Ideological Persuasion in the Media

David J. Balan
Patrick DeGraba
Abraham L. Wickelgren
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David J. Balan, Patrick DeGraba
Bureau of Economics
Federal Trade Commission
dbalan@ftc.gov, pdegraba@ftc.gov

and

Abraham L. Wickelgren
University of Texas School of Law
awickelgren@law.utexas.edu

August 25, 2009

Abstract: Media outlet owners can modify their outlet’s content so as to persuade audiences to adopt positions consistent with their preferred ideologies. In this paper, we assume that outlet owners value such persuasion, and therefore will engage in it at the cost of some reduction in profits. We compare the level and diversity of persuasion that occur under two regimes: one in which common ownership of media outlets is prohibited and the other in which it is permitted. We show that mergers between outlets whose owners have identical ideologies increase the level of persuasion, and mergers between outlets whose owners have different ideologies can increase or decrease the level of persuasion. We also show that unrestricted market competition does not necessarily generate diversity, that prohibiting monopoly control over the media does not guarantee diversity, and that, while rules prohibiting monopolization can sometimes promote diversity, in some circumstances these rules can also reduce diversity. This can occur because potential owners care about who will acquire an outlet if they do not.

JEL Codes: K2, L4, L5, L8
Keywords: Media Bias, Ideological Persuasion, Media Mergers, Content Diversity

* We are grateful to Simon Anderson, John Deke, George Deltas, Guido Friebel, David Kaplan, John McMillan, Jose Luis Moraga, Daniel O’Brien, Marco Ottaviani, David Reiffen, Andrei Shleifer, Jean Tirole, William Vogt, and seminar participants at the 2004 Summer Meeting of the Econometric Society, the Federal Trade Commission, George Mason University, Georgetown University, George Washington University, Hebrew University, the 2004 IDEI-ZEI Media Conference in Toulouse, the 2004 International Industrial Organization Conference, the National Bureau of Economic Research, the 2004 Southern Economic Association Meetings, the 2004 Stanford Conference on the Media and Economic Performance, Tel-Aviv University, and the University of Texas at Austin, for their helpful comments. The views expressed in this paper are those of the authors and do not represent the views of the Federal Trade Commission or of any individual Commissioner.
I. Introduction

“The widest possible dissemination of information from diverse and antagonistic sources is essential to the welfare of the public.” The Federal Communications Commission (FCC) presented this as the guiding principle behind its controversial decision to relax common ownership restrictions on media outlets. Dissenting from the decision (but not from the principle) Commissioner Michael Copps stated: “… At issue is whether a few corporations will be ceded enhanced gatekeeper control over the civil dialogue of our country; more content control over our music, entertainment and information; and veto power over the majority of what our families watch, hear and read.”

At the heart of these statements is a belief that media owners can affect the content on their outlets and that they can do so in a manner that advances their own ideological agendas. This belief is consistent with claims, on both the political left and the right, that major media outlets heavily promote their preferred political agendas. The source of the concern is the fear that too little ownership diversity could lead to incomplete and potentially biased representation of important issues in the media. Since the FCC sets its policies at least in part to bolster viewpoint diversity, it is important to understand what factors affect such diversity. Moreover, even if one believes, contrary to the opinion of most people, that viewpoint diversity decreases social welfare, it is still worthwhile to analyze the factors that affect it. As long as media outlets significantly affect public opinion, it is important to understand how ownership structure affects the outlets’ content choices, and which ownership structures are likely to prevail.

This paper presents a model that explicitly assumes media owners have an interest in altering their content in order to persuade viewers to adopt positions consistent with their ideologies. We use this

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2 The FCC is responsible for ensuring that such diversity is maintained. One way it has done so is by limiting permissible media concentration, as well as limiting cross-ownership between different kinds of media (such as television stations and newspapers) within a given geographic area. Its 2003 decision to relax these restrictions is currently under debate in both Congress and the courts.
3 Copps (2003)
4 The reference in these remarks appears to be to viewpoint diversity, and not to product variety in the conventional sense. Indeed, there is evidence that increased concentration increases conventional product variety. For example, Berry & Waldfogel (2001) find that mergers increase the number of musical formats on radio stations.
5 Note that these claims typically do not allege that the owners introduce these biases to increase the outlets’ profits.
6 We refer to “viewers” merely for convenience. The model applies equally to any kind of media.
model to analyze whether unconstrained competition for media outlet ownership will lead to viewpoint diversity; whether preventing monopoly control over media outlets will necessarily ensure viewpoint diversity; and even whether rules prohibiting monopolization might, at least in some circumstances, lead to less viewpoint diversity than would have obtained absent such rules. We also examine how consolidation of media ownership affects the level of persuasion that owners introduce into their content.

