or, in other words, the media serve as a vehicle to provide consumers with a common signal. A voter's willingness to pay for a higher quality of this media coverage then depends on *all* scenarios in which he will benefit from higher quality journalism. It is important to realize that these include not only the unlikely event where the voter himself is pivotal, but also all events in which a fellow accountability-loving voter who also receives the higher quality media signal decides the election.

Therefore, in the presence of media coverage it is not a voter's individual (low) pivot probability that drives his willingness to pay for the provision of information, but the (much) higher probability that the group of informed voters decides the election. As a consequence, rational voters can have a substantial demand for costly instrumental information. Whenever this demand is met by journalistic investigations, the result is an improved information level upon which collective decisions can be based, and this in turn results in higher levels of accountability.

We formalize this idea using a political agency model in the spirit of the 'career concern'-approach (Holmström 1999; Persson and Tabellini 2002).[1] The main result is that the just described incentives of voters make it feasible to establish an information service that helps increase an incumbent's accountability. We show that the quality of this information service can be determined by two distinct motives: the citizens' desire to select competent politicians as well as the desire to directly manipulate

[1]This approach is quite popular in the analysis of political accountability problems: Ashworth (2005) examines the incumbency advantage of politicians and how the incentives of incumbents change over time whereas Gehlbach (2007) compares the incentives of national politicians to provide local public goods in the case of electoral college and majoritarian elections. Alesina and Tabellini (2007, 2008) rely on this framework to compare the incentives of bureaucrats and politicians in order to optimally allocate policy tasks to each type. Kotsogiannis and Schwager (2008) study how fiscal equalization affects the accountability of politicians in the presence yardstick competition. Contrary to our setup, information is exogenously determined in all of these papers.

the incentives of incumbent politicians. Even though the resulting quality level will not be efficient due to the public good nature of accountability, quality will be substantially higher than what the pessimistic Downsian view suggests.

Extending the model to allow for competition between news organizations, we also find that information provision and the resulting accountability level is the same in case of a monopoly newspaper and competing newspapers. Our framework therefore does not provide evidence for an accountability enhancing effect of media competition – a result that might prove to be of interest and add a new angle to the debate on how the decline of newspapers affects politics (see, for example, Waldman 2011).

We also find that media companies fail to exploit scale effects when it comes to accountability news. This follows from the fact that no citizens can be exlcuded from the benefits of accountability investigations. As no voter can be excluded, a citizen is not willing to pay for journalistic investigations that have already been funded by other citizens. He is only willing to pay for additional investigations. Thus, a journalist cannot sell one unit of information more than once and we find that the quality of investigations is invariant to the number of citizens. This is markedly different to most other media content such as entertainment where excludability holds. This usually makes it profitable to provide larger groups of readers with more content. We further show that the aspect of (non-)excludability has an important implication: Accountability news can be crowded out by entertainment content whenever media companies face binding resource constraints such as news space. Thus, without binding constraints accountability levels will be invariant to the size of the electorate whereas binding constraints imply lower accountability levels with larger electorates. This result seems to be of particular interest regarding the transition of the media in the digital age where, for example, news space can be much cheaper than it used to be and constraints therefore are less likely to be binding.

**Literature**

Our analysis of journalism and the accountability of politicians makes contributions to the literature along several dimensions:

First, it speaks on a broad level to the general research on information and elections. We show that in the presence of common goals and media which distribute a common signal, the probability that the group of informed voters decides the election is what drives a voter's decision to pay for the production and provision of instrumental information. This is a major difference to the typical conjecture in papers that study voting and endogenous information where demand for information is based on individual pivot probabilities. See Oliveros (2013) for a concise survey of these papers. Further, our approach explains the actual production of instrumental information which voters can rely on instead of assuming exogenously given information sources voters can pay attention to.

Second, the above result has implications for the literature on the accountability of elected politicians. It is well known that information about an incumbent's performance crucially affects both voting decisions and the incentives of the incumbent (see, e.g., Besley 2006 or the survey by Ashworth 2012).

We explicitly model the demand for and also the production of instrumental information that helps voters establish accountability. The paper thus provides the first model of how rational voters can combine the acquisition of instrumental information with the instrument of voting in order to both select talented candidates and at the same time also set incentives for incumbents to behave well. It can then help explain regional differences in what Ashworth et al. (2012) call 'effective accountability'. The idea is that regions with the same institutional setup are characterised by identical levels of formal accountability, but they may in fact differ in their levels of realized, or effective accountability – in our case effective accountability levels can be driven apart across regions via differences in journalistic activity.

In the absence of a good explanation for instrumental demand for information, the accountability literature has proposed other motives for why individuals may receive information that can influence accountability from the media: Individuals may be motivated to pay for information not because it can help in the voting decision, but because the news either generates some entertainment value or it enables citizens to make better private choices (Aidt 2000, Prat and Strömberg 2011, Gentzkow and Shapiro 2006, Baron 2006). However, in these cases, accountability always emerges as an unintentional byproduct: when acquiring information in order to make utility-maximizing private choices, some of that information may also help make a better voting decision (Prat and Strömberg 2011). Because the outcome is still political accountability, one may be inclined to label the emerging journalistic endeavors accountability journalism, too. However, our approach is closer in spirit to what people seem to have in mind when they speak of accountability journalism: the active and direct manipulation of incentives for politicians by way of investigative reporting.

Third, the paper also adds to the literature on the role of mass media for political outcomes. This literature is thoroughly surveyed in Prat and Strömberg (2011), and also includes topics such as ideological media bias, pandering or media capture which are not closely related to our analysis. Our paper abstracts from the latter issues and specifically contributes to the still small literature strand on media and policy effects: Strömberg (2001) integrates a basic media market into various political economy models and also provides a section that alludes to accountability. In contrast to our paper, voter demand for information does not stem from the desire to make a well-informed voting decision but voters acquire information because they can better privately adapt to future policies if they are informed (see above). Thus the information on which voters base their electoral decision comes as a by-product of their motive to adapt. This private motive is also a driving force in a seminal paper by Strömberg (2004a) where he analyzes an extensive model about how media coverage affects redistributive policies. A key finding is that the increasing-returns-to-scale technology of mass media makes it more profitable for them to focus on larger groups and this creates incentives for politicians to allocate more funds to these groups. This effect follows from the excludable nature of media content when voters need information in order to privately adapt to policies. Our paper is different in two dimensions: first, we consider instrumental motives to acquire information rather

than the by-product mechanism. Second, Strömberg's analysis explains how office seeking politicians allocate given resources across voter groups, whereas our model can explain how efficiently politicians use given resources at their disposal once they actually are in office.

Our paper shares the instrumental approach with Larcinese (2007) who adapts the model in Strömberg (2004a). In contrast to our paper, Larcinese does not study the incentives of incumbent politicians but focuses on the selection of politician types by voters. His model focuses on factors that affect voters' conjectures about the probability that their vote is pivotal and which thus influence their demand for information. This is a fundamental difference to our paper where, in equilibrium, voters do not base their demand for information on the probability of individually casting the pivotal vote. Further, in Larcinese's model the media are exogenously informed and then allocate newsspace to the already existing information about politicians, whereas our model can explain the actual production of information by journalists.

Finally, though obviously methodologically different, our paper is also similar in spirit to research that empirically investigates the links between mass media and politics: Strömberg (2004b) shows that the mass media channel more political information to certain population groups, which then receive favorable policies. Empirical evidence that the mass media may affect accountability and the performance of government officials is provided by Besley and Burgess (2002), Reinikka and Svensson (2005), Shi and Svensson (2006), Svaleryd and Vlachos (2009), and Bruns and Himmler (2011). Most closely related to our analysis, Snyder and Strömberg (2010) provide empirical evidence that increases in newspaper coverage indeed raise voter information and electoral accountability.

We proceed as follows. We present the model in Section 2 and the equilibrium analysis in Section 3. Then, we extend the model in Section 4 where we introduce profit-maximizing media and the implications of the non-excludable nature of accountability news. Section 5 concludes.

## 2 The model

Our model follows the 'career concern'-approach of political agency problems as described in Persson and Tabellini (2002). There are two time periods and $N$ citizens. In period 1, there is an incumbent politician (I) who provides a public good. At the end of period 1 an election takes place, where the citizens can either re-elect the incumbent or elect a challenger (C) and the winner of the election implements the public good in period 2. In order to explain journalistic activity, we introduce the option that the citizens can spend money on an information service that generates a signal about the incumbent's performance in period 1.

