Media Capture through Favor Exchange[*]

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Abstract

We use data from Hungary to establish two results about the relationship between the government and the media. (1) We document large advertising favors from the government to connected media, and large corruption coverage favors from connected media to the government. Our empirical strategy exploits sharp reallocations around changes in media ownership and other events to rule out market-based explanations. (2) Under the assumptions of a structural model, we distinguish between owner ideology and favor exchange as the mechanism driving favors. We estimate our model exploiting within-owner changes in coverage for identification and find that both mechanisms are important. These results imply that targeted government advertising can meaningfully influence content. Counterfactuals show that targeted advertising can also influence owner ideology, by making media ownership more profitable to pro-government connected investors. Our results are consistent with qualitative evidence from many democracies and suggest that government advertising affects media content worldwide.

JEL codes: D72, D73, L82, P16, D61

1 Introduction

Media capture by the government can limit political accountability and assist the rise of autocracy. In democracies, media capture may emerge through a form of favor exchange, in which the government allocates advertising to particular outlets that in return cover the government favorably. Consistent with this idea, advertising and coverage allocations that appear to be favors are common in many democracies, which include over 18% of the population of the European Union (EU) and over 2 billion people worldwide.[1] But this suggestive evidence, as well as academic work we review below, leaves two questions open. Are the suspect allocations really favors, rather then conventional market-based choices? And if yes, are they driven by an ideological preference for like-minded actors, or by an actual exchange in which coverage is provided in return for advertising?

We combine data from Hungary and a structural model to study these questions in a concrete context. First we present reduced-form evidence to credibly document two-way favors. Our approach is to compare allocations involving actors with changing versus unchanging connection status to the government. This allows us to rule out market-based explanations—advancing on the important suggestive evidence in DiTella and Franceschelli (2011)—and conclude that the allocations represent favors. Then, building on Besley and Prat's (2006) model of media capture and Gentzkow and Shapiro's (2010) structural approach to slant determination, we estimate a structural model to distinguish, under the assumptions of the model, between owner ideology and favor exchange as the underlying mechanism. Exploiting within-owner variation in coverage for identification, we find that both mechanisms are important, implying in particular media capture through favor exchange. Counterfactuals show that through endogenous ownership even owner ideology may respond to government advertising. Our results suggest that targeted government advertising may distort media content in many democracies.

In Section 2 we discuss the Hungarian context and the our data. We study print and online media, and following investigative accounts of ownership and personal connections, we classify outlets as connected to the political right, the political left, or unconnected.

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[1] The affected countries include Bulgaria, Greece, Hungary, Poland, Romania, Slovakia, Slovenia (EU), Albania, Macedonia, Serbia, Turkey (rest of Europe), Argentina, Brazil, Colombia, Mexico (Americas), India and Pakistan (Asia). Online Appendix A1 reviews the suggestive evidence.

Section 3 presents reduced-form evidence on two-way favors between right-wing governments and connected media. We define a favor to be an allocation not driven by a conventional market force like audience preferences. To document advertising favors from the government, we compare state-owned firms' advertising composition to private firms' advertising composition around events changing the connection status of an outlet. We study three events in the print market: (1) Changes in government; (2) A change in ownership when a friend of the prime minister purchases a major newspaper; (3) A public fallout between this investor and the prime minister. We study two further events in the online market: (4) A change in the editor of a leading online portal, allegedly due to government pressure; (5) The subsequent purchase of the same portal by a connected investor.

At all five events, we see a sharp change in the share of advertising state-owned firms allocate to the connected outlet, which is accompanied by essentially no change in the share of advertising private firms allocate to the same outlet. Consider for example event (2). In 2011 a business partner of Lajos Simicska—college roommate of prime minister Viktor Orbán and a major media investor—purchased the large daily Metropol. In a single month, Metropol's share in state-owned firms' print advertising increased from about 20% to about 50%, while its share in private firms' print advertising did not change. Consider next event (3). In February 2015, Simicska and Orbán had a public fallout. The share of Simicska's two daily newspapers (Magyar Nemzet and Metropol) in state-owned firms' print advertising dropped from over 60% to around 20%, with no change in private firms' advertising. We document similar patterns for all events.

Market-based explanations for these patterns, such as changing target audiences, are inconsistent with the sharp swings in advertising, and with other facts we discuss including direct evidence on online audiences that show no change in composition. We conclude that the patterns represent advertising favors.

We next document content favors from connected media to the government exploiting events (3), (4) and (5). We show that following event (3)—the fallout between Orbán and Simicska—the share of articles covering government corruption scandals in Simicska's main political daily quickly increased from the low level of an unrelated right-connected daily to near the high level of the main left-connected daily. And we show that following events (4) and (5)—a change in the editor, and

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then the purchase by a connected investor of Origo, one of the two leading online portals—Origo's corruption coverage relative to its main competitor significantly decreased. We discuss various facts that speak against audience-based explanations for these content changes, including evidence that shows no change in the composition of online audiences. We conclude that the patterns represent content favors.

In Section 4 we develop and estimate a structural model which, under a set of more restrictive assumptions, allows us to distinguish between two mechanisms potentially driving the favors: (1) Shared ideology, in which content favors are provided because of the owner's ideological affinity with the government; (2) Favor exchange, in which content favors are provided in exchange for advertising favors received. In our model, an outlet's choice of pro-government slant is shaped by three forces: readers' slant preference which determines private advertising; the government's slant preference which determines government advertising; and the owner's ideology. We assume that the government only rewards slant in the connected outlet. The model implies that the slant difference between the connected and the unconnected outlet can be decomposed into two terms representing the ideology and favor exchange motive of the owner.[2]

We estimate the model using the Simulated Method of Moments (SMM). To distinguish between ideology and favor exchange, we use events (3) and (4)—the fallout and the change in editor—and assume that, because the owner of the outlet is unchanged, the ideology motive remains constant. The model then attributes any change in relative slant to a change in the profitability of slant. We do observe such changes in profitability for both events: for event (3) it comes from the outlet losing its connection status due to the fallout, and for event (4) from an increase we document in the government's online advertising budget. Connecting these changes in profitability with the changes in slant yields our estimate of the favor exchange motive.

This empirical strategy relies on identifying assumptions. For event (3) it relies on the arguably strong assumption that the fallout was not accompanied by a change in the investor's ideology. In support of this assumption, we argue that the fallout was unlikely to have been caused by such a change because advertising favors stopped before content favors did. Moreover, when we relax

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[2] Readers' preferences cancel, essentially because these national outlets compete for the same marginal reader who is indifferent between choosing them.

the constancy of his ideology and use only the online market for identification, we find that the investor became only slightly and insignificantly less pro-government after the fallout. For event (4), our identification strategy relies on the arguably weaker assumption that the government's total advertising budget in the online market was not endogenous to outlets' choice of slant. In support of this assumption, we show that the government's advertising share in the online, print, and television markets exhibited similar trends.

We use the resulting estimates to analyze the two mechanisms. We first show that both are quantitatively important. For example, in the period after event (5), relative to a world with no advertising favors and no change in ownership, favor exchange would have reduced Origo's corruption coverage by 42 percent, the new owner's pro-government ideology by 63 percent, and the two in combination—due to a substitution effect—by 74 percent. Thus, our structural estimates imply that government advertising can meaningfully influence content.

We then quantify the impact of a policy that eliminates targeted government advertising, and find that in our estimated model it would have increased corruption coverage in Origo by 41-79% depending on the period. Thus, policies that limit discretion in government advertising can have real effects on slant. As we discuss, this policy prediction assumes that other channels of favors from the government to the media have prohibitive transaction costs, and that the policy is expected to be permanent.

The estimated model highlights a new force through which government advertising can also influence owner ideology. The logic is that targeted advertising increases the profit from slant, and hence makes the outlet more attractive to investors with a more pro-government ideal point. Our estimates suggest that this force made Origo an increasingly attractive prospect during our sample period, and may have contributed to its purchase in event (5). More broadly, this force implies that owner ideology—the supply side of content—may be endogenous to demand.

Finally, we explore how the environment shapes media capture in our model using three counterfactuals. First we confirm the effect that lower private or higher government advertising, by making the government's demand relatively more important, increases slant in the connected outlet (Besley and Prat 2006, Gentzkow, Glaeser and Goldin 2006). Second, we explore the comparative stat-

ics of endogenous ownership. We find that both lower private and higher government advertising incentivize a pro-government connected investor to purchase an unconnected outlet—and to then increase its slant. This result is consistent with Petrova's (2011) finding that in 19th century America higher private advertising was correlated with a politically less connected press, and may help explain why, in recent years, declining private advertising in the Czech Republic and Hungary was accompanied by the takeover of foreign-owned media by domestic investors with government ties. Third, we evaluate the impact of capturing a second outlet, and show that under some conditions it can intensify the competition for government advertising and thus increase slant in both outlets. This force may explain the fallout through the logic that replacing a single connected owner with multiple competing ones can reduce the effective price of slant to the government.

Our work contributes to a literature on the political economy of the media. Our model builds on theories of media capture including Besley and Prat (2006), Petrova (2008) and Gehlbach and Sonin (2014). Good evidence on media capture comes from autocracies, and documents capture through bribes or direct state ownership (McMillan and Zoido 2004, Qin, Strömberg and Wu 2018). For democracies, the pioneering paper by DiTella and Franceschelli (2011) presents suggestive evidence on two-way favors in Argentina, but does not rule out plausible market-based explanations. DellaVigna, Durante, Knight and La Ferrara (2015) document (one-way) favors between different actors: from third party businesses to connected media. And Beattie, Durante, Knight and Sen (2020) document capture by private advertisers.[3] We contribute to this work by credibly documenting two-way favors between the government and the media, and by distinguishing, under structural assumptions, between the ideology and favor exchange mechanisms.[4]

A related line of research studies the demand- and supply-side determinants of slant. Important contributions include the theories in Mullainathan and Shleifer (2005), Gentzkow and Shapiro (2006) and Baron (2006), and the evidence in Groseclose and Milyo (2005), Gentzkow and Shapiro (2010) and Puglisi and Snyder (2015).[5] Our structural analysis builds on this work, especially on

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[3] In other work, Gentzkow, Petek, Shapiro and Sinkinson (2015) find little evidence for government capture in 19th century US newspapers. Enikolopov and Petrova (2015) and Prat (2015) survey capture by the government.