As we discuss more fully in Section II, the fact that people spend large sums of money on direct political advertisements is just one example of a substantial body of evidence that the media can be an effective tool for persuasion. If media outlet owners value persuasion as well as their outlets’ profits, then they will be willing to engage in persuasion at the cost of some reduction in profits. This only matters if potential owners who value ideology will gain control of media outlets, which will happen if they are willing to outbid pure profit-maximizers for them. Since ideologues can always choose the profit-maximizing content, they should always value owning an outlet at least as much as profit-maximizing owners do. Furthermore if, at the profit-maximizing content choice, the ideological benefits from a small amount of persuasion exceed the costs in lost profits, then an ideologue will value owning an outlet strictly more than a profit-maximizing owner will, and will engage in a positive amount of persuasion.

We assume there are two media outlets and two types of potential owners. Each type has a different ideology. The relationship between the two ideologies can be anything from perfect alignment to diametric opposition. Owners value both the profits of their outlet and utility from persuasion. Each owner chooses the level of persuasion on her outlet. Any increase in persuasion requires altering the content in a way that makes the outlet less appealing to the marginal viewer, so more persuasion on one outlet reduces the number of its viewers (and profits) and increases the number of viewers on the competing outlet.

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7 We use the term “owners” as shorthand for the person with control over the media outlet, such as a controlling shareholder or a manager. While media firms are often publicly traded, the agency literature of the past twenty years has clearly demonstrated that people in control of publicly traded firms do not act as perfect agents for shareholders. We therefore model a decision-maker who trades off the profits of the media outlet against some personal benefit from affecting society through media persuasion.

8 There is a history in economics of assuming that firms maximize something in addition to profits. Perhaps the best-known example is Becker’s (1971) famous work on racial discrimination.
We first present results on how the ownership structure affects the level of persuasion. We then allow the ownership structure to be determined endogenously, and present results on equilibrium viewpoint diversity.

Our main results regarding levels are as follows. A merger between outlets with owners having identical ideologies causes persuasion to increase. This is due to what we call the “profit externality” effect: an owner of both outlets internalizes the increase in profits that one outlet earns when the other outlet increases its level of persuasion. A merger between outlets with owners having differing ideologies can either increase or decrease the level of persuasion, because owners having differing ideologies introduce two additional effects. First, the lost viewers from additional persuasion that switch to the other outlet are exposed to that outlet’s (different) ideology. Because a merger eliminates this effect (the viewers that switch to the other outlet are now exposed to the same ideology), it tends to further increase persuasion, reinforcing the profit externality effect. Operating in the other direction, however, is what we call the “concavity” effect. If there are diminishing returns to persuasion, then separate ownership with differing ideologies gives each owner a higher marginal benefit of persuasion than does common ownership. Following a merger, the acquiring owner will change the acquired outlet’s persuasion to that of her preferred ideology, reducing her marginal utility from persuasion, causing her to cut back. If this effect dominates, then a merger between two outlets whose owners have different ideologies could reduce the level of persuasion on both outlets.

We then allow the ownership of the outlets to be determined endogenously. Each owner’s willingness-to-pay for an outlet depends on the profits of the outlet as well as the increase in ideological utility that each potential owner would receive by winning the outlet away from the other potential owners. That is, the equilibrium ownership configuration depends on how much each potential owner values the outlet given that if they don’t own it someone else will. One consequence of this is that each potential owner’s willingness-to-pay depends on who will own the outlet if she does not. Another consequence is that the equilib-

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9 Not all ideological persuasion need be profit-reducing. A profit-maximizing owner may include it as a form of product differentiation. We abstract from the latter motive in order to isolate the effects of owner induced persuasion.
rium ownership configuration depends on complicated interactions between the three effects described above: the profit externality effect, the viewership effect, and the concavity effect.

Our definition of ideological diversity is that the owners of the two outlets are of different types. Our main results regarding diversity are as follows. First, we show that prohibiting common ownership (i.e., prohibiting one owner from owning both outlets) does not guarantee ideological diversity. There are conditions under which mandating that outlets be independently owned results in owners with identical ideologies purchasing the two outlets.