## 2.1 Production of the public good

The level of the public good in period $t \in \{1, 2\}$ is

$$g_t^i = e_t^i + \theta^i \quad \text{with } i \in \{I, C\}. \tag{1}$$

The variable $e_t^i \geq 0$ denotes the respective incumbent's effort in a time period and $\theta^i$ his competence. So the level of effort is a period-specific choice whereas competence remains constant over time.

A central assumption of the 'career concern'-approach is that the incumbent does not know his own competence when he selects his effort level. For him, competence is a random variable and he shares a common prior belief about this random variable with the citizens. We assume that the common prior belief about the competence of a politician is described by a normal distribution with mean $\bar{\theta}$ and precision $\tau_\theta$.

The assumption of symmetric information about competence between the incumbent and the citizens implies that there are no signaling issues in our model which would arise if the incumbent knew his own competence in contrast to the citizens. If we apply a narrow definition of competence, e.g. academic degrees, then an incumbent will know his own competence but it should also be quite easy for the public to find it out. Then, competence wouldn't be a random variable anymore and its manifestation would be common knowledge.

However, it appears more realistic to assume that for both a politician and the electorate it is uncertain to which extent the personal skills and characteristics of a politician or those of his staff are a good fit for a particular political-economic environment. When it comes to implementing policies, for example, politicians have to deal with many different actors such as bureaucrats, lobbyists, party leaders, or businessmen and it appears reasonable that there is some uncertainty involved that determines the outcome (Ashworth 2005 and Besley 2006, for example, argue in the same way). Then, the precision $\tau_\theta$ can be understood to measure how complex the tasks are that an incumbent faces. If a task is very simple (high $\tau_\theta$), for example, then all players can make relatively good predictions about how fixed characteristics of an incumbent affect policy outcomes.

So the level of the public good results from the realization of the random variable *competence* and the action *effort level* chosen by the incumbent. This action can be interpreted in various ways: On the one hand, we can take it literally and say that effort denotes how much time an incumbent devotes to activities like attracting grant monies, monitoring bureaucrats or negotiating contracts. According to this interpretation, working hard reduces the time that is left for enjoying the amenities associated with political office and we introduce the cost function $\gamma(e)$ that measures the foregone pleasure of these unproductive activities. Our following results apply to functions $\gamma(e)$ that are strictly convex with $\gamma(0) = 0$, $\gamma'(e) > 0$, $\gamma(e)'' > 0$ and $\lim_{e \to 0} \gamma'(e) = 0$. For ease of exposition, however, we will use the specific function $\gamma(e) = \frac{1}{2}e^2$ in the analysis. This assumption does not alter our results in any

substantial way.

On the other hand, the variable $e$ can also be interpreted from a rent-seeking perspective. Alesina and Tabellini (2007) or Gehlbach (2007), for example, show that our 'effort story' can easily be transformed into a rent-seeking model. The basic idea in both variants is that politicians can influence policy outcomes via a costly action. In a rent-seeking context, politicians typically would decide how much money they divert from productive purposes to rents which may include opulent amenities and salaries, payments to political parties or inefficient contracts with cronies. Then, less rent-seeking increases public good production while it reduces the immediate benefits of politicians. Thus, $e$ can also be interpreted as foregone rent extraction which results in reduced benefits for the incumbent of $\gamma(e)$. So whenever we argue in terms of *higher* or **lower** levels of effort there is a corresponding interpretation in terms of *lower* or **higher** levels of rent-seeking.

When deciding on his effort level, the incumbent knows that the citizens can use information about his performance in public good production in period 1 to help decide whether or not to re-elect him. By exerting effort $e$ the incumbent can manipulate public good provision and try to influence the probability of his re-election $\rho(e_1)$. Thus, the incumbent's objective in period 1 is to maximize

$$\rho(e_1) \cdot [R - \gamma(e_2)] - \gamma(e_1), \tag{2}$$

where $R > 0$ denotes an exogenous rent from being in office. So the incumbent weighs the cost of effort in period 1 against the expected net rent in period 2. The level of effort he chooses depends on the mapping of effort into the probability of re-election which depends on the electoral decision.

## 2.2 A citizen's decision problem

Each citizen makes two decisions that can affect his well-being: (i) He can vote for either the incumbent or the challenger or he can abstain at the end of period 1. Let $v_i \in \{I, C, \emptyset\}$ denote the voting decision of a citizen where $\emptyset$ means abstention. Throughout the analysis we assume that voting is costless. (ii) He can contribute money to the establishment of an information service that generates a signal about the incumbent's performance in period 1. An increase of information quality by one unit costs $k > 0$. Consequently, if citizen $i$ wants to contribute $c_i$ units of quality he has to pay the amount $k \cdot c_i$. For convenience, throughout the paper we label the information service as a "newspaper". The logic of the model applies to other forms of media as well.

We assume that each citizen's utility is linear in the level of the public good and that each citizen makes his decisions in order to maximize his intertemporal utility[2]

$$u_i = g_1 + g_2 - k \cdot c_i.$$

[2]There is no discounting.

In principle, the citizens could receive a signal about an incumbent's performance in both time periods. As, however, the game ends after period 2 there won't be any benefit from a signal in period 2 and thus we exclude it from the analysis for ease of exposition.

Mass media provide its consumers with a common signal. Thus, we assume that each contributing citizen will receive a signal

$$s = g_1 + \varepsilon \tag{3}$$

about the incumbent's performance and the citizens can use this information when making their electoral decisions. We assume that $\varepsilon \sim N(0, 1/x)$, where $x = \sum_i c_i$ measures the clarity of the signal. Thus, with their contributions the citizens can manipulate the clarity of the signal. The variable $x$ can be interpreted to be the editorial resources that the citizens want the newspaper to set up for its investigations. Thus, $x$ could measure the talent, qualifications or number of journalists on staff. Then, $k \cdot x$ would be the amount of money spent on investigative resources. From now on we will refer to $x$ simply as *journalistic quality* which is the key variable of our model.

We assume that the citizens cannot observe the incumbent's performance without reading the newspaper. A straightforward explanation would be that the incumbent's performance has long-term consequences so that, as in Besley and Prat (2006), the citizens do not observe their utility before the election. The assumption can also be interpreted as a convenient simplification to describe the following situation: The citizens enjoy utility from public institutions but the total utility is composed of both the incumbent's contribution and another component that the incumbent had no influence on. Think of the economic situation in general or contributions of other politicians, for example. If the citizens cannot perfectly distinguish between the two components their total utility can be interpreted as a direct noisy signal of the incumbent's contribution. Then, information from the newspaper helps the citizens assess the extent of the incumbent's contribution. As long as we assume that the direct signal is sufficiently noisy our simplification does not change the results in a substantial way.

## 2.3 Timing of the game

A key question is whether or not the quality of investigations $x$ that is chosen by the citizens can be observed by the incumbent before he chooses his effort. In other words, the question is whether a game with simultaneous or sequential moves is a better description of the interaction between the citizens' informational decision and the incumbent's effort decision.

We proceed as follows: First, we study the simultaneous version of the game where the incumbent cannot observe newspaper quality before deciding how much effort to spend.

**Timing of events in the simultaneous setting**

Period 1:

- Nature selects the competence of the incumbent $\theta^I$ which remains unknown to all players.
- The incumbent chooses the effort level $e_1$ and $g_1 = e_1 + \theta^I$ is realized but not observed by the citizens who simultaneously choose their contributions $c_i$.
- The contributing citizens receive the signal $s = g_1 + \varepsilon$ and update their beliefs about the incumbent's talent.
- The election takes place.

Period 2:

- The winner of the election chooses an effort level and either $g_2^I = e_2^I + \theta^I$ or $g_2^C = e_2^C + \theta^C$ is realized.

After analyzing this setup, we turn to a variation of the model where the citizens determine an observable journalistic quality at the beginning of period 1, before the incumbent decides about his effort.