[4] Our work also relates to media accounts in Hungary, especially the thorough analysis of Bátorfy (2015) that documents the apparent bias in government advertising, but does not compare it to private advertising and does not conduct statistical analysis.

[5] See Gentzkow, Shapiro and Stone (2016) and Snyder and Puglisi (2016) for reviews. Some of this work, taking

Table 1: Political cycle in Hungary

| | Share in parliament of | | | Central |
	Left	Right	Far right	government
1994-1998	**72%**	28%	0%	left
1998-2002	41%	**55%**	4%	right
2002-2006	**51%**	49%	0%	left
2006-2010	**55%**	45%	0%	left
2010-2014	19%	**68%**	12%	right
2014-2018	18%	**70%**	12%	right

Gentzkow and Shapiro (2010) who document the effect of readers' demand for slant, and contributes with evidence on a different demand-side determinant: the government's demand for slant.[6]

2 Context and data

2.1 Politics and media in Hungary

To provide political context for our sample period of 1994-2016, Table 1 reports, by political cycle, the shares of Hungarian parliament members belonging to parties we classify to be on the left, right, or far right.[7] The political affiliation of the government changed three times in this period: in 1998, 2002 and 2010. Both the 1998-2002 and the 2010-16 right wing governments were led by Viktor Orbán as prime minister.

We study print and online media markets in this period, and classify some outlets as connected to the political right or the political left. We base our classification on a sequence of reports by Mertek Media Monitor (MMM), a nonprofit organization studying the media in Hungary, which identify all the connections we use in our analysis (Mertek Media Monitor 2013, Mertek Media Monitor 2016, Mertek Media Monitor 2017). We verify these connections using data on firm

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the perspective of readers, labels government pressure a supply-side determinant. We instead take the perspective of media outlets and label slant-rewarding government advertising a demand-side determinant.

[6] We also build on a literature on favoritism emanating from Fisman (2001), which includes studies of credit (Khwaja and Mian 2005), sales (Cingano and Pinotti 2013) and procurement (Schoenherr 2019) among other contributions.

[7] Independent members on average represented less than one percent of parliament and are not reported.

ownership, and combine our data and other sources referenced below for additional details such as the dates of connection-changing events.

We begin with an overview of the connections to the right, which are our main focus. These connections evolved through three distinct phases. First, in a "monopolistic phase," before 2015 most right-connected media were owned by the business group of a single investor, Lajos Simicska, who was a college roommate of the right-wing prime minister Viktor Orbán, ex-treasurer of Orbán's party Fidesz, and head of the Tax Authority for a period during 1998-2002 (MMM 2013). Second, in early 2015 Simicska and Orbán had a fallout, and outlets controlled by Simicska became unconnected (MMM 2016). Third, in an "oligopolistic phase" several new right-connected outlets emerged, which were owned by multiple different investors (MMM 2016, MMM 2017). Building on this overview, we turn to provide more detail about specific outlets' connections to the right and to the left, separately for the print and online markets.

Print market. Daily newspapers in Hungary in this period are naturally classified as national political dailies that cover political news intensely, national tabloids that cover political news lightly, regional daily newspapers, and the free newspaper Metropol which is somewhere between these categories (Bell Research 2010). We focus only on national political dailies, and include Metropol in this category. Table 2 Panel A reports the 2014 market shares—in private firms' advertising and in circulation—of the five largest political dailies in Hungary, as well as the main connection status for those we use in the analysis.

During the first phase of right-connected media, two of the top three newspapers on the list of Table 2 were part of the Simicska media empire. Simicska's business group owned the main right-wing daily newspaper *Magyar Nemzet* since 2000, and before 2000 owned various predecessors which were then merged into Magyar Nemzet. And in 2011 his close business partner (co-owner in several companies) purchased the free daily *Metropol*.[8] We classify these newspapers as connected to the right for the relevant periods.

The second phase was marked by a public fallout in February 2015 between Simicska and Orbán. In a single day, the lead editors and top management of the three flagship outlets in Simicska's

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[8] Simicska's business group also owned billboard companies, a radio station and a television channel (MMM 2013).

Table 2: Leading media outlets in print and online markets

	Private advertising	Circulation	Main connection
A. Top national political dailies	market share		
Metropol	62%	77%	right
Népszabadság	17%	10%	left
Magyar Nemzet	12%	8%	right
Magyar Hírlap	4%	2%	right
Népszava	2%	3%	not used
Total (USD million, 1000 readers)	19	448	
B. Top online news portals	market share		
Origo	36%	32%	right
Index	35%	31%	unconnected
24.hu group	24%	30%	not used
Hvg	5%	6%	not used
Total (USD million, 1000 readers)	68	3,643	

Note: Columns 1 and 2 computed for 2014. In the online market readers are real users. Column 3 reports the main connection for outlets whose connection status is used in the analysis.

media empire—the daily Magyar Nemzet, the television channel Hír TV, and the radio channel Lánchíd radio—unexpectedly quit (MMM 2016, Pethő and Szabó 2019). Resignations by several prominent journalists and editors followed. On the same day, the otherwise secretive Simicska, apparently taken by surprise, gave interviews in which he claimed Orbán was responsible for the resignations and called Orbán unprintable names (Nagy 2015), suggesting that he viewed the events as a "coup" against his media. Although we do not have direct evidence on the cause of the fallout, investigative accounts suggest that Orbán found Simicska too powerful and wanted to limit his influence (MMM 2016, Pethő and Szabó 2019).[9] We classify Magyar Nemzet and Metropol as unconnected after February 2015.[10]

[9] For example, in January 2015 Orbán allegedly met with the editors of several friendly media outlets—many of which were owned by Simicska—and told them that they should not expect further government advertising because their owners were in good financial health (Pethő and Szabó 2019). Consistent with the coup interpretation, several people who resigned became prominent members of state media and the new right-connected media (Rényi 2017).

[10] Consistent with this classification, after the fallout the city of Budapest, whose mayor was an ally of Orbán, did not roll over the contract allowing the distribution of Metropol in subway stations. Shortly afterwards Simicska

In the third phase new connected outlets emerged in the print, online and television markets (MMM 2016, 2017). We exploit this phase in the online market and discuss it further below.

Continuing with the print market, the small daily *Magyar Hírlap* was purchased in 2005 by a prominent backer of Orbán—organizer of pro-government marches after 2010—hence we classify it as connected to the right after 2005 (MMM 2013). This connection was independent of Simicska and unaffected by the fallout.

On the left, the main connected daily newspaper was *Népszabadság*, which until 2015 was co-owned by a foundation of the socialist party MSZP (MMM 2013). We classify Népszabadság as connected to the left for its entire existence.[11] Finally, Magyar Hírlap was thought to be leaning to the left before 2005, and *Népszava* throughout the period, at times with possible connections (Sipos 2013, MMM 2017). We do not use these two outlets' potential connections to the left in the analysis.

Online market. Table 2 Panel B reports summary statistics for leading online media outlets. The two main portals were *Origo* and *Index*, and they are the focus of our analysis. The other portals were smaller.[12]

Just before and during the third phase in the evolution of right-connected media, the online portal Origo experienced two key events. First, in 2014, while it was owned by a subsidiary of the German media company Telekom, Origo's editor was replaced, allegedly because of an investigative report critical of the government. Subsequently several journalists left (MMM 2016). Second, in 2016 Telekom sold Origo to a firm linked to the cousin of the central bank's governor who has been an ally of Orbán (MMM 2016). We classify Origo as connected to the right after the second event. During our period of interest Index was owned by an investor who was allegedly friendly to the right-wing government, but who had no explicit political ties. Following MMM (2017), we therefore classify Index as unconnected.[13]

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closed the paper (MMM 2017).

[11] Népszabadság's career ended in late 2016, when a foreign investor, who purchased it as part of a media portfolio, closed it down and then re-sold the rest of the portfolio to a company linked to a friend of Orbán (MMM 2017).

[12] The market shares for *24.hu* include other online publications in its business group and are hence overestimated.

[13] There were attempts to make Index connected. Simicska obtained an option to buy Index, which however was kept secret and not exercised until 2017 when ownership was transferred to a private foundation (MMM 2017).

Table 3: Summary statistics on advertising, 1994-2016

| | Print | | Online | |
	Number of advertisers	Spending shares	Number of advertisers	Spending shares
Private firm	500	77.0%	500	90.0%
State-owned firm	325	13.8%	96	6.1%
Govt. agency	460	9.2%	247	3.9%
Total spending (USD M)		2,370		946

2.2 Data and sample definitions

We work with three main datasets.

Advertising. We have monthly data on the list price and advertising volume of most large advertisers in most newspapers and online portals, obtained from Kantar Media. We study three types of advertisers: private firms, state-owned firms, and government agencies. In both the print and online market, our main sample consists of the 500 largest private firm advertisers, all state-owned firm advertisers, and all government agency advertisers.[14] Table 3 present summary statistics on advertising spending in this sample. State-owned firms and government agencies, in combination, account for 23% and 10% of total advertising in the print and online markets. In this table we report advertising value at list prices, computed by Kantar Media as the product of advertising surface and list price, using the the price specific to the concrete ad (position, color, day, media, etc.).

Firm data. We have balance sheet information for essentially all firms in Hungary from the Hungarian Tax Authority for 1992-1999, the Hungarian Statistics Office for 2000-2012, and the Hungarian Company Register for 2013-16. These data allow us to classify firms as state-owned or private. The Hungarian Company Register also contains for 1992-2016 name and address data of firm owners and officials, which we use to verify the political connections of media outlets. In addition we hand-collected data on their total advertising spending from the annual reports of 30

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[14] Because there was a major privatization wave before 1997, for the purposes of sample definition we classify a firm as a state-owned advertiser if it was state-owned at least once during or after 1997.

private and 30 state-owned companies for 2014-16.