Second, we show that eliminating the common ownership restriction may eliminate existing diversity (as one would expect) but surprisingly may also create diversity that would not exist if the restriction were maintained. That is, there are conditions under which permitting common ownership results in the two outlets being owned by two different types of owners while prohibiting common ownership causes the outlets to be owned by two different owners of the same ideological type. The intuition is that if one owner owned both outlets, she would engage in more persuasion than if two owners with the same ideology each owned an outlet. As a result, an owner with an opposing ideology has a greater incentive to buy an outlet if common ownership is permitted than if it is prohibited.

The remainder of the paper is organized as follows. Section II discusses the evidence supporting our assumption that media outlets can in fact effectively persuade. Section III reviews some previous literature. Section IV lays out the model. Section V analyzes the effect of mergers on the level of persuasion. Section VI presents the analytical results on the effect of relaxing common ownership restrictions on viewpoint diversity. Section VII contains a discussion of the interpretation of the model. Section VIII concludes.

II. Efficacy of Persuasion

A key assumption in our model is that society’s beliefs and behavior can be influenced by media persuasion. Empirical support for this assumption comes in many forms. Political candidates spend a great deal of money on advertising. For example, in the 2008 presidential election, Barack Obama spent over
$235 million on broadcast television advertisements while John McCain spent over $125 million (New York Times 2008). The parties presumably would not spend this money unless they believed that it was effective. To say that media persuasion cannot affect people’s political views is to say that the 2008 election outcome would not have changed even if Obama had spent zero instead of $235 million on televised political advertisements while McCain had continued to spend $125 million. This is strong evidence either that media persuasion is effective or that the two major political parties in the United States are irrational, as they continue to spend large sums of money without getting any benefit from it.\textsuperscript{10,11}

There is also direct empirical evidence of the media’s influence over political opinions. Perhaps the best evidence of this effect comes from a recent paper on the effect of the introduction of Fox News. Della Vigna and Kaplan (2007) find that Fox News convinced between three and twenty eight percent of its viewers to vote Republican. Thomas Stratmann (2007) finds positive and statistically significant effects of campaign media advertising on House candidates’ vote shares.\textsuperscript{12} Huber and Arceneaux (2007) measure changes in voter attitudes for voters in non-battleground states who live in media markets adjacent to battleground states to examine the effects of presidential campaign television advertising. They find strong evidence that voters are persuaded by presidential advertisements.

David Stromberg (2005) finds evidence that campaign visits affect the probability that a presidential candidate will win any given state. He estimates that if one candidate visits a state once and the other candidate does not visit the state at all, the probability that the visiting candidate wins the state increases by 0.7 percentage points. If one candidate makes 10 visits while the other candidate makes only 7 visits, the

\textsuperscript{10} A great deal of money is also spent on persuasive commercial marketing, which strongly suggests that it is effective as well. There is considerable evidence on this point in the psychology literature. One leading "…study suggests that, although the information content of an advertisement may be the most important determinant of product attitudes under some circumstances, in other circumstances such noncontent manipulations as the celebrity status (likeability) or credibility of the product endorsers may be even more important." (Petty, Cacioppo, & Schumann, 1983).

\textsuperscript{11} A good example of the effectiveness of commercial persuasion is the effect of pharmaceutical promotions on physician prescribing behavior. A recent article in the Journal of the American Medical Associations (Wazana, 2000) surveys the medical literature on the subject. She finds that: "interactions [between physicians and] pharmaceutical representatives were also found to impact the prescribing practice of residents and physicians in terms of prescribing cost, nonrational prescribing, awareness, preference, and rapid prescribing of new drugs, and decreased prescribing of generic drugs."
candidate that visits the state 10 times increases the probability that he wins the election in that state by 0.2 percentage points. Given that a tiny percentage of the voters in any given state actually attend any of these campaign events, the dominant mechanism by which the visits affect election outcomes must be through media coverage of the event. Whether the effect is due to increased local media coverage caused by the visit, or to the fact that media coverage of a visiting candidate tends to emphasize issues of local interest, or merely to a positive feeling arising from the fact that the candidate made the effort to visit, the point is the same: media coverage of a visit influences voting behavior. Furthermore, this remains true despite the obvious fact that the content of these events, and hence the media coverage, is biased in favor of the candidate making the visit, and that the viewers (presumably) know this.

There is also direct empirical evidence, mostly from the psychology literature, on the ability of the media to persuade its viewers. In these studies, subjects are divided into several groups, each of whom is shown a different newscast. Not only did the viewing of the newscast change the subjects' beliefs, but the direction of the change varied in the expected way with the content of the newscast (viewers held a more critical view of the president’s foreign policy when exposed to newscasts covering defense inadequacies). See Roskos-Ewoldsen, Roskos-Ewoldsen, and Dillman Carpenter (2002) for a survey of this literature. Psychological research also demonstrates that the media can influence people’s political beliefs and attitudes by making certain issues more salient than others (Petty, Priester, and Brinol 2002 discuss several studies on these effects).