This approach allows to study the difference between the two scenarios. We will show that the citizens are strictly better off in the sequential setting where newspaper quality is known to the incumbent when he chooses effort. A situation where newspapers establish long-term relationships with their readers by way of offering subscriptions may constitute a relevant example for the sequential setting, and this fits well with the observation that most non-tabloid newspapers sell the bulk of their circulation via subscriptions.[3]

# 3 Equilibrium

## 3.1 Voting and the value of information

A rational citizen wants to elect the politician whom he expects to provide more of the public good in period 2. Neither the incumbent nor the challenger will provide any effort in period 2 because effort is costly and the game will end after period 2. Thus, $e_2^I = e_2^C = 0$ and the performance in period 2

[3]For the United States the 2011 Community Newspaper Readership Survey found that two thirds of newspaper readers subscribe to the local newspaper rather than buy it at the newsstand (`http://www.rjionline.org/sites/default/files/2011_nna_community_readership_survey_report_1.pdf`). The Nordic Information Center for Media and Communication Research (nordicom.gu.se) reports that in Scandinavian countries the ratio of newspaper copies sold via subscription to single-copy newspaper sales is roughly 5 to 1.

will be determined solely by the competence of the office holder, i.e. performance is either $g_2^I = \theta^I$ or $g_2^C = \theta^C$. The citizen understands these incentives and thus he wants to elect the candidate whom he expects to be more competent so that his optimal voting decision is

$$v^* = \begin{cases} I & \text{for } E(\theta^I) \geq E(\theta^C) \\ C & \text{for } E(\theta^I) < E(\theta^C) \end{cases}$$

in every possible informational scenario.

The citizen's prior belief is such that he expects the incumbent to be just as competent as the challenger and thus he is indifferent between selecting $I$ or $C$. Before making a decision, however, the citizen can receive additional information about the incumbent's competence from the newspaper. Recall that subscribing to a newspaper of quality $x$ implies that the citizen receives a signal

$$s = e_1 + \theta^I + \varepsilon \tag{4}$$

where $\theta^I \sim N(\bar{\theta}, 1/\tau_\theta)$ and $\varepsilon \sim N(0, 1/x)$. The signal contains information that the citizen can use to revise his belief about the incumbent's competence and reconsider his voting decision. We assume that the citizen is rational in the sense that he updates his belief using Bayes' rule, given his belief $\tilde{e}$ about the incumbent's effort.[4]

It follows (see, for example, DeGroot 1970 or Pratt et al. 1995) that the citizen's posterior belief about the incumbent's competence is described by a normal distribution with mean

$$E\left(\theta^I | s, x, \tilde{e}\right) = \frac{\tau_\theta \bar{\theta} + x \cdot (s - \tilde{e})}{\tau_\theta + x}$$

and precision $\tau = \tau_\theta + x$.

For the citizen, $s$ is a noisy signal of $\theta^I$ which is biased by the incumbent's action and therefore the citizen intends to correct the signal for the bias. The mean of the posterior belief is a weighted average of the prior mean $\bar{\theta}$ and the observed value of $s$ corrected by the expected $\tilde{e}$. The weights depend on the precisions of the prior and of the signal in an intuitive way: a higher precision increases the weight given to the respective values of the prior belief and of an observation of the signal. For a given realized value $s$ and belief $\tilde{e}$, higher newspaper quality (higher $x$) then shifts the posterior mean farther away from the prior mean.

[4]When it comes to the game between the incumbent and the citizen, no out-of-equilibrium action of the incumbent can be observed because the distributions of the random variables $\theta^I$ and $\varepsilon$ have full support on the real line. From the citizen's perspective, every signal he receives is consistent with his equilibrium belief, because he attributes the difference between a realization of the signal and his belief to realizations of the random variable $\theta^I + \varepsilon$ which can be every value on the real line.

Thus, for a realized value $s$ of the signal a citizen who reads the newspaper prefers the incumbent if

$$E\left[\theta^I|s,x,\tilde{e}\right]-\bar{\theta}\geq 0 \tag{5}$$

and the challenger otherwise.

The vote of a single citizen who reads the newspaper is relevant for the outcome of the election only if it is pivotal and there are three possible events where the vote of a reader is pivotal: (1) his preferred candidate leads by one vote, (2) the unwanted candidate leads by one vote or (3) there is a tie. Thus, it is a weakly dominant strategy for a citizen who reads the newspaper to vote according to his signal. The intuition of this result is straightforward. Newspaper readers know which candidate should be elected and by following their signal they can increase the probability that the preferred candidate wins. They cannot make a mistake such that they vote against a better informed citizen.

Non-readers are indifferent between the two candidates. They know, however, that readers most likely prefer one candidate and that they can benefit from the knowledge of the readers if the latter decide the election. But as non-readers do not observe the signal they do not know which candidate subscribers prefer. If a non-reader voted randomly for one of the candidates he would risk to vote against a better informed reader which would decrease the probability that the candidate favored by readers wins. Thus, given that the readers follow the signal the best response of non-subscribers is to abstain. This is a variant of the swing voter's curse (Feddersen and Pesendorfer 1996).[5] As the citizens' incentives regarding their voting decisions are straightforward to see in our simple setup we do not provide a formal proof here. The interested reader can find a formal proof in Bruns (2013).

When subscribers vote according to the signal and non-subscribers abstain it is ensured that the electoral decision is based upon the information provided by the newspaper and, consequently, all citizens correctly expect their contributions to be effective. The principle underlying this result is robust to the case of non-identical citizens. We could, for example, distinguish between better and less educated citizens where the less educated subscribers receive the signal $s$ with additional receiver noise because they do not understand newspaper reports as well as the better educated subscribers. Though better informed than non-subscribers, less educated subscribers are still subject to the swing voter's curse as are non-subscribers. and thus they also prefer to abstain and this behavior indeed maximizes the payoff from their contributions. We could also introduce partisans whose voting decision is solely determined by their partisan leanings as in Feddersen and Pesendorfer (1996). Then, the probability that a contribution to newspaper quality will result in a better informed collective decision equals the probability that one of the neutral subscribers casts the decisive vote. This probability may be smaller than 1 and in turn the benefits from higher newspaper quality decrease. This results in a variation of our model where the demand for information is lower.

[5] In Feddersen and Pesendorfer (1996) there is an exogenous stochastic process that determines if a citizen is informed or not. Battaglini et al. (2010) show that subjects in a laboratory experiment behave in a way that is consistent with the swing voter's curse.

Thus, the novel insight is this: Strategic voting in the presence of mass media creates an effective technology that enables a citizen to improve the informational basis of the collective decision via his contribution $c_i$. The influence of a single citizen on the election is no longer tied to his own vote only, but by increasing newspaper quality he can expect to improve the collective decision via the votes of fellow citizens whom he shares preferences with. In this simple model, the probability that a citizen's payment $k \cdot c_i$ results in a better informed collective decision equals the probability that some citizen with the same preferences decides the election. Here, this probability equals 1, of course. In a richer setting with heterogenous citizens this probability will usually be smaller than one but still (much) larger than the very low probability that a single vote is decisive. Thus, a citizen's willingness to pay for the provision of information is substantially increased as compared to models where citizens base their willingness to pay on being pivotal.

One could argue that due to low individual pivot probabilities citizens would not be willing to pay attention to the information that journalists provide, because processing information is costly. If no one would be willing to pay attention then newspaper content would not be effective in improving the collective decision and thus no citizen should be willing to pay for its production. The information in newspapers, however, is usually not just "dry information", i.e. it's not merely a bunch of numbers and tables. Journalists are specialists in combining the facts resulting from their investigations with storytelling. Thus, voters can absorb information while also being entertained. We find it reasonable to assume that this entertainment value offsets the cost of absorbing information. We can interpret our setting such that readers expect entertaining articles about the incumbent to also change their beliefs about his competence and that they are willing to pay for this effect.

In the following we will characterize a symmetric equilibrium where all citizens read the newspaper. When the citizens consider how much money to spend on information, the realization of $s$ has not been determined yet. However, given the optimal voting decision after having observed the signal $(v^*|s)$ and the distribution of the signal we can compute a citizen's expected utility for a given expectation $\tilde{e}_1$ about the incumbent's effort. The citizen's expected utility is

$$\tilde{u}_i(x) = \tilde{e}_1 + \bar{\theta} + \underbrace{E\left[E(\theta^{v^*}|s,x,\tilde{e})\right]}_{\text{selection effect}} - k \cdot c_i,$$

where

$$E(\theta^{v^*}|s,x,\tilde{e}) = \begin{cases} E(\theta^I|s,x,\tilde{e}) & \text{for } s \geq \tilde{e} + \bar{\theta} \\ E(\theta^C) = \bar{\theta} & \text{for } s < \tilde{e} + \bar{\theta}. \end{cases}$$

The value of information here originates from the option to change the electoral decision in light of new evidence. The risk of selecting the wrong (the less competent) candidate is lower when acquiring additional information so that the citizen can expect a higher level of the public good in period 2. We

label this the "selection effect" of newspaper coverage.