Media content, circulation and readership. We have the online content of three daily newspapers and four online portals for 2013-16: Népszabadság the main left-connected daily, Magyar Nemzet the main right-connected daily, Magyar Hírlap a smaller daily connected to the right in this period; as well as Index and Origo, the main online portals, and hvg.hu and 444.hu, two smaller portals we use for auxiliary purposes. Index provided their content data directly, we scraped the content of the other outlets.

Data on circulation and page views come from public sources (matesz.hu, dkt.hu). In the online market, we obtained data on the audience demographics of Index and Origo for 2013-18 from a media company.[15] We also use data from representative polls collected by polling organization TARKI at various times during 2010-17 on subjects' demographics and political preferences. Some polls in 2013 also contain information on print and online media consumption.

3 Reduced-form Patterns of Two-way Favors

3.1 Favors from the Government to the Media

We first present figures documenting the reduced-form patterns of advertising around five events, and then discuss their interpretation. Regressions confirming the significance and robustness of the graphical results are in Online Appendix A2.1.

Print market 1994-2014. Our first event is a set of events: changes in government. Focusing on the period 1994-2014, Figure 1 plots *rightshare*, the market share of the the main right-connected daily (Magyar Nemzet) relative to the left- and the right-connected daily (Népszabadság and Magyar Nemzet), for three measures of market activity: circulation, private firms' advertising, and state-owned firms' advertising. Shaded areas correspond to right-wing governments.[16]

The market share in circulation—data on which is available starting 2000—shows that the circulation of the right-connected daily, relative to the combined circulation of the two newspapers,

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[15] Unfortunately, to our knowledge in the print market comprehensive publicly available data on audiences do not exist, because such data were not collected for Magyar Nemzet.

[16] In the definition of the right-connected daily we also included the antecedents of Magyar Nemzet: Új Magyarország, renamed Napi Magyarország in 1997 and merged into Magyar Nemzet in 2000.

Figure 1: Share of right daily relative to left and right daily, $R/(L + R)$

Shaded areas represent right-wing governments.
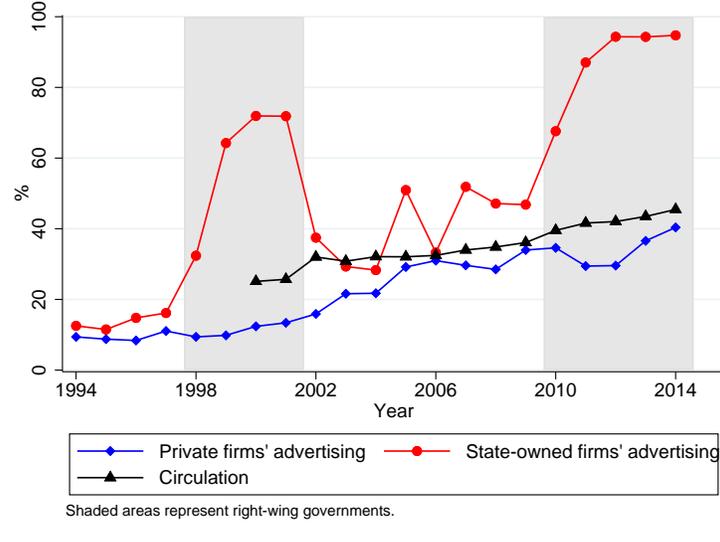
gradually increased in this period, reaching about 45% by 2014. This pattern was paralleled by a similar increase in the market share in private firms' advertising: as its relative circulation increased, the right-connected daily attracted relatively more private advertising.

The main message of the figure is that the *rightshare* in state-owned firms' advertising was similar to these benchmarks during left-wing governments, but dramatically higher during right-wing governments. During the 1998-2002 right-wing administration *rightshare* increased from 16% to 72%, after the 2002 change in government it quickly dropped, and during the new right-wing administration elected in 2010 it again increased from 47% to 95%. Before discussing the interpretation of this key pattern, we document similar patterns for four other events.[17]

Metropol. Our second event is a change in ownership. In 2011, a business partner of the right-connected investor Simicska purchased Metropol, a freely distributed daily newspaper which represented a large share of the print advertising market. In Figure 2 we plot the advertising and circulation share of Metropol relative to all publicly oriented daily print newspapers.[18] Before the change in ownership, Metropol's share in state-owned firms' and private firms' print advertising

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[17] Although there is also some variation in (list) prices, likely driven by different ad features, our results in this section are mostly driven by variation in advertising quantity.

[18] Thus the denominator includes not just the national political dailies of Table 2 Panel A, but also regional dailies.

Figure 2: Share of Metropol around purchase by connected investor, *Metropol/All*


Shaded areas represent right-wing governments.
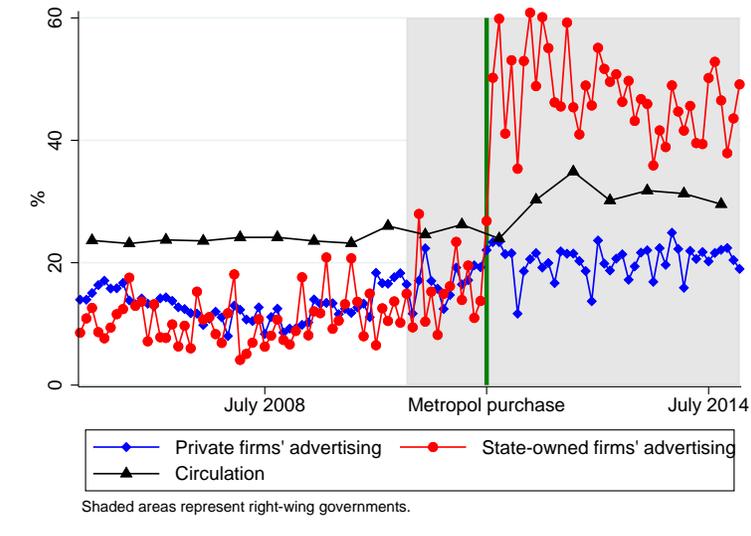
was below 20%, slightly lower than its circulation share. Immediately after the month of purchase, its share in state-owned firms' print advertising jumped to above 50%. This was accompanied by a much smaller increase of its circulation and essentially no change of its share in private firms' advertising.

Fallout in 2015. Our third event is the fallout between Orbán and Simicska discussed in Section 2.1. In February 2015, in a surprise event, much of the top management of the Simicska media empire resigned; Simicska blamed Orbán and called him unprintable names in interviews (MMM 2016, Pethő and Szabó 2019). Figure 3 shows the combined advertising share of the investor's two daily newspapers Magyar Nemzet and Metropol. The increase in state-owned firms advertising after 2010 is the pattern we have seen in the previous figures. The novelty is the period around the "fallout" in February 2015: in the course of just a few months, the share of state-owned firms' advertising in the investor's papers dropped from above 60% to below 20%. The decline started a few months before the fallout became public.

Online market 2013-2016. Paralleling the fallout new right-connected outlets emerged in several markets. We focus on online media, which is relevant for the content analysis below. During the 2010s online portals have become an important news source, and two leading portals emerged,

Figure 3: Share of investor's dailies around fallout, R/All
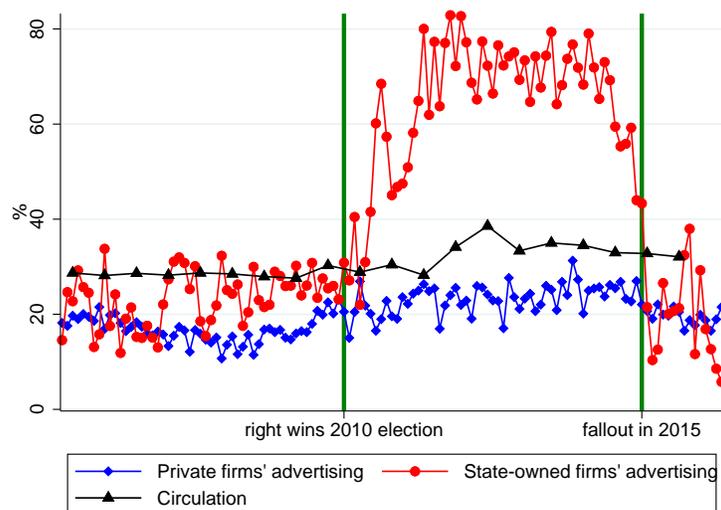
Origo and *Index*. Our fourth and fifth events concern Origo, owned by the Hungarian subsidiary of the German telecommunications giant Telekom in the beginning of the period. In August 2014 the editor of Origo was replaced, allegedly because of pressure from the government after Origo investigated a government scandal. And in January 2016 Telekom sold Origo to a business group connected to the cousin of the governor of the central bank (MMM 2016).

Figure 4 plots advertising in Origo relative to the combined advertising in Origo and Index. We also show the composition of the number of visitors (real users), which confirms that the two portals were roughly equally popular during the period. The figure shows an increase in state-owned firms' relative advertising in Origo after the first event; and another increase in their relative advertising in Origo after the second event. There were no corresponding increases in private firms' relative advertising or in the relative number of visitors.