There is compelling evidence that persuasion works in other contexts as well. Fisman et al. (2008) show that a professor’s ideology has a substantial influence on his or her students’ distributional preferences. They used the fact that Yale law students are randomly assigned to first year professors. They had these students participate in a modified dictator-game experiment to test their preferences for equity and

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12 Previous analyses of the effect of media advertisements on vote shares failed to find a significant relationship. Stratmann (2007) argues that these earlier analyses are flawed because they did not take into account the fact that advertising prices differ across media markets.

13 George and Waldfogel (2002) provide direct empirical evidence of this effect. They show that the spread of the New York Times reduces subscription rates to local newspapers by college educated people and thereby reduces their participation in local elections.
efficiency. They found that students who had first year classes with faculty with an economics Ph.D. showed much greater preference for efficiency and less preference for equity than students whose first year instructors were non-economists.

While this evidence shows that the media can persuade its viewers, it does not explain how persuasion occurs. While our model of media persuasion does not depend on any particular explanation for how persuasion occurs, we suggest two possibilities here. The first can be found in DeMarzo, Vayanos, & Zwiebel (2003), which analyzes a model in which individuals’ failure to account for repetition of information gives rise to a persuasion bias similar to what we assume in our model (for example, that more airtime devoted to one viewpoint tends to sway viewers to that viewpoint). The basic idea is that fully accounting for repetition of information presents an extremely difficult inference problem, one that would be very difficult for people to correctly solve. They go on to discuss psychological evidence that indicates that individuals in fact do not adequately account for whether information is new or repetitive.

The second possible explanation comes from a model that we have informally sketched ourselves. The basic structure of the model is as follows. Viewers are fully rational and they rely on media outlets for information about the state of the world, but they cannot observe the information that the outlets obtain. The outlets can report all of the information that they gather, or they can selectively omit information. We find that by selectively reporting information, an outlet can bias the information available to its viewers. This influences viewers’ equilibrium beliefs, even if they know the bias of each media outlet and can fully and costlessly account for these biases when deciding what to believe after seeing a media report. The persuasion in this case arises from the fact that if a right-wing outlet (for example) were to present fewer right-wing facts than its viewers had come to expect, the viewers would (mistakenly) infer that few right-wing facts were received by the outlet, and their beliefs would move to the left.

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14 The model is available from the authors upon request.
15 This has somewhat the same structure as Holmstrom’s (1999) career concerns model in which workers have an incentive to work harder than the efficient amount in order to convince their employer that they are of high ability even though the employer takes this fact into account when inferring workers’ ability from their output. In equilibrium the employer ends up with an accurate assessment about each worker’s ability, yet still no worker can cut back their effort to the efficient level without the employer concluding that their ability is lower than it really is.
The above version of the model is sufficient to generate the result that persuasion is possible. However, if viewers fully adjust for the persuasion of ideological outlets, then an ideological owner cannot actually move viewer beliefs relative to a non-ideological one: in equilibrium ideological owners will do just enough persuasion to offset the adjustment that viewers make for their ideology (if they did less, viewers would come away with beliefs that were incorrect in the opposite direction). In order to get the result that an ideological owner can actually move viewer beliefs in her direction, relative to the beliefs that would prevail if the outlet had a non-ideological owner, our model requires that adjusting for the persuasion done by ideological owners is costly, and that some fraction of (rational) viewers will not fully do so. That is, the result requires that some viewers must be “rationally naïve.” It is likely that this is the case in reality, as figuring out an outlet’s equilibrium bias is a complicated exercise, which is only worth doing if the viewer places a high value on being correctly informed. To the extent that the effect of being informed is making better voting decisions, the benefit is negligible as an individual vote has essentially no chance of swaying an election. Some people may value being informed for its own sake, and so be willing to expend effort on making correct inferences, but there is no reason to believe that such a sentiment is universal or invariant to the costs of becoming informed.16

III. Previous Literature

A growing literature has developed devoted to the relationship between media and public policy. On the empirical side, Stromberg (2004b), Djankov et al. (2003), Besley & Prat (2002), George & Waldfogel (2002), and Besley & Burgess (2002) all demonstrate that the media can have important effects on politics and public policy. Stromberg (2004a) considers the ways in which specific characteristics of media technologies change the optimal behavior of politicians and consequently change policy. Corneo (2003) also analyzes issues of media bias, but his focus is on explaining what factors may create bias rather than analyzing the effect of ownership structure. Similarly, Baron (2004) presents a model in which outlets

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16 Indirect empirical support for this comes from the movement among Democrats to set up left-wing talk radio stations in response to the success of right-wing ones. This movement is not grounded in making a profit but to ad-
allow journalists to indulge their bias in exchange for lower wages. Because allowing bias lowers costs, a profit-maximizing media outlet may tolerate biased reporting that reduces its demand. Ellman & Germano (2004) develop a model in which profit-maximizing media owners participate in a two-sided market, with viewers on one side and advertisers on the other. Their decisions regarding content must balance the wishes of these two groups.