The impact of additional information on the expected utility in period 2 is described in

**Lemma 1.** *From the prior perspective the expected utility in period 2, given a rational voting decision $v^*$ is*

$$E\left[E(\theta^{v^*}|s,x,\tilde{e})\right] = \bar{\theta} + \omega(x)$$
$$= \bar{\theta} + \sqrt{\frac{x}{\tau_\theta(\tau_\theta + x)}} \cdot \varphi(0), \tag{6}$$

*where $\varphi$ is the density function of the standard normal distribution. The function $\omega(x)$ is strictly increasing in $x$ and strictly concave with infinite slope at the origin.*

*Proof.* See Appendix. □

Thus, the citizen always benefits from higher newspaper quality, but at a decreasing rate. Further, the value of an information service of quality $x$ depends on the precision of the prior belief about competence ($\tau_\theta$) an intuitive way: The less informative his prior belief is (i.e., the lower $\tau_\theta$) the more value the citizen attributes to a newspaper of quality $x$.

It follows that, in a symmetric equilibrium, a representative citizen $i$ chooses $c_i$ in order to maximize

$$\tilde{e}_1 + \bar{\theta} + \bar{\theta} + \omega(c_i + c_{-i}) - k \cdot c_i \tag{7}$$

where $c_{-i}$ denotes the contributions of the other citizens. Then, the optimal contribution solves

$$\omega'(c_i + c_{-i}) - k = 0. \tag{8}$$

This means that a citizen's marginal willingness to pay for higher quality, evaluated at the aggregate amount of contributions equals the cost of increasing quality by one unit. The assumption of identical citizens implies that, in a symmetric equilibrium, the solution to equation (8) is characterized by a situation where each citizen contributes an identical amount to the quality of the information service so that the total quality adds up to $x = N \cdot c$. Given the properties of the function $\omega(x)$ there is a unique solution to equation (8) and thus newpaper quality in equilibrium is $\hat{x} = N \cdot \hat{c} > 0$ determined by

$$\omega'(\hat{x}) - k = 0. \tag{9}$$

Thus, in contrast to the traditional Downsian reasoning, there will be journalistic activity even with rational and selfish citizens. However, the efficient newspaper quality would solve

$$N \cdot \omega'(x) - k = 0 \tag{10}$$

which implies that $\hat{x}$ is inefficiently low. This is not surprising given the public good nature of newspaper quality.

To sum up, depending on the parameters of the model, there can be substantial journalistic activity for instrumental reasons, which is a more optimistic perspective than what the literature typically offers. Our analysis describes a mechanism based on rational voting behavior that provides a solid foundation for the common perception that accountability journalism is a public good, as voiced in Hamilton (2009) or Waldman (2011), for example. The result about underprovision of newspaper quality fits in well with the concerns of media scholars regarding the underprovision of so-called 'hard news' as compared to 'soft news'.

Note that newspaper quality $\hat{x}$ does not depend on $\tilde{e}$ and thus characterizes information acquisition in equilibrium. Having determined the citizens' optimal behavior for given expected effort by the incumbent we now turn to the analysis of the incumbent's optimal behavior.

## 3.2 Incumbent behavior

The incumbent understands the citizens' decision problem when he decides how much effort he is willing to provide. He correctly expects that the citizens will receive a signal of quality $\hat{x}$ about his performance. He can further conclude that he will be re-elected if the citizens consider him to be at least as competent as an average politician:

$$E\left(\theta^I|s,x,\tilde{e}\right) - E(\theta^C) \geq 0 \quad \Leftrightarrow \quad \frac{\tau_\theta\bar{\theta} + x(s-\tilde{e})}{\tau_\theta + x} - \bar{\theta} \geq 0. \tag{11}$$

The incumbent knows that, for given $\tilde{e}$, his effort influences the mean of the citizens' posterior belief, $E\left(\theta^I|s,x,\tilde{e}\right)$, via the signal $s$. He does not know, however, the exact value of this belief when he chooses his effort level because of the random elements in the signal. From the incumbent's prior perspective, the term $E\left(\theta^I|s,x,\tilde{e}\right) - E(\theta^C)$ is the normal random variable

$$\frac{x}{\tau_\theta + x} \cdot (e - \tilde{e} + \theta^I - \bar{\theta} + \varepsilon)$$

with mean

$$\mu = \frac{x}{\tau_\theta + x} \cdot (e - \tilde{e})$$

and precision

$$r = \frac{\tau_\theta^2}{x} + \tau_\theta.$$

The incumbent can manipulate the mean $\mu$ of this distribution by increasing or decreasing his effort. For a given belief $\tilde{e}$, an unexpected amount of effort increases the citizen's estimate of $\theta^I$. Hence, one unit of additional effort increases $\mu$ by the factor $x/(\tau_\theta + x)$ and we know that higher newspaper quality (higher $x$) magnifies this effect of exerting more effort. As $\mu$ is increasing in $e$, the probability of re-election is higher for larger values of effort for a given $\tilde{e}$.

The probability of re-election from the incumbent's perspective is thus

$$\begin{aligned}\rho &= \Pr[E\left(\theta^I|s,x,\tilde{e}\right) - \bar{\theta} \geq 0] \\ &= 1 - \Phi\left[(0 - \mu(e|\tilde{e},x))r^{\frac{1}{2}}\right],\end{aligned}$$

where $\Phi$ denotes the standard normal distribution function. Hence, the incumbent chooses $e$ to maximize

$$\left\{1 - \Phi\left[(0 - \mu(e|\tilde{e}))r^{\frac{1}{2}}\right]\right\} \cdot R - \frac{1}{2}e^2, \tag{12}$$

taking the citizen's expectation about effort, $\tilde{e}$, as given. The optimal level of effort is characterized by the first-order condition[6]

$$e = \left\{\varphi\left[(0 - \mu(e|\tilde{e}))r^{\frac{1}{2}}\right]\sqrt{\frac{\tau_\theta \cdot x}{\tau_\theta + x}}\right\} \cdot R, \tag{13}$$

where $\varphi$ is the standard normal density function. The term in curly brackets is the density of the distribution of $E(\theta^I|s) - \bar{\theta}$ evaluated at 0, times the effect of an additional unit of effort on the mean of $E(\theta^I|s) - \bar{\theta}$. Thus, the optimal effort level is such that the marginal expected rent is equal to the marginal cost of effort.

With rational expectations, the citizen correctly anticipates the incumbent's behavior and thus we have $e = \tilde{e}$ in equilibrium. It follows that $\mu = 0$ and with $x = \hat{x}$ equation (13) yields

**Proposition 1.** *In equilibrium, newspaper quality is $\hat{x} > 0$ defined by $\omega'(\hat{x}) = k$ and the incumbent's effort equals*

$$\hat{e} = \frac{1}{\sqrt{2\pi}} \cdot \sqrt{\frac{\tau_\theta \cdot \hat{x}}{\tau_\theta + \hat{x}}} \cdot R. \tag{14}$$

*Proof.* See above. □

It is easy to see that the incumbent exerts more effort for larger values of the exogenous rent $R$, so the prospect of holding a more prestigious office makes incumbents work harder. In this model,

[6]The distribution function $\Phi$ is both concave and convex on part of its domain. We assume that $R$ lies below the upper bound $\frac{1}{\varphi(1)}\frac{\tau_\theta + x}{\tau_\theta x}$ which ensures that the incumbent's objective function is concave so that the first order condition is sufficient to characterize the optimal level of effort (see also Ashworth 2005).

however, we are mainly interested in how journalistic quality $x$ influences incumbent behavior and we can derive the following result from Proposition 1:

The term $\frac{\tau_\theta \cdot x}{\tau_\theta + x}$ is increasing in $x$ and thus more investigations make the incumbent work harder. This effect stems from the fact that higher journalistic quality increases the effect of an unexpected additional amount of effort. When $x$ is higher, a signal is given more weight in the updating process which implies that a better performance of the incumbent due to an unexpected boost of effort has a stronger influence on the citizen's belief about $\theta^I$. This makes the incumbent exert more effort.

However, the citizen is not fooled by the incumbent in equilibrium but correctly anticipates the level of effort and it follows that in equilibrium $\mu = 0$ and that the probability of re-election is

$$\rho^* = 1 - \Phi(0) = \frac{1}{2}.$$

This result shows that exerting effort does not pay off for the incumbent in the sense that the probability of re-election is higher than prior to exerting effort. Not exerting effort, however, would reduce the probability of re-election because the citizen would form a lower estimate of the incumbent's competence in this case.