Interpretation as favors. One interpretation of the above patterns is as favors from the government to connected media. According to this interpretation, the government targets advertising to connected outlets not for economic but for other—e.g., political—reasons. This interpretation can explain the key patterns around all five events. When an outlet becomes more closely connected to the right-wing government, it starts to receive advertising favors; and when it loses its connection

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Figure 4: Share of Origo around change in editor and owner, $Origo/(Index + Origo)$
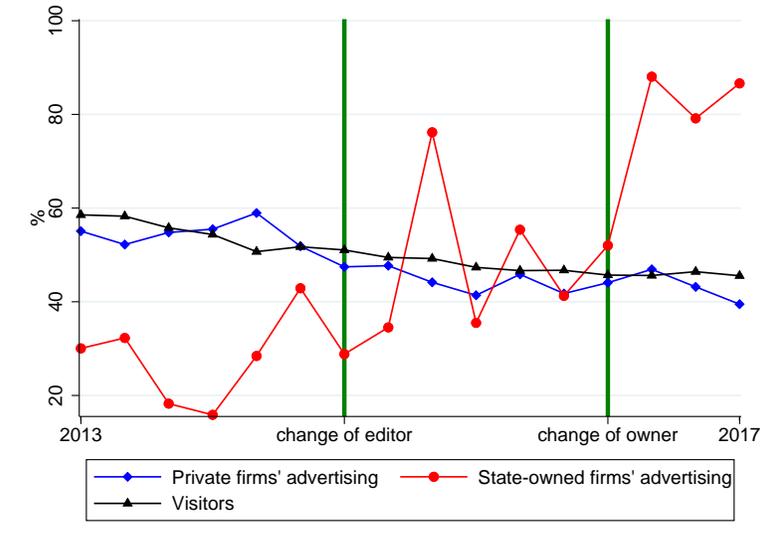
status, advertising favors stop.

The broad alternative interpretation is that the allocations represent some market based motive. A leading candidate is audiences: in this interpretation the changes in advertising are driven by changes in advertisers' target audiences. Several facts and arguments speak against this interpretation. (1) Private advertising did not change around the events, so the changes in target audiences would have to be specific to government advertisers. (2) The audience-based explanation requires two qualitatively different mechanisms to explain the five facts. To explain the cross-government patterns, it requires a change in state-owned firms' preferred audience. To explain the within-government patterns—e.g., Metropol—it requires a change in the outlets' actual audience. (3) Audiences are unlikely to change drastically in a matter of months, especially for a free-of-charge newspaper, making it difficult to explain the sharp changes after the purchases of Metropol and Origo, and around the fallout. (4) We present direct evidence on online audiences in Online Appendix A3.1 and show that several key demographics of the readers of Index and Origo evolved in parallel around Origo's change in editor and owner. There is no evidence for changing audiences.[19] (5) We also present evidence on the evolution of pre-existing readers' opinions in Online Appendix

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[19] Unfortunately corresponding data on consumers in the print market are not available.

A3.1. A 2013 poll which included questions on media consumption provides data on readers' demographics and political preferences. Using subsequent polls we track the dynamics of political preferences of people having the demographics of the readers of Index respectively Origo in 2013, and find that they evolved essentially in parallel. This is perhaps unsurprising since in 2013 the overlap between the readers of Origo and Index was 69%. For print media, we similarly find that the political opinions of people having the demographics of 2013 readers of Magyar Nemzet evolved in parallel to those of both Népszabadság and Index. (6) The target audience explanation requires large swings in the target audiences of state-owned firms. We do not see large swings in the target audiences of private firms: Online Appendix A3.2 shows that there were only small differences in their advertising composition by industry or firm size, which varied at most slightly with the political cycle.

A second market-based explanation is based on prices. In this explanation, connected media offered discounts to government advertisers—perhaps as favors to the government—but government advertisers acted in a profit-maximizing fashion given these discounts. Building on an approach by Bucsky (2018), in Online Appendix A3.3 we use data we hand-collected from companies' annual reports on their total advertising spending in years 2014-16, in combination with their advertising composition in our data, to infer: (i) the average price paid by government advertisers to connected media, and (ii) the average price of all other advertising. These are admittedly imperfect measures as they also cover advertising in television and on billboards. Still, we find that state-owned firms paid three times as high prices to connected media than did private firms. This is evidence against the discounts interpretation and suggests that government advertisers rewarded connected outlets with both high quantity and high prices. We conclude that the evidence supports the advertising favors interpretation.

A related question is whether the patterns indicate favors by right-wing governments, by left-wing governments, or both. Four of the five events take place under right-wing governments, and thus show that these governments did engage in advertising favors. The patterns around our first set of events, changes in government, can be driven by either left-wing or right-wing advertising favoritism. Under the assumption that private firms' advertising composition represents the optimal

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composition also for state-owned firms, Figure 1 would imply that left-wing governments did not provide advertising favors to Népszabadság. But we do not have independent evidence supporting this assumption, and therefore we do not take a stand on whether left-wing governments engaged in advertising favoritism.[20]

3.2 Favors from the Media to the Government

We turn to document favors in media content. Our strategy is to explore changes in corruption coverage around changes in connection status. To do this we developed a measure of corruption coverage. We reviewed a number of articles in several daily and online newspapers and built a list of scandals which involved allegations of the abuse of public resources. We collectively label these corruption scandals. For each scandal, we identified a set of relevant keywords.[21] We then searched the online content of all media used in the comparisons, and for each scandal identified all articles containing the set of keywords. We hand-checked a random subset of these articles to ensure that they indeed mention the relevant scandal, and adjusted keywords when necessary to eliminate false matches. Finally, for each month we computed the share of articles that covered at least one corruption scandal.

Dailies. We first consider the online content of Simicska's main daily newspaper Magyar Nemzet, before and after the fallout and the associated decline in government advertising. Figure 5 plots the fraction of articles covering scandals in this newspaper—the "affected" right-connected daily—as well as in two others: the left-connected daily Népszabadság, and the smaller "unaffected" right-connected daily Magyar Hírlap which was not related to Simicska. The key point of the figure is that corruption coverage in the affected right-connected daily increased after the fallout from the low level of the unaffected right-connected daily to near the high level of the left-connected daily. In contrast, the gap between the two benchmark dailies was essentially unchanged. Thus the affected

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[20] To zoom in on left-wing favoritism, we looked at the purchase, during a left-wing government in 2005, of the formerly left-leaning daily Magyar Hírlap by a right-connected investor. We do not find clear patterns: in the year after the purchase the government's advertising share in Magyar Hírlap increased, then it slowly declined. We are thus not able to prove or disprove advertising favoritism under left-wing governments. During the right-wing government after 2010 there was a clear increase in government advertising in this daily.

[21] It is possible that we missed or misclassified some scandals, but because our analysis compares outlets, this does not affect the interpretation of our results. Online Appendix A6 provides more details about our procedure and contains the list of keywords.

Figure 5: Coverage of corruption scandals around fallout
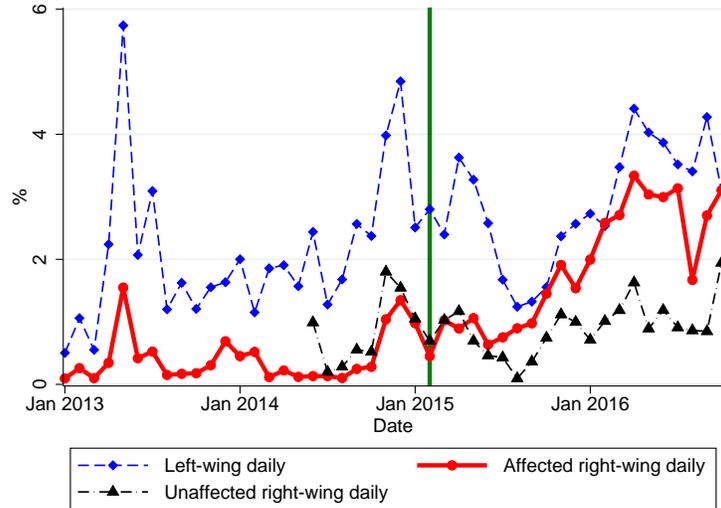
daily had low corruption coverage while it received advertising favors, but high corruption coverage after favors were terminated.

Online media. We next consider online media and compare the content of Origo with that of the other main portal Index. Figure 6 plots the fraction of articles covering scandals in Origo and Index, during the same period used in Figure 4 which showed advertising in these portals. Corruption coverage in Origo was slightly higher than that in Index in the period before the new editor; dropped below that of Index during the period with the new editor; and the gap widened substantially in the period with the new owner. The comparison with the advertising results shows that Origo decreased corruption coverage simultaneously with receiving more government advertising in two stages: in a first adjustment following the change in editor, and in a second adjustment following the change in owner. Regression results presented in Online Appendix A2.2 show that these changes in content—in both the print and online markets—are significant.

Interpretation as favors. One interpretation of the above patterns is that they are favors from connected media to the government. This interpretation can explain the changes surrounding all three events.

The leading alternative explanation is that the content changes were driven by changes in au-

Figure 6: Coverage of corruption scandals in Origo around new editor and acquisition
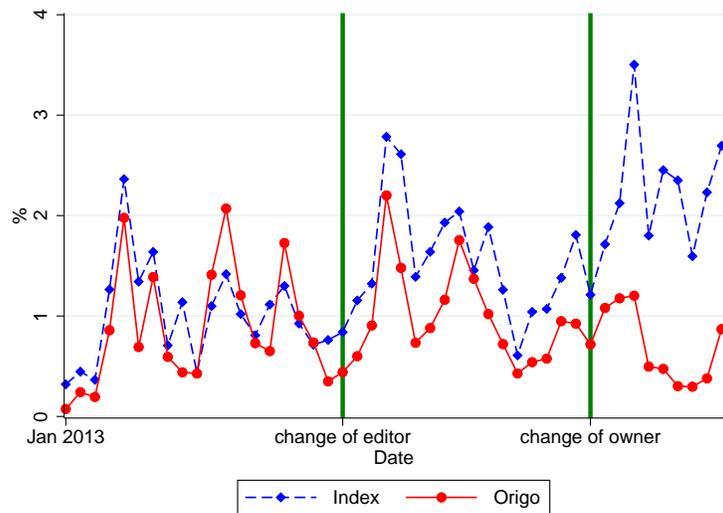
dience preferences. Several of the arguments we discussed in Section 3.1 to rule out the audience-based explanation for the advertising patterns also apply here. In the online market, as we show in Online Appendix A3.1, both audience composition and the political views of the demographics of pre-existing readers evolved in parallel for Origo and Index. These results are strong evidence against the audience-based explanation. In the print market, the political opinions of the demographics of pre-existing readers also evolved in parallel for Magyar Nemzet and both Népszabadság and Index. But perhaps the most convincing evidence in the print market comes from timing. The audience-based explanation suggests that first reader preferences, then content, and finally government advertising should change, while the actual timing of the fallout was the opposite: as Figures 3 and 5 show, advertising favors started to decline first—months before the fallout became public—and content responded several months later. We conclude that the evidence supports the content favors interpretation.