The closest work to ours is that of Anderson & McLaren (2007). They also consider ideologically motivated media owners and compare the ability of the media to influence policy under monopoly and duopoly. Because in their model the ideologies of the two owners are always diametrically opposed, they do not explore how the existence of diversity depends on the ideological affinity between potential owners.

Mullainathan & Shleifer (2005) is also related to our work. In their model, viewers have beliefs that they like to see confirmed in the media, and profit-maximizing outlet owners produce content tailored to those beliefs.17 They show how the distribution of viewer tastes and market structure interact to influence the equilibrium bias.

In contrast to the demand-side explanation in Mullainathan & Shleifer, we examine a supply-side incentive for media persuasion.18 These are fundamentally different assumptions which yield different testable implications. For example, their analysis predicts that, when there is one outlet, the reporting will reflect the average ideology of viewers. In our model with one outlet, it is the owner’s ideology that will be reflected in the outlet’s reporting.19 Also, in their model if there are two outlets, the reporting will always reflect the opposing ideologies and on average will reflect the average ideology of viewers. Furthermore, this result does not depend on whether the outlets are owned by different owners or the same

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17 Gentzkow & Shapiro (2005) also present a model of profit-maximizing media bias. In their model, the media biases its reporting in the direction of viewers’ prior beliefs in order to increase consumer perceptions of the accuracy of the reporting.

18 In their paper persuasion takes the form of media bias. Our modeling of persuasion need not rely on any notion that outlet owners are distorting the truth, though it is consistent with that interpretation.

19 Because of the complexity of modeling endogenous entry, we have abstracted from modeling consumer tastes. We expect that adding consumer taste would not qualitatively change our results. For example in the Mullainathan and Shleifer model with a single newspaper owner, that paper’s bias in equilibrium reflects the average ideology of the readership. Adding the assumption that the owner of the newspaper received positive utility for introducing a
owner; ownership structure does not matter in their model. In our analysis in equilibrium two owners with the same ideologies (or a single common owner) could own the two outlets, which would result in persuasion that reflected only one ideology. Alternatively, the two outlets could be owned by owners with different ideologies, in which case the two outlets will reflect the ideologies of the two owners. The point is that with supply side incentives affecting persuasion, in equilibrium the persuasion will not necessarily be equal to the average ideology of the viewers, and ownership structure therefore matters.

IV. The Model

There are two competing media outlets indexed by $j \in \{1, 2\}$. Outlets present content that attracts viewers. An outlet’s profits are an increasing function of its viewership. Viewers treat the content of the two outlets as differentiated, so changes in the content of one outlet cause some viewers to leave that outlet, a fraction of whom switch to the other outlet.

Owners can alter their outlet’s content so as to persuade viewers to adopt positions consistent with their preferred ideology. Marginal viewers regard additional amounts of persuasion as diminishing the quality of the content—the more persuasion on a particular outlet, the fewer viewers that outlet will attract. We fully recognize that some viewers have a taste for specific ideological content and that they prefer some level of persuasion. Our model therefore should be interpreted as considering deviations from the profit maximizing levels of persuasion that would occur if disinterested profit maximizing owners chose content. Thus, for example, a left wing owner modeled as increasing the level of persuasion on her outlet can be interpreted either as adding additional left wing content beyond the profit maximizing level or reducing right wing content below the profit maximizing level. We assume for simplicity, that viewers

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20 Profits could be derived either from outlets selling content directly to consumers or from selling advertising to vendors. In either case we abstract from the price setting decisions in these markets.

21 One would imagine that if viewers had very weak preferences and owners had very strong ones, owners’ preferences would dominate. Even in a model in which both viewers and owners had strong preferences, one might suspect that an owner whose ideology differed from those of her viewers would provide content tailored in part to her viewers’ ideology but slanted towards her own ideology.
react to all persuasion equally, regardless of its ideological bent, so owners only engage in persuasion consistent with their preferred ideology.