It is important to note that the citizens' demand for information stems from the problem of selecting the more competent candidate and the resulting effort by the incumbent is but a by-product of the selection problem. As to the selection problem, we can also make an interesting comparison with a strand of the literature that is concerned with information aggregation. Suppose that the citizens receive a very noisy (but unbiased) signal without the newspaper. Then it can turn out that the collective decision is correct in the sense that the elected candidate would also have been chosen by a perfectly informed citizen (the jury theorem holds). If the citizens expect this to happen, they will not be willing to pay for the newspaper. However, it is far from clear in which situations the assumptions of the jury theorem are satisfied in reality and our approach (relying on relatively simple assumptions) can explain the behavior of voters in situations where the jury theorem does not apply. Moreover, even if the selection problem can be solved with a very poor signal another problem arises: the incumbent wouldn't exert any substantial effort because effort would hardly affect the (non-equilibrium) posterior belief of the citizens. In other words, there is an incentive problem. In the next section, we show that the citizens can directly manipulate the incentives of the incumbent when they can arrange for a situation where the incumbent observes newspaper quality before having exerted effort.

### 3.3 The case of observable newspaper quality

Comparing the simultaneous choice of newspaper quality and effort with a sequential setting, the electoral selection problem at the end of period 1 is the same as before. Further, it follows from Proposition 1 that the incumbent's equilibrium effort equals $e(x) = \frac{1}{\sqrt{2\pi}} \cdot \sqrt{\frac{\tau_\theta \cdot x}{\tau_\theta + x}} \cdot R$ for a given $x$. If

the citizens can choose an observable newspaper quality before the incumbent makes his effort decision, the optimal contribution to newspaper quality maximizes

$$\tilde{u}_i(c_i) = \underbrace{e_1(c_i + c_{-i})}_{\text{incentive effect}} + E(\theta^I) + \underbrace{E\left[E(\theta^{v^*}|s, c_i + c_{-i})\right]}_{\text{selection effect}} - k \cdot c_i. \tag{15}$$

Thus, there is a direct incentive effect of newspaper quality in the sequential setting which generates an additional value of information beyond the selection effect that we observe in both the simultaneous and the sequential setting. Here, the citizens can directly manipulate incumbent effort, and this is in contrast to the case with unobservable newspaper quality where effort can be considered a 'by-product' of the optimal $\hat{x}$ that originates from the citizens' selection problem.

Equation (15) also offers insights concerning a hypothetical situation where citizens have partisan preferences favoring the incumbent over the challenger or vice versa. Suppose a partisan citizen has a strong leaning towards the incumbent and that his preferences are such that this partisan leaning serves as a substitute for the public good $g$. Then, $\omega(x)$, the value of information that stems from the problem of selecting the better candidate for future public good provision, decreases. The incentive effect, however, remains the same because the partisan citizen still wants the incumbent to work hard in period 1. This reasoning also applies in the case of a partisan citizen who favors the challenger.

Defining $f(x) := e_1(x) + \omega(x)$ and substituting for $e_1(x)$ and $\omega(x)$ we obtain

$$f(x) = \varphi(0)\sqrt{\frac{\tau_\theta \cdot x}{\tau_\theta + x}} \cdot R + \sqrt{\frac{x}{\tau_\theta(\tau_\theta + x)}} \cdot \varphi(0) \tag{16}$$

and it follows

**Lemma 2.** *The value of observable newspaper quality is described by the function $f(x)$ that is strictly increasing in $x$ and strictly concave with infinite slope at the origin.*

*Proof.* See appendix. □

Thus, a representative citizen $i$ chooses his contribution $c_i$ in order to maximize

$$\tilde{u}_i(c_i) = f(c_i + c_{-i}) + 2\bar{\theta} - k \cdot c_i \tag{17}$$

and it follows that the equilibrium quality of the newspaper $x^*$ solves

$$f'(x^*) = k. \tag{18}$$

Due to the properties of $f(x)$ there is a unique interior solution to this equation. As $f'(x) > \omega'(x)$ for $x > 0$ it follows that the citizen acquires more information in the sequential than in the simultaneous

setting: $x^* > \hat{x}$. This is a straightforward consequence of the additional 'incentive effect' in the sequential setting.

We can summarize the key findings for the sequential setting in

**Proposition 2.** *In the sequential setting, the citizens choose newspaper quality $x^* > 0$ defined by $f'(x^*) = k$ and the incumbent's effort equals*

$$e^* = \frac{1}{\sqrt{2\pi}} \cdot \sqrt{\frac{\tau_\theta \cdot x^*}{\tau_\theta + x^*}} \cdot R. \tag{19}$$

*Proof.* See above. □

Now we can compare a citizen's expected utilities in both settings. As the unique maximum value of $e(x) + \omega(x) - k \cdot x$ is at $x^*$, it follows that the difference in expected utility is

$$\tilde{u}(x^*) - \tilde{u}(\hat{x}) = [e(x^*) + \omega(x^*) - k \cdot x^*/N] - [e(\hat{x}) + \omega(\hat{x}) - k \cdot \hat{x}/N] > 0.$$

Thus, a citizen is strictly better off in the sequential setting because of the additional direct effect of newspaper quality on the incentives of the incumbent – which we label the "incentive effect". Given the choice whether or not to make journalistic quality observable to the incumbent at the beginning of the game, the citizens should clearly opt for observability.

It would therefore be in the interest of the citizens that a newspaper engages in long-term investments into investigative resources so that the incumbent is aware of the informational environment within which he makes his effort decision. This could mean, for example, that he knows whether a highly-qualified veteran journalist or a rookie is responsible for investigations into his performance. In other words, if a news outlet has a reputation for providing journalism of a certain quality, the incumbent will consider this when exerting effort.

Interestingly, newspapers often refer to the connection between subscriptions and their repuation as a high quality news outlet. The *The Oklahoman*, for example, seems to intend to create a link between its claimed reputation as a watchdog and the subscription options it offers. On the web page where it presents its subscription options The Oklahoman describes itself as follows[7]

> "The Oklahoman is the largest daily newspaper and the most trusted news source in the state of Oklahoma. Our goal is to serve news and information to readers. We take our first-amendment responsibility seriously, and we feel obligated to serve as Oklahoma's watchdog."

Arthur Ochs Sulzberger Jr., Publisher of the New York Times, argued in a similar way when the Times introduced digital subscriptions:

[7] `http://newsok.com/home/archives`

> "Today marks a significant transition for The New York Times as we introduce digital subscriptions. It's an important step that we hope you will see as an investment in The Times, one that will strengthen our ability to provide high-quality journalism to readers around the world and on any platform."[8]

According to this perspective, subscriptions can be considered a vehicle to establish a long-term relationship between a newspaper and its readers which determines a newspaper's long-term investments in journalistic quality. We could then interpret our information service as a highly simplified representation of such a long-run interaction between newspaper and citizens where the reputation that the newspaper manages to build up becomes common knowledge, and consequently the incumbent will know the level of investigations before choosing his effort. As we believe that this interpretation is the more realistic one, in the remaining analysis we will focus on the sequential setting where a citizen can subscribe to a newspaper at the beginning of the game.

In the next section, we add more structure to the supply side by introducing profit-maximizing newspaper companies that can provide the citizens with information. In contrast to the simplifying analysis above, these newspaper companies now decide how much information they produce and how much they charge for it.

# 4 Extensions

## 4.1 Profit-maximizing newspapers

In this section we will analyze how introducing profit-maximizing newspapers will affect our results. We assume that newspapers run the information service described above and that they finance their activity via subscriptions. As to the timing, we continue with the assumption that the incumbent observes newspaper quality before deciding about his effort in period 1.

**A monopoly newspaper.**

The newspaper offers a subscription package $(p, c)$, where $p$ denotes the price of a subscription and $c$ represents the increase in the quality of the information that the newspaper produces for each subscription sold. This contribution mechanism is similar to Besley and Ghatak (2007). An alternative interpretation would be that for a an increase of $c$ quality units, a citizen is willing to accept an amount of annoying advertising that generates a disutility of $p$.