4 Structural Model and Mechanisms

The two-way favors between the government and the media we documented above may be driven by two broad mechanisms. Under the ideology mechanism the favors are disconnected: content favors are provided because of the media owner's ideological affinity with the government, and do not depend on advertising favors. Under the favor exchange mechanism the favors are connected: content favors are provided in exchange for the advertising favors received. We now turn to develop and estimate a structural model that allows us—under more restrictive assumptions than those used in the reduced-form analysis—to distinguish between these mechanisms.

4.1 Setup

Our model builds on Gentzkow and Shapiro's (2010) structural approach to analyzing the demand and supply of slant, but explicitly incorporates the government's demand for slant (Besley and Prat 2006). Thus, in our model of an oligopolistic media market, outlets' choice of pro-government slant is shaped by three forces: readers' slant preference, the government's slant preference, and the owner's ideology. Readers' slant preference determines each outlet's number of readers, which in turn affects both government and private advertising. The government's slant preference has an additional affect on government advertising. And the owner derives ideological disutility when slant departs from her ideal point. The relative strength of these forces is shaped by the owner's utility weight on profits relative to ideology. This framework incorporates both the favor exchange and the ideology mechanisms discussed above.

Formally, in our three-stage model first media outlets, then readers, and then advertisers make one-time decisions. Each decision refers to a single time period lasting T years. At stage 1, outlet $i \in \{1, 2\}$ chooses slant $\tilde{s}_i \in \mathbb{R}$ to maximize

$$V_i = \beta \cdot E\left[\sum_{j=1}^{J} p_i q_{ij}\right] - \frac{NT}{2}(\tilde{s}_i - \hat{s}_i)^2. \tag{1}$$

The first term is proportional to the expected revenue from advertising: p_i is the price of advertising and q_{ij} is the quantity placed by advertiser j at media outlet i.[22] The expectation operator is needed

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[22] We ignore circulation revenue for simplicity and because it has been zero in the online market; it could be easily

because demand q_{ij} will stochastically depend on slant $\tilde{s}_i$ as we explain below. Since we do not have high-quality price data, we assume that p_i are predetermined and exogenous.[23] The second term is the quadratic ideological cost of deviations in slant from the owner's ideological bliss point $\widehat{s}_i$. This term is proportional to N, the total mass of readers in the market, and T, the length of the horizon: slanting is more painful the more people it can reach and the longer it lasts. The key parameter β measures the relative importance of revenue versus ideology, and thus, as we will see, the relative strength of the favor exchange and ideology mechanisms.[24]

Besides the "endogenous" outlets $i = 1, 2$, the model also has an exogenous reference outlet $i = r$ whose slant equals its exogenous bliss point $\tilde{s}_r = \widehat{s}_r$. This outlet serves only as a reference relative to which the slants of the modeled outlets can be evaluated.

Readers and advertisers observe the "measured slant" of outlets $i = 1, 2, r$, which is distorted relative to true slant:

$$s_i = \tilde{s}_i + \zeta + \xi_i. \tag{2}$$

Here ζ is a latent variable that represents politically unbiased "neutral" coverage, and may depend on the number or intensity of scandals in the period. And ξ_i is measurement error from noisy monthly content observations, modelled as a mean-zero normal random variable with variance $\sigma_\xi^2/(24T)$.[25] In the data we will measure s_i as the negative of the share of articles covering corruption scandals, so that higher s_i corresponds to more pro-government coverage.

At stage 2, each reader h from the mass of readers N chooses one outlet $i = 1, 2$ to maximize

$$u_{ih} = \alpha_i + \gamma(s_i - s_r) + \varepsilon_{ih} \tag{3}$$

where α_i represents an average preference for media i, γ measures the elasticity of utility to measured slant, $s_i - s_r$ is the measured slant of media i relative to that of the reference s_r, and ε_{ih} is a reader-specific i.i.d. error term with a type-1 distribution. For example $\gamma < 0$ means that readers

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incorporated into the model of the print market.

[23] Given the Cobb-Douglas functional forms below, any level of prices will generate the same predictions for advertising spending.

[24] Equation (1) ignores the cost of production. This approach can be justified either by assuming that the cost is proportional to revenue, or that it is unrelated to slant.

[25] We normalize by 12 to make the assumption of monthly observations explicit, and by 2 for convenience in the analysis below.

dislike slant. The share of readers who choose outlet i is then

$$\frac{N_i}{N} = \frac{\exp[\alpha_i + \gamma(s_i - s_r)]}{\sum_{l=1}^{2} \exp[\alpha_l + \gamma(s_l - s_r)]}. \tag{4}$$

At stage 3, after observing measured slants (s_1, s_2, s_r) and the masses of readers (N_1, N_2), advertisers make their allocation decisions. Let G_j be an indicator for a state-owned advertiser. Advertiser j chooses its profile of advertising (q_{1j}, q_{2j}) to maximize

$$\sum_{i=1}^{2} \log(q_{ij}) \cdot N_i \exp[\nu_{ij}] \cdot \exp[G_j(\theta_i + \delta_i(s_i - s_r))]. \tag{5}$$

These are Cobb-Douglas preferences. For a private advertiser, $G_j = 0$ and the last term is one (for both outlets i), thus the Cobb-Douglas shares are proportional to the number of readers N_i, perturbed by demand shifters ν_{ij} which are mean-zero normally distributed random variables independent across advertisers and outlets. For a state-owned advertiser, $G_j = 1$ and the last term becomes active. θ_i is just an outlet-specific shifter, while the key term $\delta_i(s_i - s_r)$ represents a preference for advertising in outlets with more slanted content. This term is central to our model: with $\delta_i > 0$ it implies that advertising and slant are complements, and thus the slant of i will be rewarded with advertising by state-owned advertisers. We allow δ_i to be outlet-specific, so that it can represent a connection or tacit agreement specifically with outlet i. In practice, we will assume that $\delta_i > 0$ for connected outlets and zero otherwise.

Each advertiser j has an exogenous budget W_j dedicated to the market we study, and maximizes (5) subject to the budget constraint

$$\sum_{i=1}^{2} p_i q_i = W_j. \tag{6}$$

We assume that the demand shifters ν_{ij} in (5) have variance $1/(2W_j)$ to capture that large advertisers make more precise allocation decisions.

Strategies and equilibrium. The logic of the model is that outlets at stage 1 anticipate how their slant will affect readers' behavior at stage 2 and advertisers' behavior at stage 3, and take all of it into account when choosing their slant. Formally, at stage 3 advertiser j's behavior is characterized by $a_{ij} = p_i q_{ij}/W_j$, the budget share it allocates to outlet i. The advertiser chooses a_{ij} as a function of the measured slant profile $\vec{s} = (s_1, s_2, s_r)$, the masses of readers $\vec{N} = (N_1, N_2)$ and the preference

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shocks $\vec{\nu}_j = (\nu_{1j}, \nu_{2j})$, so we can represent its strategy with a function $a_{ij}(\vec{s}, \vec{N}, \vec{\nu}_j)$. Similarly we represent the masses of readers choosing each outlet—which can be thought of as readers' "aggregated strategy"—with functions $N_i(\vec{s})$. A strategy profile is then a vector $(\tilde{s}_1, \tilde{s}_2, \vec{N}(.), \vec{a}(.))$. In equilibrium each outlet i correctly anticipates advertisers' and readers' strategies, and maximizes (1) taking expectation over the measurement error ξ and the preference shocks ν, to best respond to the strategy of its competitor $\tilde{s}_{-i}$.

Definition 1. An equilibrium consists of outlets' strategies $(\tilde{s}_1, \tilde{s}_2)$, readers' aggregated strategies $(N_i(\vec{s}))_{i=1}^2$, and advertisers' strategies $(a_{ij}(\vec{s}, \vec{N}, \vec{\nu}_j))_{i,j=1}^2$, such that: (i) For each outlet i, $\tilde{s}_i$ maximizes (1) given $\tilde{s}_{-i}$, $N_1(\vec{s})$, $N_2(\vec{s})$ and $q_{ij} = a_{ij}(\vec{s}, \vec{N}, \vec{\nu}_j) \cdot W_j/p_i$; (ii) $N_i(\vec{s})$ satisfies (4); and (iii) $q_{ij} = a_{ij}(\vec{s}, \vec{N}, \vec{\nu}_j)W_j/p_i$ maximizes (5) subject to (6).

4.2 Discussion of model assumptions

Absolute versus relative slant. We think of slant as pro-government coverage relative to a "neutral" benchmark ζ. Readers and advertisers do not observe this benchmark because it depends on variables such as the number or severity of potential scandals in the period. But they do observe coverage in multiple outlets, and we assume base their decisions on slant relative to a reference (s_r) critical of the government that plausibly covers many potential scandals, thus netting out the latent variable ζ.

Readers' choices. By assuming that each reader must choose exactly one outlet, we introduce competition between outlets in a tractable way. In reality readers can choose multiple outlets but then need to divide their attention; and advertisers plausibly reward outlets in proportion to the units of attention they attract. Our model is a simple representation of this idea.

Readers' preferences. For simplicity, in our model all readers have the same—positive or negative—utility weight γ on slant. A natural alternative assumption may be to allow right-wing and left-wing readers to have different preferences for slant. In such an economy, we expect that the γ of our model would approximate the slant preference of the marginal reader who is indifferent between the two outlets, because the preference of that reader should determine audience responses to marginal changes in slant. Our assumption of homogeneous slant preference is especially plausi-

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ble for the online market, where—as we show in Online Appendix A3.1—the readers of Origo and Index had similar political preferences, and in fact had a 69 percent overlap, before the events.