Let \( p_j \) and \( p_{-j} \) be the level of persuasion undertaken on outlets \( j \) and \( -j \), respectively. The number of viewers of outlet \( j \) is denoted \( n_j \). We assume that \( n_j = n(p_j - \gamma p_{-j}) \), where \( n \) is decreasing and weakly concave in the relevant region.\(^{22}\) The parameter \( \gamma \in (0, 1) \) is similar to a diversion ratio; it parameterizes how many viewers outlet \(-j\) gains for every one that \( j \) loses due to its persuasion. Producing content is costless, so outlet profits depend only on the number of viewers. Specifically, the profits from owning outlet \( j \) are denoted as \( \pi(n(p_j - \gamma p_{-j})) \), where \( \pi \) is increasing and weakly concave in \( n(p_j - \gamma p_{-j}) \).\(^{23}\) We can think of each outlet as being endowed with some content that would generate \( \pi(n(0)) \) if both owners engaged in the profit-maximizing level and type of persuasion.

There are two types of potential media owners: \( A \) and \( B \). Each type is characterized by a preferred ideology which owners of that type would like to persuade viewers to adopt. The degree of affinity between the ideologies is represented by the parameter \( \lambda \in [-1, 1] \). A value of \( \lambda \in (0, 1] \) (\( \lambda \in [-1, 0) \)) means that the persuasion preferred by one type increases (decreases) the utility of the other type. Assuming that \( \lambda \) is bounded by -1 implies that each type regards one unit of the most opposed persuasion as equally harmful as a unit of the most preferred persuasion is beneficial. \( \lambda = 1 \) implies the two owners are of the same ideology. Potential owners\(^{24}\) are affected by all of the persuasion in the media as a whole, regardless of which outlets they own (if any). That is, potential owners care about “effective persuasion.” We define “effective persuasion” for an \( A \)-type as:

\[
E = \psi_j p_j n(p_j - \gamma p_{-j}) + \psi_{-j} p_{-j} n(p_{-j} - \gamma p_j)
\]

\(^{22}\) \( n \) cannot be concave everywhere since an outlet cannot have a negative number of viewers. The restriction is therefore that \( n \) is concave in any region that can be reached in equilibrium. The condition for this is specified in the proof to Lemma 1 below.

\(^{23}\) If outlets receive a fixed per-viewer payment from advertisers, then \( \pi \) will be linear.

\(^{24}\) The reference is to “potential owners” rather than simply to “owners” because non-owners also care about persuasion content in the media. In what follows, this will be important for the willingness-to-pay of different types to gain control of outlets.
The parameters $\psi_j$ and $\psi_{-j}$ take on a value of 1 if the corresponding outlet is owned by an $A$-type, and take on a value of $\lambda$ if it is owned by a $B$ type. Effective persuasion for a $B$-type has the analogous definition. This means that the same persuasion is regarded differently by $A$-types than by $B$-types.

Owners derive ideological utility from effective persuasion. Ideological utility is given by the function $V(E)$, which is everywhere increasing, and which is weakly concave in the positive region. $V$ is also anti-symmetric. That is, $V(-E) = -V(E)$. This implies that $V(0) = 0$, and that a potential owner is willing to pay the same amount to avoid a level of effective persuasion $-E$ as she will be willing to pay to achieve a level of effective persuasion $E$. The concavity of $V$ for positive levels of effective persuasion, combined with anti-symmetry, implies that $V$ is convex for negative effective persuasion. All potential owners have the same $V$ function.

The total utility $u_j$ received by the owner of outlet $j$ (in the case in which the two outlets have separate owners) is simply the sum of outlet profits and ideological utility. That is:

$$u_j = \pi(n(p_j - \gamma p_{-j}) + V(p_j n(p_j - \gamma p_{-j}) + \lambda p_{-j} n(p_{-j} - \gamma p_j))$$

Given this structure, we construct the following game. The owner of each outlet chooses a level of persuasion for her outlet. Given these persuasion levels, viewers sort themselves between outlets according to $n(\cdot)$ (some viewers do not watch any outlet). Each owner receives utility as described in (2) above.

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25 Defining effective persuasion in this way has the property that effective persuasion (for either type) is represented by a single number, which can be thought of as “most-preferred persuasion person units.” For example, suppose that both outlets are owned by $A$-types, each outlet engages in 10 units of persuasion and has 100 viewers, and $\lambda = -.5$. Then effective persuasion is equal 2000 for $A$-types and -1000 for $B$-types.