Let $D$ denote the number of subscriptions that the newspaper sells. Then a citizen who subscribes

[8] Arthur Ochs Sulzberger Jr. (Publisher of The New York Times), "A Letter to Our Readers About Digital Subscriptions", The New York Times, March 17, 2011, `http://www.nytimes.com/2011/03/18/opinion/l18times.html`.

to a newspaper receives a signal

$$s = g_1 + \varepsilon \tag{20}$$

where $\varepsilon \sim N(0, 1/x)$ and $x = D \cdot c$.

The newspaper chooses $(p, c)$ in order to maximize the profit

$$\Pi(p, c) = D(p, c) \cdot (p - k \cdot c) \tag{21}$$

where $k$ is the cost of producing one unit of $c$.

**Timing.** First, the newspaper announces its subscription package and then the citizens choose whether or not to subscribe. The incumbent observes the resulting newspaper quality and then chooses an effort level. Afterwards the newspaper produces the signal and sends it to its subscribers.

A citizen $i$ subscribes to the newspaper if

$$f(c + c_{-i}) - f(c_{-i}) \geq p.$$

In a symmetric equilibrium, the monopoly newspaper charges $p = f(c + c_{-i}) - f(c_{-i})$ and maximizes the profit per subscription

$$\Pi_i(c) = f(c + c_{-i}) - f(c_{-i}) - k \cdot c.$$

The equilibrium quality of the newspaper is then characterized by the first-order condition

$$f'(x_m^*) = k \tag{22}$$

where $x_m^* = N \cdot c^*$. Thus, each citizen pays the price $p^* = f(N \cdot c^*) - f((N-1) \cdot c^*)$ for a subscription.

It follows from equation (22) that the quality of the monopoly newspaper is the same as in the case above where citizens directly choose how much they want to contribute to newspaper quality. Thus, introducing the profit-maximizing newspaper does not affect the level of accountability. The citizens, however, suffer in terms of higher expenditures per contribution.

**Competing newspapers.**

Now there are two newspapers that offer the subscription packages $(p_1, c_1)$ and $(p_2, c_2)$, where $p_1$ and $p_2$ denote the respective prices of a subscription and $c_1$ and $c_2$ represent an increase in the quality of the information that the respective newspaper produces for each subscription sold. Let $D_1$ and $D_2$ denote the number of subscriptions that the respective newspaper sells. Then a citizen who subscribes

to a newspaper receives a signal

$$s = g_1 + \varepsilon$$

where $\varepsilon \sim N(0, 1/x)$ and $x = D_1 \cdot c_1 + D_2 \cdot c_2$. Thus, the quality of the signal depends on the extent of sampling by the two newspapers: Newspaper 1 produces a signal

$$s_1 = g_1 + \varepsilon_1 \quad \text{with} \quad \varepsilon_1 \sim N(0, 1/D_1 c_1)$$

and newspaper 2 produces a signal

$$s_2 = g_1 + \varepsilon_2 \quad \text{with} \quad \varepsilon_2 \sim N(0, 1/D_2 c_2),$$

where the two noise terms are independently distributed.

The idea behind the signal $s$ is that subscribers have access to both the information produced by the newspaper they are subscribed to and the information produced by the other newspaper. As we intend to describe newspaper coverage over a certain period of time (e.g., a whole electoral term) and not the quality of a single copy only, this description seems to be appropriate. Often one news organization will come up with an original story, and other news organizations will then pick up on it. A prominent example is the resignation of former German President Christian Wulff after rumors had it that he had enjoyed a series of favors and freebies that were considered unseemly. The news magazine *Der Spiegel* and the tabloid *Bild* were the first media that investigated and reported on this topic. Once their reports were published other news outlets could observe and deliver them to their customers. The same of course happens all the time with less prominent stories, too. Thus, in this model, subscribing to one newspaper provides access to both signals produced by the newspapers and

$$s = \frac{D_1 c_1 s_1 + D_2 c_2 s_2}{D_1 c_1 + D_2 c_2} = g_1 + \frac{D_1 c_1 \varepsilon_1 + D_2 c_2 \varepsilon_2}{D_1 c_1 + D_2 c_2}$$

is a sufficient statistic for the single signals. Note that with $\frac{D_1 c_1 \varepsilon_1 + D_2 c_2 \varepsilon_2}{D_1 c_1 + D_2 c_2} =: \varepsilon$ we have $s = g_1 + \varepsilon$ as described above.

The newspapers non-cooperatively announce their offers. They choose $(p_1, c_1)$ and $(p_2, c_2)$ in order to maximize their profits

$$\Pi_1[(p_1, c_1), (p_2, c_2)] = D_1[(p_1, c_1), (p_2, c_2)] \cdot (p_1 - k \cdot c_1)$$

and

$$\Pi_2[(p_1, c_1), (p_2, c_2)] = D_2[(p_1, c_1), (p_2, c_2)] \cdot (p_2 - k \cdot c_2),$$

where $k$ is the cost of producing one unit of $c$.

A representative citizen $i$ subscribes to a newspaper if the additional value he derives from subscribing is larger than the price of the subscription, i.e.

$$f(c_n + c_{-i}) - f(c_{-i}) - p_n > 0$$

for at least one newspaper $n = 1, 2$. For given offers $(p_1, c_1)$ and $(p_2, c_2)$ the citizen subscribes to newspaper 1 if

$$f(c_1 + c_{-i}) - f(c_2 + c_{-i}) > p_1 - p_2$$

and to newspaper 2 if

$$f(c_1 + c_{-i}) - f(c_2 + c_{-i}) < p_1 - p_2.$$

*Price equilibrium.* Assume that the qualities $c_1$ and $c_2$ of the subscriptions are given and consider the decision of citizen $c$ for a given pair of offers: At least one newspaper has always an incentive to undercut its rival's price in order to attract the citizen. In response, the undercut newspaper lowers its price until the citizen favors its offer again and this Bertrand-like price competition pushes prices downwards. We have to distinguish between price-equilibria with equal and unequal given qualities:

- *Unequal qualities.* Assume with no loss of generality that $c_1 > c_2$. If newspaper 1 offers a higher quality, it charges

  $$p_1^* = f(c_1 + c_{-i}) - f(c_2 + c_{-i}) + kc_2$$

  and earns a positive profit. If newspaper 1 charges a higher price, newspaper 2 can undercut this price and attract the citizen. However, to ensure non-negative profits, newspaper 2 cannot announce a price lower than $p_2 = k \cdot c_2$ and thus it cannot undercut if newspaper 1 charges $p_1^*$. Consequently, $p_1^*$ is the profit-maximizing price for newspaper 1 while the price of newspaper 2 is $p_2^* = k \cdot c_2$.

  For $c_1 < c_2$ it follows that

  $$p_2^* = f(c_2 + c_{-i}) - f(c_1 + c_{-i}) + kc_1 \quad \text{and} \quad p_1^* = k \cdot c_1.$$

- *Equal qualities.* In case of equal qualities the newspapers can undercut each other's prices as long as the prices are above the cost to produce a subscription of quality $c_1$ or $c_2$. Thus, the only

price equilibrium has both newspapers set equal prices $p_1^* = p_2^*$, which are characterized by

$$p_1^* = k \cdot c_1 \quad \text{and} \quad p_2^* = k \cdot c_2.$$

Having analyzed the price setting stage we can now turn to the stage where the newspapers choose the quality increase per subscription.

*Quality equilibrium.* The profits from selling a subscription to citizen $c$ are

$$\Pi_{1i}(c_1, c_2) = \begin{cases} p_1^*(c_1, c_2) - k \cdot c_1 & \text{for } c_1 > c_2 \\ 0 & \text{for } c_1 \leq c_2 \end{cases}$$

and

$$\Pi_{2i}(c_1, c_2) = \begin{cases} 0 & \text{for } c_1 \geq c_2 \\ p_2^*(c_1, c_2) - k \cdot c_2 & \text{for } c_1 < c_2. \end{cases}$$

It is a weakly dominant strategy for each newspaper to choose the quality that maximizes the profit per subscription for a given strategy of the other newspaper. Due to the symmetry of the newspapers' maximization problem, both newspapers offer the same contribution to quality per subscription characterized by

$$f'(c_n + c_{-i}) = k. \tag{23}$$

In equilibrium, the newspaper market provides an information service of quality $x^* = x^*(k, \tau_\theta) > 0$ and this quality is implicitly defined by

$$f'(x_n^*) = k. \tag{24}$$

Each citizen contributes the amount $c_n^* = x_n^*/N$ via a subscription and pays the price $p_n^* = k \cdot [x_n^*/N]$ and the newspapers earn zero profits in equilibrium.