Government preference for slant. When $\delta_i > 0$, government advertisers reward the slant of outlet i with advertising. This specification is a reduced-form representation of the government wishing to support like-minded news, either because of ideological preference or as part of an exchange with the outlet. We assume that $\delta_i > 0$ is only possible for connected outlets, to capture the idea that—because advertising and coverage generally take place at different times—both the ideology and the exchange motives require a degree of trust between the government and the outlet. Because δ_i governs the government's ability to reward slant, it is broadly similar to the transaction cost parameter τ of Besley and Prat (2006), with the difference that we allow for heterogeneity in δ_i to represent variation in connection status.

Exogenous budget. We assume that advertisers' budgets do not respond to outlets' slant choices, i.e., that W_j does not depend on s_i. Below we show that the government's advertising share followed similar trends in the online, print and television markets, suggesting that it indeed did not respond to slant choices specific to one market.

4.3 Equilibrium characterization

We assume that only media 1 is connected, so that $\delta_1 > 0$ and $\delta_2 = 0$. Let $\delta = \delta_1 - \delta_2$, $\alpha = \alpha_1 - \alpha_2$, $\theta = \theta_1 - \theta_2$, $\nu_j = \nu_{1j} - \nu_{2j}$. The following result characterizes advertisers' behavior, which can be interpreted as the demand for slant.

Proposition 1 (Demand for slant). *In any equilibrium, advertising shares satisfy*

$$\log \frac{a_{1j}}{a_{2j}} = \alpha + \gamma \cdot (s_1 - s_2) + \theta \cdot G_j + \delta \cdot (s_1 - s_r) \cdot G_j + \nu_j. \tag{7}$$

All proofs are in Online Appendix A4. The Proposition shows how the slant profile, through readers' and the government's slant preferences, determines relative advertising in the two outlets. The term $\alpha + \gamma(s_1 - s_2)$ represents the effect of readers' preferences: when $\gamma < 0$, lower slant attracts more readers and hence more advertising. The term $(\theta + \delta(s_1 - s_r))G_j$ is only active for government advertisers ($G_j = 1$) and represents the effect of the government's preferences. When

$\delta > 0$, the slant (relative to the reference) of the connected media 1 is rewarded by the government. The slant of the unconnected media 2 is not rewarded. Finally $\nu_j \sim N(0, \sigma_\nu^2/W_j)$ is an advertiser preference shock.

We next characterize outlets' behavior. Because they anticipate advertiser strategies (7), outlets take into account the marginal effect of slant on the advertising share a_{ij}. This effect turns out to depend on the *marginal advertising share*

$$mas_j = E_{\nu,\xi}[a_{1j}(1 - a_{1j})]$$

which measures the responsiveness of the advertiser's strategy to a marginal change in the benefit of advertising (e.g., for a private advertiser $\partial E[a_{1j}]/\partial \tilde{s}_1 = \gamma \cdot mas_j$). Using this notation, and letting $\xi_{1r} = \xi_1 - \xi_r$ and $\xi_{2r} = \xi_1 - \xi_r$, the following result characterizes outlets' behavior, i.e., the supply of slant.

Proposition 2 (Supply of slant). *In any equilibrium, measured slants satisfy*

$$s_1 - s_r = (\widehat{s}_1 - \widehat{s}_r) + \frac{\beta\gamma}{NT} \cdot \sum_j mas_j \cdot W_j + \frac{\beta\delta}{NT} \cdot \sum_{j:G_j=1} mas_j \cdot W_j + \xi_{1r} \tag{8}$$

and

$$s_2 - s_r = (\widehat{s}_2 - \widehat{s}_r) + \frac{\beta\gamma}{NT} \cdot \sum_j mas_j \cdot W_j + \xi_{2r}. \tag{9}$$

Equations (8) and (9) are not closed-form solutions for slant, because their right hand sides involve mas_j which depends on a_{ij} and hence on the equilibrium slants. But they are useful for intuition and estimation. Consider (8) which expresses the slant of the connected outlet 1 relative to that of the reference. The first term on the right hand side is the gap between the outlets' ideal points. Absent a preference for profits ($\beta = 0$), this is the only systematic determinant of relative measured slant. When the outlets also value profits ($\beta > 0$), the next two terms become active. The second term, which sums over all advertisers, is the *economic profit motive*. For $\gamma < 0$, this term is negative: readers' slant aversion contributes negatively to equilibrium slant. The third term, which sums only over government advertisers, is the *political profit motive*. For $\delta > 0$, this term is positive: the government's slant preference contributes positively to equilibrium slant. All

these terms depend on the advertisers' budgets W_j, which govern the size of the potential penalty or reward. They also depend on the marginal advertising shares $mas_j = E[a_{1j}(1 - a_{1j})]$, roughly because the advertising share a_{1j} can respond more to slant when its value is intermediate. And $\xi_{1r} \sim N(0, \sigma_\xi^2/(12T))$ is measurement error in slant.

Consider next (9) which expresses the slant of the unconnected outlet 2 relative to that of the reference. Here there is no political profit motive: since outlet 2 is unconnected, its slant (relative to s_r) is shaped only by the preference of readers, not that of the government.[26]

Differencing (8) and (9), denoting $\xi = \xi_1 - \xi_2$, we obtain

$$s_1 - s_2 = (\widehat{s}_1 - \widehat{s}_2) + \frac{\beta\delta}{NT} \cdot \sum_{j:G_j=1} mas_j \cdot W_j + \xi \tag{10}$$

which decomposes the systematic difference between the two outlets' measured slants into (1) the *ideology component* coming from the difference in the owners' ideal points, and (2) the *favor exchange component* coming from the political profit motive affecting the connected outlet 1. Readers' preference cancels: intuitively, these national outlets compete for the same marginal reader and the same marginal advertising dollar (formally, $a_1(1 - a_1) = a_2(1 - a_2)$). The fact that reader preferences do not enter this expression is consistent with the evidence we presented in Section 3 that audiences did not drive the changes in relative slant between the connected and unconnected outlets.

4.4 Empirical strategy

We now describe how we map the model to the data. Because readers' and advertisers' choices only reveal their relative preference between the outlets, we can only hope to identify the parameters $\alpha = \alpha_1 - \alpha_2$ and $\theta = \theta_1 - \theta_2$, but not α_i and θ_i. Thus the set of potentially identifiable demand-side parameters is $\omega^D = (\alpha, \gamma, \theta, \sigma_\nu^2, \delta)$. Similarly, because the observed slants s_i all include the unknown and time-varying "neutral coverage" component ζ, while the unobserved ideal points $\widehat{s}_i$ are all net of this term, we can only hope to identify differences between ideal points. Thus the set

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[26] Propositions 1 and 2 are necessary conditions that hold for any equilibrium. In Online Appendix A5 we numerically show that at the estimated parameters the strategy profiles meeting these conditions do constitute an equilibrium.

of potentially identifiable supply-side parameters is $\omega^S = (\beta, \sigma_\xi^2, (\widehat{s}_i - \widehat{s}_r)_{i=1}^2)$.

To infer these parameters, we structurally estimate the model for a number of time periods in the print and online markets. We call a (time period, market) pair an episode, and use the notation $e = (t, m)$ for episodes. We assume that each episode represents a complete and stand-alone environment and equilibrium of the model, so that, for example, future changes are unanticipated and do not affect the equilibrium of a given episode. In principle all components of ω^D and ω^S could vary across episodes, but we impose the following restrictions: β and γ are constant across episodes, δ_i is the same constant for connected media and zero for unconnected media, α and θ are constant within a market across periods, and σ_ξ^2 and σ_ν^2 are constant across all episodes. Most important, we assume that the $\hat{s}_i$ ideal points for $i = 1, 2$ are constant within an owner across periods.[27]

We estimate the parameters with SMM using four moment conditions. Our first two conditions help infer the demand-side parameters ω^D and amount to estimating the linear equation (7) of Proposition 1. Our second two conditions help infer the supply-side parameters ω^S and amount to estimating the non-linear equations (8) and (9) in Proposition 2.

M1 ν_j is orthogonal to the right hand side variables in (7):

$$E[\nu_j | m] = E[\nu_j \cdot G_j | m] = E[\nu_j \cdot (s_1 - s_2)] = E[\nu_j \cdot (s_1 - s_r)G_j] = 0.$$

M2 The variance of ν_j is σ_ν^2 / W_j: $E[\nu_j^2 W_j] = \sigma_\nu^2$.

M3 Expected measured slant equals equilibrium slant in each episode e: $E[\xi_{1r} | e] = E[\xi_{2r} | e] = 0$.

M4 The variance of ξ_{ir} is $\sigma_\xi^2 / (12T)$: $E[\xi_{ir}^2 \cdot 12T] = \sigma_\xi^2$.

Because α and θ vary by market while γ and δ do not, in M1 only the first two conditions are separate by market. M3 is a separate condition for each episode. M2 and M4 pool the episodes. Note that the variables used in the moment conditions vary across episodes; for simplicity we omit this dependence in the notation.

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[27] We do not impose that $\widehat{s}_r$ is constant over time. Thus by basing their decisions on $s_i - s_r$, actors net out the distortion due to ζ but may introduce new distortion due to fluctuations in $\widehat{s}_r$. We effectively assume that actors are more concerned about the former distortion.

We implement estimation in two steps. In the first step we exploit M1 and M2. This step does not require solving the model: we can simply estimate (7) in OLS. For this regression we aggregate the advertising data to the time period level, so the unit of observation is (advertiser, market, period). We weight observations by total advertising spending in the market and period, and weight markets equally. The resulting estimates satisfy M1, and the spending-weighted average of squared residuals satisfies M2.

In the second step we use M3 and M4. In this step, given a set of parameters (ω^D, ω^S) and budgets W_j we numerically solve the model, which allows us to compute the right-hand-side of equations (8) and (9) without the ξ_{ir} error terms. M3 then amounts to minimizing the distance between the left-hand-side and the right-hand-side of these equations, while M4 minimizes the distance between the theoretical and empirical second moments of ξ_{ir}. We estimate M3 and M4 with SMM using the identity matrix as the weighting matrix.