26 The most straightforward interpretation of $V$ (and the most consistent with a traditional profit-maximization assumption) is that it represents monetary profits from some other enterprise also owned by a media outlet owner, which can be increased by an appropriate choice of content on the media outlet. But persuasion can also simply be a consumption good; some people would like to have others adopt certain beliefs and are willing to spend money to bring that about.

27 The most intuitive way to think about this is as follows. When effective persuasion for a particular ideology is very high, the ideology enjoys wide acceptance so there is little benefit to converting the few remaining holdouts. Similarly, when effective persuasion is very negative, the idea is so far out of the mainstream that persuading one additional person will have little effect. It is for intermediate cases, when an idea is balanced between being widely accepted and widely rejected, that persuasion is most effective.

28 This assumption is made for tractability. In fact, those with stronger ideological convictions or with a lower marginal utility of money will have higher $V$ functions. Thus, media persuasion will tend to be skewed towards the ideologies of the highly committed and/or of the wealthy.
We only consider symmetric Nash equilibria, so the level of persuasion will be the same for both outlets. This level is denoted by \( p(\lambda) \).

Total utility \( u_M \) for a monopolist owner of both outlets is:

\[
(3) \quad u_M = \pi(n(p_j - \gamma p_{-j})) + \pi(n(p_{-j} - \gamma p_j)) + V(p_j n(p_j - \gamma p_{-j}) + p_{-j} n(p_{-j} - \gamma p_j))
\]

In this case the monopolist chooses the level of persuasion on both outlets. Let \( p^M \) denote the optimal monopoly level of persuasion on each of the outlets.

V. Ownership Structure and the Level of Persuasion

This section compares the equilibrium level of persuasion \( p(\lambda) \) when the two outlets are separately owned with the equilibrium level when both outlets have a common owner. In order to analyze this, we first consider how the equilibrium level of persuasion varies with \( \lambda \) under separate ownership.

**Lemma 1:** The equilibrium level of persuasion \( p(\lambda) \) is: (i) strictly increasing in \( \lambda \) (the degree of ideological affinity between the two owners) if \( V \) is linear; and (ii) strictly decreasing in \( \lambda \) if \( V \) is sufficiently concave. That is, \( p'(\lambda) \) is strictly positive under (i) and strictly negative under (ii).

**Proof:** All proofs in Appendix 1

The intuition behind Lemma 1 is as follows. Increasing persuasion on one outlet causes some viewers to leave that outlet, and a fraction \( \gamma \) of those lost viewers go to the other outlet, where they are exposed to the other outlet’s persuasion. The more ideologically aligned are the two outlets (i.e., the larger is \( \lambda \)), the smaller is the owner’s ideological utility loss from losing viewers to the other outlet, and so the more per-

\[29\] In the appendix we prove there are no asymmetric equilibria in which the effective persuasion is positive for both owners. This does not rule out asymmetric equilibria when effective persuasion is negative for one of the owners. This could happen if, for example, \( p_j > p_{-j} \) and \( \lambda = -1 \). In this case, owner \(-j\) would have negative effective persuasion, and would therefore be operating in the convex portion of \( V \). Since the proof relies on \( V \) being concave, it does not rule out some possible asymmetric equilibria. In what follows, however, we will consider only symmetric equilibria.

\[30\] For the remainder of the paper, whenever \( p \) is followed by an argument, it refers to the equilibrium level of persuasion.
suasion that owner will do. We refer to this effect as the “viewership” effect. When \( V \) is linear, the viewership effect is the only effect operating, so \( p'(\lambda) \) is positive. When \( V \) is concave, however, there is an opposing effect, which we call the “concavity” effect. The more ideologically aligned are the two types, the more utility each type receives from the other type’s persuasion, the smaller is the marginal benefit of each owner’s persuasion, and so the less persuasion each owner will do. The concavity effect is stronger when \( V \) is more concave, and if \( V \) is sufficiently concave, then the effect dominates and \( p'(\lambda) \) is negative everywhere.\(^{32}\)

Having established these results regarding \( p'(\lambda) \), we now analyze how the equilibrium level of persuasion is affected by common ownership of the two outlets. This is the subject of the following proposition.

**Proposition 1:**

a. \( p^M > p(1) \)

b. If \( p'(\lambda) > 0 \) for all \( \lambda \), then \( p^M > p(\lambda) \) for all values of \( \lambda \).