We can summarize our results in

**Proposition 3.** *The cases of competing newspapers and a monopoly newspaper result in identical newspaper quality and thus the accountability of the incumbent is invariant to the market form.*

The citizen, however, is better off in the competitive case because he pays a lower price for the newspaper. With and without competition a newspaper's incentives are such that the profit of a subscription is maximized. The monopoly newspaper already provides the citizen with the same quality that the latter would have chosen himself and then competition simply reduces prices. This result is

similar to the case of rational readers in Mullainathan and Shleifer (2005).

A brief comment on the subscription story presented in this section is in order: A subscription implies that the citizen gives money to a newspaper at the beginning of the game and afterwards the newspaper will produce a costly signal that is sent to the citizen. A relevant question is why a newspaper wouldn't simply keep the cash and send no signal at all or a signal with lower quality to the citizen. In other words, can the newspaper commit to delivering the promised quality? A result by Besley and Ghatak (2007) applies to this question. They show that a setup similar to ours can be extended to a game with an infinite time horizon and that in such a more encompassing model companies can credibly promise a quality. Applied to our setting with competition, their result implies that a newspaper would need to charge a price above production costs in order to make a credible promise about quality and in equilibrium newspaper quality would be slightly lower. The magnitude of this effect depends on the citizen's ability to monitor a newspaper.[9]

## 4.2 Non-excludability of accountability journalism

The presence of economies of scale in the production of media content has long been recognized in the economic literature (see Samuelson 1958, 1964, for example). If economies of scale make it more profitable to produce more content favored by large groups, then members of these large groups may also benefit from resulting better policies as shown by Strömberg (2004a) in the context of redistributive policies. In this section, however, we show that there is no corresponding result when the accountability of politicians is concerned.

**The effect of non-excludability**.
A key driver of the phenomenon that it can be profitable for media to provide larger groups with more content originates from the fact that content (pictures, movies, written stories) once it is produced can be sold to more than one consumer because content is non-rival in consumption. Being able to sell a given content to many consumers, however, requires that each consumer cannot enjoy utility from content without having paid for it. In other words, a certain degree of excludability has to be guaranteed.

In our setting, however, a citizen who neither acquires information nor goes to the polls still benefits from the effects of a well-informed electoral decision established by his fellow citizens (as long as all citizens agree that more accountability and a well-informed selection of politicians is desirable). Consider the monopoly case from above. It follows directly from equation (22) that newspaper quality is independent of the number of citizens whereas the contribution per citizen decreases. Thus, the incentives of the incumbent are independent of the size of the electorate. Citizens in larger electorates,

[9]Usually, newspapers do not only report on politicians directly before an election. We could interpret a combination $(s, x)$ as a sufficient statistic for a sequence of signals over a period so that a citizen can see in detail what journalists have found out. If a citizen can monitor a newspaper like this, the effect on quality in an infinite horizon setting should not be very large.

however, benefit in terms of lower prices which is straightforward to see by inspecting the equilibrium price

$$p^* = f(x^*) - f((1 - 1/N)x^*). \tag{25}$$

To sum up, due to the non-excludable nature of accountability journalism, larger electorates will not enjoy more accountability of politicians. However, larger electorates could enjoy more media induced accountability of their politicians if, for example, the cost $k$ per unit of content tends to be negatively correlated with the size of the electorate. Indeed, Heider (2000) and Kaniss (1997) argue that the cost of investigations is lower in bigger cities than in rural areas.

**Crowding out**.

We have derived the above result under the assumption that the newspaper's decision is not limited by a binding resource constraint so that the newspaper can increase quality of reporting $x$ until marginal profit is zero. However, until now we have abstracted from the problem that the transmission of more information usually takes up more space. At the same time, practitioners often argue that editorial content, such as accountability stories, is created subject to limited news space, the so-called *news hole*. This is the space on newspaper pages that is not used for advertising, and this implies that it would not be possible to profitably finance newspaper pages via revenues from subscriptions. Rather, a certain number of ads is necessary to create space for editorial content. In other words, an interesting story will be printed only if a newspaper can sell enough ads to finance the corresponding news space.

If we consider a local newspaper, the narrative of limited news space may imply that the number of local businesses, for example, is crucial for the number of ads in a newspaper. As a newspaper usually cannot influence how many businesses operate in their market area, this scenario would mean that newspapers indeed choose their editorial content subject to a constraint. This is also true in the long run, with economic ups and downturns affecting how binding the constraint actually is.[10] In what follows, we assume that a local advertising market results in a news hole of size $B$.

Newspapers also print content which does not qualify as accountability journalism, and the typical newspaper delivers a mix of content. In order to make the analysis more realistic, we extend our model by allowing for content $y$ in addition to accountability journalism $x$. For simplicity, we refer to $y$ as the broad category of 'entertainment'. We assume that entertainment content is excludable, which means that a citizen cannot benefit from content $y$ if he has not subscribed – think of reading the cartoons, or a detailed recap of the weekend's football games.

Surely, there may be some spillovers in terms of neighbors and friends spreading entertaining content, but everyone who has played a game of Chinese Whispers knows that some of the content will

[10] Checking whether the practitioners' narrative can be explained by a thorough economic analysis, especially the interdependence between advertising and editorial content would be another interesting research question. In this paper we take the practitioners' narrative as given, formalize it and discuss possible implications.

be lost along the way. Voters probably care about getting the full and original story in the case of entertainment content and therefore would rather read this content for themselves in order to reap the full benefits. However, in the case of accountability information they need not care: they can just abstain and let those who actually read the newspaper decide the election. Then, they will still get the full benefit of accountability news.

In the entertainment case, a citizen thus cannot benefit from the actions of his fellow citizens as in the case of the electoral decision. We assume that a citizen's benefit from entertainment equals $z(y)$ with $z' > 0, z'' < 0$ and that his total utility from content is $f(x) + z(y)$.

Consider the case where the newspaper aims to maximize the profit originating from editorial content, and offers a package $(p, c, y)$ to this end. Then, it chooses the price and the capacities of the editorial office to maximize

$$\Pi(q, x, y) = D(q, x, y) \cdot q - k(x + y) \quad s.t. \;\; x + y = B, \tag{26}$$

where still $x = D \cdot c$. Thus, for simplicity, we assume that there is a one-to-one relationship between the editorial outputs investigative reporting $x$ and entertainment $y$ and the required news space to publish the outputs. For given $c$ and $y$, a citizen $i$ subscribes to the newspaper if

$$z(y) + f(c + c_{-i}) - f(c_{-i}) \geq p \tag{27}$$

and thus the newspaper charges $p = z(y) + f(c + c_{-i}) - f(c_{-i})$. Then, in a symmetric equilibrium, the profit-maximizing combination of $x^*$ and $y^*$ satisfies

$$\begin{aligned} f'(x^*) - k &= \lambda \\ N \cdot z'(y^*) - k &= \lambda. \\ x^* + y^* &= B \end{aligned}$$

for some $\lambda > 0$. It is straightforward to see that $x^*$ satisfies

$$N = \frac{f'(x^*)}{z'(B - x^*)}.$$

Thus, with a binding constraint, there is less investigative journalism when the electorate is larger. The reason is that accountability-enhancing content is crowded out by the content category entertainment – which features excludability. This would imply that incumbents perform better in smaller electorates. The results of this section are summarized in

**Proposition 4.** *Without a binding resource constraint the quality of accountability journalism is invariant to the numer of citizens. In case of a binding constraint accountability journalism can be crowded out by entertainment when the number of citizens increases.*

*Proof.* See above. □

An interesting application of this result might be found in light of the current transition of traditional newspapers to also embrace new media, especially the internet. Most large newspapers these days also maintain online residencies, and many also offer online subscriptions. When it comes to the space constraints, these online editions may be quite different from the classic print newspaper, mainly in the sense that the cost of publishing an additional story online is much lower than printing it. Sure, the journalists still have to be paid, but the distribution cost for an additional article is probably minuscule. In this context the New York Times' David Carr points to limited resources that shape decisions about content: "[...] We're built on scarcity in print. [...] You move that over to the web [...] We can make more of anything."[11] An implication of this development might be that newsspace constraints will be much less likely to have practical relevance in the digital age. If this is true, the result should be less crowding out of investigative journalism by entertainment and consequently higher levels of accountability.