Identification in the second step requires a parameter restriction. To see why, note that with E episodes M3 consists of $2E$ equations, while M4 is a single equation. This gives us $2E + 1$ restrictions. But in general the number of supply side parameters is $2E + 2$: besides β and σ_ξ^2 there are the $2E$ relative ideal points $\widehat{s}_i - \widehat{s}_r$, one for each outlet in each episode. To reduce the number of parameters, we make use of the identification assumption that the ideal point of an owner does not change between episodes. When we impose this assumption for one owner (Telekom) the system is exactly identified, and when we impose it for two owners (Telekom and Simicska) the system is overidentified.

Logic of identification. In the online market we use as episodes the three periods surrounding the changes in editor and owner, and in the print market the two periods surrounding the fallout. Given these episodes, the demand parameter δ is essentially identified from the reduced-form patterns. Indeed, in (7) δ measures the intertemporal correlation in outlets' relative advertising and relative slant, and is thus identified from the co-occurence of increased advertising and slant in Origo following the changes in editor and owner, and of reduced advertising and slant in Magyar Nemzet following the fallout.

The identification of the supply parameter β comes from comparing between periods in which the

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connected outlet has the same owner and hence the same owner ideology. By (10), any systematic change in relative slant between such periods must come from a change in the political profit motive. In the online market, that motive turns out to change because of an increase in the government budget W. In the print market, it changes because of the changing connection status of the owner, which we model as δ dropping to zero after the fallout. In both cases, the resulting variation in the right-hand-side of (10) identifies β. We discuss potential threats to identification after presenting the results.

Inference. For inference we boostrap our entire estimation procedure. In the first step we draw advertisers, allowing for correlation in decisions within an advertiser. In the second step we draw months for each market, reflecting our assumption that measurement error in slant is uncorrelated between months, but allowing for correlation across outlets in a month.

Measurement. As we already mentioned, in the data we define measured slant as the negative of the share of articles covering government corruption scandals in an outlet. This measure captures one important aspect of pro-government coverage, but has the limitation that it is bounded from above while slant in the model is unbounded. Boundedness turns out not to be a binding constraint in our estimation, but is binding in some of our counterfactuals. In those cases we allow corruption coverage to go negative and interpret it as "praise" for the government.

Sample definition. To better capture funds allocated by the government, we include both state-owned firms and administrative government agencies in the sample of government advertisers. For the reference outlet we use the online version hvg.hu of the weekly print magazine Hvg. This outlet has been critical of the government, and hence serves as a natural benchmark relative to which the corruption coverage of other outlets can be evaluated. For robustness we also explore results with another critical reference outlet 444.hu.

4.5   Results

We report results from four specifications in Table 4. Column 1 estimates the model in the online market in the three periods depicted in Figure 6: before the change in the editor, after the change in the editor, and after the change in the owner of Origo. The identification of β comes from comparing

between periods 1 and 2, during which Origo's owner was unchanged but both its slant and—it turns out—the government's advertising budget increased. The comparison between periods 2 and 3 identifies the difference in ideal points between the old and the new owner. Column 2 estimates the model in the print market in the periods before and after the fallout, as depicted in Figure 5. Here the identification of β hinges the assumption that while the fallout made Magyar Nemzet unconnected, it did not affect the owner's ideology. Column 3 pools the online and the print market and exploits both sources of variation to identify β. Column 4 is also a pooled specification but allows the owner of Magyar Nemzet to change his ideology after the fallout. Thus in this column β is identified only from the online market. In all four specifications, δ is identified from the comovement between the connected outlet's corruption coverage (relative to the reference) and government advertising. And γ is identified from the comovement between the two outlets' relative corruption coverage and relative private advertising.

The Table reports positive and significant estimates for β and δ in all specifications, which are statistically indistinguishable across columns. The magnitude of δ can be interpreted directly: for example, in column 3, $\delta = 441$ implies that a 1 basis point increase in the connected outlet's slant would increase the advertising ratio by about 4.4 percentage points. We interpret the magnitude of β using counterfactuals below.[28] The estimates imply both that the government rewarded slant by advertising ($\delta > 0$), and that connected media responded by adjusting corruption coverage ($\beta > 0$), i.e., that the favor exchange mechanism was active in our setting. The estimate of γ is negative and significant in both markets, showing—consistent with findings in Durante and Knight (2012) and Knight and Tribin (2019)—that the marginal reader dislikes slant.

The table also reports estimates of the ideal point of the connected owner relative to that of the unconnected owner ($\widehat{s}_1 - \widehat{s}_2$). These estimates are in percentage points and measure the difference in the ideal share of articles covering corruption scandals. Column 1 shows that the initial owner of Origo, Telekom, was by 0.3 percentage points less pro-government than Index; while the new owner of Origo was by 1.3 percentage points more pro-government. In column 2 we find that

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[28] A partial equilibrium interpretation of $\beta = 1.50$ is that the outlet can be induced to reduce corruption coverage by 1 basis point with a linear incentive that rewards each basis point of slant by $1/\beta = 0.7$ Thousand Forints (2.7 USD) per year for each reader in the market. Indeed, adding $z \cdot \tilde{s}$ to (1) yields $\beta z/(NT)$ in the first order condition (8), implying—holding fixed the other terms—that a unit increase in slant can be achieved with an incentive $z = NT/\beta$.

Table 4: Structural estimates

	Online	Print	Pooled	Pooled, flexible ideology in print
Demand parameters				
Govt preference for slant δ	421	513	441	441
	(254, 566)	(234, 728)	(301, 553)	(312, 550)
Reader preference for slant γ	-53	-149	-69	-69
	(-87, -26)	(-321, 48)	(-107, -27)	(-114, -31)
Supply parameters				
Weight on profit β	1.38	1.63	1.50	1.24
	(0.58, 3.60)	(0.41, 4.48)	(0.67, 2.90)	(0.52, 3.51)
Relative ideal point $\widehat{s}_1 - \widehat{s}_2$ (percentage points)				
online, before	-0.3		-0.3	-0.2
	(-0.9, 0.1)		(-0.8, 0.0)	(-1.0, 0.1)
online, after	1.3		1.2	1.3
	(0.4 1.7)		(0.5, 1.7)	(0.6, 1.7)
print, before		1.0	1.0	1.2
		(0.7, 1.4)	(0.7, 1.4)	(0.2, 1.7)
print, after				1.0
				(0.7, 1.4)

Note: Bootstraped 95% confidence intervals in parentheses.

Simicska, the owner of Magyar Nemzet, was 1 percentage point more pro-government than the owner Népszabadság. The point estimates of these relative ideologies in the pooled specification of column 3 are similar. The ideology differences between owners imply that the shared ideology mechanism for content was also active in our setting. Finally, when in column 4 we allow the ideal point of Simicska to differ between periods, we find that he became only slightly and insignificantly less pro-government after the fallout.

Concerns with identification. Our empirical results hinge on the plausibility of our identifying assumptions. In the print market, our arguably strong identifying assumption is that the ideology of Simicska remained unchanged around the fallout. In support of this assumption, Figures 3 and

6 show that advertising favors stopped before content favors did, suggesting that the fallout was not caused by a change in Simicska's ideology. But it is also possible that the fallout itself brought about such a change. To the extent that the decline in favors made Simicska change his ideology, this pattern is just another form of favor exchange. Yet another possibility is that some other aspect of the fallout, not the decline in advertising favors, made Simicska change his ideology. Column 4 of Table 4, where we allow Simicska's ideology to differ across periods and find small and insignificant changes, speaks against this interpretation.

In the online market, the required identifying assumptions are arguably weaker. The assumption that Telekom's ideology was unchanged around the change in editor appears uncontroversial. Instead, the main threat to identification is that the increase in the government's advertising budget between periods 1 and 2 may have been endogenous to the slant chosen by Telekom. In that case the model would be misspecified and moment condition M3 would be violated.[29] To address this concern, we show in Online Appendix A5 that the increase in the government's budget share in the online market broadly paralleled similar increases in its budget share in the television and the print markets, suggesting that it was not driven by slant choices specific to that market.

Another concern with the empirical results is that actual advertising prices may systematically differ from list prices. To address this concern, we use our proxy for the connected price premium introduced in Section 3.1 and developed in Online Appendix A3.3. Re-estimating the model after adjusting advertising spending—assuming that Telekom received the unconnected price, but Origo's new owner and Simicska received the connected price— yields results qualitatively similar to Table 4 (Online Appendix A5).

Our approach implicitly assumes that we observe all favors: that corruption coverage is the slant measure that advertisers respond to, and that advertising represents all rewards that outlets receive. In reality, advertisers may respond to other components of media content such as anti-immigrant messages, and media owners may receive other types of rewards such as procurement contracts. In some special cases our results can be extended to cover these alternatives. When the "real" measure of slant is an increasing linear function of corruption coverage, using our measure

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[29] Our structural estimation allows, however, the government's budget to depend on the ideology or connection status of media owners.

simply amounts to rescaling the model parameters. Thus our qualitative and quantitative conclusions remain unaffected. Similarly, the case in which connected outlets' unobserved rewards are proportional to the government advertising they receive is analogous to the case in which connected outlets earn a higher price on government advertising. We have already seen that for a concrete value of the connected price premium our results are qualitatively similar. Of course, these special cases are restrictive, and it would be important to more fully investigate the implications of unobserved favors in future work.

A final concern is that our reference hvg.hu may not capture adequately the pool of corruption scandals relative to which actors evaluate an outlet. In Online Appendix A5 we show that our results are qualitatively similar when we use another critical outlet 444.hu as the reference.

4.6   Owner ideology versus favor exchange

We next assess the quantitative importance of the owner ideology and the favor exchange mechanisms. To do this we recompute the equilibrium of the model under different scenarios. We focus on the online market, and use the parameter estimates from column 1 of Table 4. We also compute bootstrapped confidence intervals that account for the imprecision in our parameter estimates.

Decomposition. We decompose the corruption coverage of Origo relative to what it would be in a counterfactual world in which there is no targeted advertising ($\delta = 0$) and Telekom remains the owner throughout. We define the ideology component to be the effect, under $\delta = 0$, of changing owner ideology from that of Telekom to that of the actual owner. We define the favor exchange component to be the effect, under Telekom ownership, of increasing δ from zero to its estimated value. Ideology and favor exchange can potentially interact, and we define the interaction component to be the difference between the combined effect of the two changes, and the sum of the ideology and favor exchange components.

Table 5 reports the results. In periods 1 and 2, the ideology component was by definition zero because Telekom was the owner. In these periods, favor exchange reduced corruption coverage in Origo by 29 respectively 44 percent relative to the benchmark of no targeted advertising. In period 3, after the ownership change, owner ideology absent favor exchange would have reduced corruption

Table 5: Owner ideology and favor exchange effects on corruption coverage in Origo (%)

	Total	Owner ideology	Favor exchange	Interaction
Period 1	-29	0	-29	0
	(-49, -13)		(-49, -13)	
Period 2	-44	0	-44	0
	(-59, -26)		(-59, -26)	
Period 3	-74	-63	-42	32
	(-83, -62)	(-76, -30)	(-58, -26)	(9, 40)

Note: Bootstraped 95% confidence intervals in parentheses.

coverage by 63 percent, and favor exchange absent the change in ideology by by 42 percent. The combined effect of ideology and favor exchange was a total decline of 74 percent. This is less then the sum of the parts, implying that from the perspective of the government, owner ideology and favor exchange are substitutes. Intuitively, when Origo already attracts a large share of government advertising due to its pro-government ideology, the additional reward from further increasing slant is limited. The results imply that both owner ideology and favor exchange were quantitatively important drivers of content in our setting.

The estimates are also informative about the impact of a policy that sets $\delta = 0$, and thus effectively bans targeted advertising. The numbers in Table 5 imply that such a policy would have increased corruption coverage by 41% in period 1, 79% in period 2 and 42% in period 3. Thus, policies that limit discretion in government advertising—for example by requiring that government support be proportional to reader shares—can have meaningful impacts on slant. But we emphasize that this prediction relies on two key assumptions. First, other channels through which the government can reward slant, such as bribes, favorable regulation, or procurement contracts to the owner's business, should have prohibitively high transaction costs. Second, the policy should be plausibly permanent, because a temporary pause in advertising—for example, due to an electoral loss if the party is expected to be reelected—may be accommodated by a sufficiently flexible favor exchange relationship.

Finally, the finding that ideology and favor exchange are substitutes suggests that favor exchange

is more likely to emerge in environments in which media owners' ideology tends to be critical of the government. Given that before 2005 three national dailies in Hungary were leaning to the left (Sipos 2013), this result may help explain why we have stronger evidence for favor exchange on the right.

It is instructive to compare our results to Gentzkow and Shapiro (2010), who show in the context of US newspapers that, through the profit motive of owners, readers' demand has a large effect on slant. Our results are consistent with the importance of the profit motive, and imply that when government advertising is a significant source of profits, the government's demand can also have a large effect on slant. One possible reason Gentzkow and Shapiro (2010) do not find an effect of political pressure on slant may be that government-controlled advertising in the US appears to be a small source of newspaper revenue.

Endogenous owner ideology. In the above decomposition we assume that owner ideology is exogenous, so that content only responds to advertising favors through the favor exchange mechanism. But the model highlights a new effect through which owner ideology may also be endogenous to advertising favors. The logic is straightforward: since advertising favors increase the profits from pro-government slant, they make owning the outlet relatively more attractive to investors with a more pro-government ideal point. To demonstrate this effect in our context, in Table 6 we report, for Origo, the difference in expected "net profits"—that is, expected utility after subtracting ideology costs—for the new owner relative to the old owner. We consider two scenarios: with advertising favors ($\delta > 0$) and without advertising favors ($\delta = 0$).

The point estimates in column 1 in Table 6 show that in the presence of targeted advertising, the net profit advantage of the new owner was initially negative, but increased over time and became marginally positive by period 3. In contrast, column 2 shows that in the absence of targeted advertising, Origo would have been consistently and significantly less profitable under the new owner than under Telekom. These patterns are consistent with the purchase of Origo by a pro-government investor in period 3. And while we cannot with certainty attribute Origo's purchase to targeted advertising, the table does demonstrates that advertising favors can incentivize pro-government investors to purchase media. Thus owner ideology, i.e., the supply side of media

Table 6: Net profit advantage of more pro-government owner (percent of revenue)

	Favor exchange ($\delta > 0$)	No favor exchange ($\delta = 0$)	Difference
Period 1	-7	-20	13
	(-17, 2)	(-32, -6)	(6, 16)
Period 2	-5	-18	13
	(-15, 5)	(-29, -4)	(8, 17)
Period 3	0	-17	17
	(-6, 15)	(-27, -1)	(10, 26)

Note: Bootstraped 95% confidence intervals in parentheses.

content, may also be endogenous to the demand from government advertising.

4.7 Impacts of environment and policy

We now turn to use the estimated model to examine the impacts of environmental and policy factors on media content and media capture.

Changes in private and government advertising. We first consider the impact of changes in the advertising environment. Motivated by the recent trend of declining private advertising (Angelucci and Cagé 2019), we explore the impact of a uniform decline in the advertising budget of all private advertisers. We consider a 60% decline because this is the approximate decline in the two main political dailies between 2013 and 2016 in our data. In addition, motivated by our finding that government advertising causally affects content, we also explore the impact of a uniform increase in the government advertising budget. We consider a 100% increase, which is the approximate increase in the two main online portals between 2013 and 2016 in our data. We conduct both counterfactuals for period 1 of the online market.

Table 7 reports the results. The first two columns show impacts on corruption coverage in Origo and Index. Both the decline in private and the increase in government advertising reduces corruption coverage in Origo, by 67% respectively 75%. This effect is driven by the mechanism formalized in the models of Besley and Prat (2006) and Gentzkow et al. (2006): when government

Table 7: Effects of private and government advertising

| | On corruption coverage (%) | | On return to connected |
	Origo	Index	pro-gov't owner (pp)
60% decrease in private budget	-67 (-130, -28)	-49 (-151, -17)	15 (8, 23)
100% increase in gov't budget	-75 (-97, -35)	11 (3, 27)	11 (7, 15)

Note: Bootstraped 95% confidence intervals in parentheses.

advertising becomes relatively more important, the connected outlet Origo caters more to the government. In Index, the decline in private advertising reduces, but the increase in government advertising increases corruption coverage. The former effect is due to Index catering less to readers; the latter arises because in our model government advertising is also driven in part by readers and thus incentivizes Index to cater more to them.

The third column explores how these changes in private and government advertising affect the endogenous ownership effect identified in Section 4.6, i.e., the incentive for a pro-government connected owner to buy media. Specifically, we compute the gain in net profit, under the different advertising environments, from making Origo connected and moving the owner's ideology from that of Telekom to that of the new owner. We find that the gain in net profit from such a takeover (as a share of initial revenue) is 15 respectively 11 percentage points larger when the private advertising budget is lower or the government advertising budget is higher. Intuitively, media capture is more attractive to investors when the benefit from catering to readers is lower, or when the benefit from catering to the government is higher. We also find that the change in ownership would substantially increase slant: in our counterfactuals the new owner would reduce corruption coverage by 217 respectively 145 percent, which should be interpreted—because corruption coverage cannot go negative—as increases in other aspects of slant such as praise. These results about endogenous ownership are consistent with Petrova's (2011) finding that in 19th century America higher private advertising was correlated with a politically less connected press. They also help

Table 8: Change in corruption coverage when capturing another outlet (%)

	Index	Origo	Average reader
Episode 1	-34	6	-12
	(-73, -17)	(-8, 25)	(-31, 4)
Episode 2	-19	56	12
	(-43, -10)	(25, 94)	(-5, 23)
Episode 3	-16	-19	-16
	(-77, -3)	(-138, 2)	(-86, -3)

Note: Bootstraped 95% confidence intervals in parentheses.

explain the pattern observed in the Czech Republic and Hungary that declining private advertising after the financial crisis was accompanied by the takeover of previously multinational-owned media by domestic investors with government ties (See Online Appendix A1 for details).

Capturing another outlet. In our last counterfactual we evaluate the impact of capturing the independent outlet Index. We model capture by setting the δ of Index to equal that of Origo, and report the results in Table 8. The effects on Index are straightforward: since it now gets paid for doing so, it reduces corruption coverage. The effects on Origo are more subtle. In periods 1 and 2 it *increases*, while in period 3 it reduces corruption coverage. The intuition for these results comes from the nature of competition for government money. In our model, competition is most intense when the two outlets have near equal shares in the government market. This is the case in periods 1 and 2 without the capture of Index. Capture then tilts the balance in Index's favor and thus softens competition, with the result that Origo caters less strongly to the government. But in period 3, the new owner of Origo is strongly pro-government, which realigns the balance between the two outlets when both are captured, and thus re-intensifies competition. As a result Origo now slants more relative to the case when Index is not captured. Thus both the capture of outlets, and more intense competition between connected outlets, can increase pro-government slant in the market. The idea that competition between connected outlets can reduce the effective price of slant to the government may help explain the fallout between Orbán and Simicska, and the subsequent regime

with multiple connected media owners.

5 Conclusion

This paper makes two main contributions. First it documents two-way favors between the government and connected media in Hungary. Second, it uses a structural model to distinguish between shared ideology and favor exchange as the mechanism, and documents that both are important. The structural analysis also yields new economic insights, including the potential endogeneity of owner ideology to government advertising. Since favor-like allocations appear common in many democracies, our results suggest that government advertising may have substantial effects on media content worldwide.

One interesting direction for future research may be to combine an approach like ours that estimates the impact of government advertising on content with an approach that estimates the impact of content on votes (DellaVigna and Kaplan 2007, Chiang and Knight 2011, Enikolopov, Petrova and Zhuravskaya 2011, Prat 2018). Such an analysis could measure the advertising price of a vote.

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