# 5 Concluding remarks

Popular opinion has it that the investigative endeavors of mass media can serve to hold politicians accountable. Newspapers for example have been heralded as the "last bastion against political corruption,"[12] and the "principal bulwark" against "casual endemic civic corruption" and "[...] self dealing".[13] This paper has provided this idea with a theoretical foundation that is based on instrumental motives of voters to demand information. The main contribution therefore is to show that the Downsian paradigm of rational ignorance need not apply in a society where information flows to a large extent via mass media. While this is the major finding of our research, we have along the way also derived some additional results that may have some tentative implications for policy.

We have shown that accountability is higher when there is a long term relationship between readers and newspapers, because a long term commitment to a certain quality of journalism allows to directly manipulate an incumbent's incentives. Subscriptions often serve as a vehicle to establish such a long term relationship with their readers, and so we would expect that subscription-based media are especially successful in providing accountability. This general idea may also prove to be of importance in light of the current partial transition of news reporting from print to the internet. Newspapers are still figuring out how to best get paid for content in this new environment, particularly whether subscription based news reporting will be sustainable on the internet. Amidst these concerns our model can be seen as a pointer that subscription based reporting can serve voters as a means to discipline

[11] David Carr, NY Times columnist, UT Austin 2012 Mary Alice Davis Distinguished Lecture.
[12] http://www.theguardian.com/media/2009/mar/27/david-simon-wire-newspapers
[13] Clay Shirky, in a talk on "Internet Issues facing Newspapers" at Harvard's Berkman Center for Internet and Society, September 22, 2009.

politicians, regardless of the medium.

Going from a simplified media market to one where we explicitly model newspapers as profit maximizing entities, our results shed some light on how market structure affects the provision, of instrumental information, and subsequently political accountability. This has been at the center of some debate: in the US, many local media markets in the 20th century have gone from having two newspapers to being monopoly markets, amid fears that lower political accountability may ensue at the local level. Another example is the Norwegian government, which tries to keep alive the second-largest newspapers in the respective local media markets by subsidizing them.[14]

However, from the perspective of our model, we cannot support claims that monopoly media markets exhibit systematically lower levels of accountability and subsequently have to endure any related adverse effects. While voters in our model do benefit from competing newspapers in the sense that they pay a lower price for a given level of information and accountability, the level of information that is provided remains unchanged in equilibrium when compared to the monopoly case – implying identical incentives for politicians. Obviously, this result should be interpreted carefully because we abstract from issues such as media bias. Mullainathan and Shleifer (2005), for example, show that the market form influences the incentives of newspapers to bias information and it is not clear how introducing this aspect would affect our result.

The analysis also shows that the size of the electorate has no effect on the incentives of politicians, and therefore larger electorates do not benefit from better politics. Quite the contrary, when we introduce different kinds of content that compete for scarce news space, we find that a larger population may actually be detrimental. The reason is that in the presence of binding space constraints in terms of the number of pages a newspaper can print on a given day, entertainment content may crowd out investigative content. This finding again is important in light of the transition to publishing news on the internet: online, there are basically no limitations to the number of pages and therefore the amount of news that can be printed. In that sense, moving news distribution to the internet can actually improve accountability and lead to more favorable outcomes.

# 6 Appendix

*Proof of Lemma 1.*

**Value of Information.**

A quick way to show that $E\left[E(\theta^{v^*}|S,x,\tilde{e})\right] = \omega(x) + \bar{\theta}$ is to substract the constant $\bar{\theta} = E(\theta^I)$ from

[14] Forskrift om produksjonstilskudd til nyhets- og aktualitetsmedier, `http://lovdata.no/dokument/SF/forskrift/2014-03-25-332` .

$E\left[E(\theta^{v^*}|S,x,\tilde{e})\right]$. Then we have

$$\begin{aligned} E\left[E(\theta^{v^*}|S,x,\tilde{e})\right] - E(\theta^I) &= E\left[E(\theta^{v^*}|S,x,\tilde{e})\right] - E\left[E(\theta^I|S,x,\tilde{e})\right] \\ &= E\left[E(\theta^{v^*}|S,x,\tilde{e}) - E(\theta^I|S,x,\tilde{e})\right], \end{aligned}$$

where $E(\theta^I) = E\left[E(\theta^I|S,x,\tilde{e})\right]$ follows from the law of iterated expectation.

The citizen elects the incumbent if

$$E\left[\theta^I|s\right] - \bar{\theta} \geq 0. \tag{28}$$

and the challenger otherwise. Prior to reading the newspaper, the left-hand side of (28) is a random variable for the citizen and we define $\lambda := E\left[\theta^I|s\right] - \bar{\theta}$. $\lambda$ is a normal random variable with mean zero and precision $r = \frac{\tau_\theta(\tau_\theta+x)}{x}$. Given the optimal posterior voting decision it follows that

$$\begin{aligned} E(\theta^{v^*}|S,x,\tilde{e}) - E(\theta^I|S,x,\tilde{e}) &= \begin{cases} E(\theta^I|S,x,\tilde{e}) - E(\theta^I|S,x,\tilde{e}) & \text{for } \lambda \geq 0 \\ E(\theta^C) - E(\theta^I|S,x,\tilde{e}) & \text{for } \lambda < 0 \end{cases} \\ &= \begin{cases} 0 & \text{for } \lambda \geq 0 \\ -\lambda & \text{for } \lambda < 0. \end{cases} \end{aligned}$$

It follows from calculus (see also DeGroot 1970: 247-248) that

$$\omega(x) = \int_{-\infty}^{0} -\lambda \; dF(\lambda) = \left(\frac{\tau_\theta(\tau_\theta + x)}{x}\right)^{-1/2} \cdot \varphi(0).$$

Re-adding the constant $\bar{\theta}$ we obtain that $E\left[E(\theta^{v^*}|S,x,\tilde{e})\right] = \omega(x) + \bar{\theta}$.

**Concavity of $\omega(x)$.**

The first and second derivatives are

$$\omega'(x) = \frac{1}{2}\left(\frac{\tau_\theta^2}{x} + \tau_\theta\right)^{-3/2} \varphi(0)\frac{\tau_\theta^2}{x^2} > 0$$

and

$$\begin{aligned} \omega''(x) &= \frac{1}{2}\varphi(0) \cdot \left[\frac{3}{2}r^{-\frac{5}{2}}\left(\frac{\tau_\theta^2}{x^2}\right)^2 - 2r^{-\frac{3}{2}}\frac{\tau_\theta^2}{x^3}\right] \\ &= \frac{1}{2}\varphi(0)\frac{\tau_\theta^2}{x^3}r^{-\frac{3}{2}}\left[\frac{-(\tau_\theta + 4x)}{2(\tau_\theta + x)}\right] < 0. \end{aligned}$$

Thus, $\omega(x)$ is a strictly concave function in $x$.

**The slope of $\omega(x)$ at the origin**.
We are interested in the limit value $\lim_{x\to 0}\omega'(x)$. To determine the limit value it is sufficient to inspect

$$\lim_{x\to 0}\frac{1}{x^2}\cdot\left(\frac{\tau_\theta^2}{x}+\tau_\theta\right)^{-3/2}=\lim_{x\to 0}\left(\tau_\theta^2 x^{1/3}+\tau_\theta x^{4/3}\right)^{-3/2}=\infty$$

and thus $\lim_{x\to 0}\omega'(x)=\infty$. □

*Proof of Lemma 2.*
**Concavity of $f(x)$.**

The first and second derivatives are

$$f'(x)=\frac{1}{2}\varphi(0)\left(R+\frac{1}{\tau_\theta}\right)\cdot\frac{\tau_\theta^{3/2}}{(\tau_\theta+x)^{3/2}x^{1/2}}>0$$

and

$$f''(x)=-\frac{1}{4}\varphi(0)\left(R+\frac{1}{\tau_\theta}\right)\cdot\frac{\tau_\theta^{3/2}(\tau_\theta+4x)}{(\tau_\theta+x)^{5/2}x^{3/2}}<0.$$

Thus, $f(x)$ is a strictly concave function in $x$.

**The slope of $f(x)$ at the origin**.
We are interested in the limit value $\lim_{x\to 0}f'(x)$. To determine the limit value it is sufficient to inspect

$$\lim_{x\to 0}\frac{1}{(\tau_\theta+x)^{3/2}x^{1/2}}=\lim_{x\to 0}\frac{1}{(\tau_\theta x^{1/3}+x^{4/3})^{3/2}}=\infty$$

and thus $\lim_{x\to 0}f'(x)=\infty$. □

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