Part (a) says that each outlet engages in more persuasion when the two outlets are commonly owned than when they are separately owned by two owners with the same ideology. The intuition is closely related to the familiar intuition underlying the price effects of mergers between substitutes: persuasion on one outlet causes some viewers (and the profits they represent) to leave that outlet and a fraction of these viewers switch to the other outlet. A monopoly owner of both outlets internalizes this externality, whereas different owners of the two outlets do not, which causes the monopolist to persuade more. We refer to this as the “profit-externality” effect.

Part (b) says that a monopolist owner of both outlets persuades more than do two owners with different ideologies, provided that equilibrium persuasion is always increasing in the degree of ideological affinity. Part (b) follows directly from Lemma 1 and from part (a) of Proposition 1: Lemma 1 says that if

\(^{31}\) Recall that when the owners of the two outlets have the same ideology (whether or not they are commonly owned), \( \lambda \) is always equal to one.
If \( p'(\lambda) < 0 \), then it is possible that a monopolist owner of both outlets will, in equilibrium, persuade less than do two owners with different ideologies. This can happen if \( V \) is sufficiently concave (so that \( p'(\lambda) \) is at least sometimes negative) and if the two ideologies are sufficiently opposed. The intuition is as follows. Following common ownership of two formerly independent outlets with different ideologies, the viewership effect (resulting from the fact that under common ownership both outlets will have the same ideology), and the profit externality effect (resulting from the common ownership itself) both tend to cause persuasion levels to increase. However if \( V \) is concave then the concavity effect is also present and works in the opposite direction; \( V \) concave means that when the two outlets switch from having owners of different types to having owners of the same type, effective persuasion goes up and the marginal utility of effective persuasion goes down, which makes the owner want to cut back on persuasion on both outlets. If \( V \) is sufficiently concave, this effect can outweigh the viewership and profit externality effects, and so total persuasion can decrease under common ownership.

The concavity effect is stronger the smaller is \( \lambda \). The reason is that the more opposed are the two ideologies, the larger the increase in effective persuasion when the two outlets switch to having the same ideology, the larger the reduction in the marginal benefit of persuasion, and so the more the outlets want to cut back on persuasion as a result.

VI. Endogenous Ownership and Diversity of Persuasion

We now turn to the issue of viewpoint diversity, where diversity is defined as an \( A \)-type owning one outlet and a \( B \)-type owning the other. Not all diversity under this definition is equally “diverse”—if the two outlets are owned by different types, but \( \lambda \) is close to 1, then the ideological bent of the media will be quite homogeneous. We characterize conditions under which there will be diversity when there is a policy

---

32 The magnitude of the viewership effect is increasing in \( \gamma \), whereas the magnitude of the concavity effect is independent of \( \gamma \). This means that \( p'(\lambda) \) is smaller when \( \gamma \) is smaller, which means that when \( \gamma \) is smaller, \( V \) can be less
regime prohibiting ownership of both outlets by a single owner (the “prohibited regime”), and compare them to the conditions under which there will be diversity when there is no such policy (the “permitted regime”).

We assume, without loss of generality, that $A_1$ owns outlet 1, which means that there is diversity if and only if a $B$-type owns outlet 2. When common ownership is prohibited, there are two potential owners for outlet 2: $A_2$ (which, like $A_1$, has $A$-type ideology) and $B$ (which has $B$-type ideology). When common ownership is permitted, there are three potential owners for outlet 2: $A_1$, $A_2$, and $B$. We examine the set of stable ownership structures given that any owner of outlet 2 can sell the outlet to any of the other potential owners.\(^{33}\) That is, an ownership structure is stable if no other owner wants to buy outlet 2 at a price at which the owner is willing to sell it. Since the utility of each potential owner depends on who ultimately owns outlet 2, each potential owner’s valuation for the outlet depends on who will own outlet 2 if she does not. We assume complete information; each player knows the value of owning outlet 2 for every potential owner.

This section compares the stable ownership structure when common ownership (i.e., one owner owns both outlets) is prohibited to the structure when it is permitted for the two polar cases for which we have analytical results: (i) where $V$ is linear; and (ii) where $V$ is sufficiently concave so that $p'(\lambda) < 0$ for all $\lambda$. We find that in both cases prohibiting common ownership does not guarantee diversity. Furthermore, when $V$ is linear, permitting common ownership never eliminates diversity, and there always exists a region of $\lambda$ for which permitting common ownership creates diversity that would not have existed if common ownership were prohibited. When $V$ is sufficiently concave so that $p'(\lambda) < 0$ for all $\lambda$, in contrast, there always exists a region of $\lambda$ for which permitting common ownership eliminates diversity, and there may or may not be a region (or regions) of $\lambda$ for which it creates diversity.

\(^{33}\)concave and still have $p'(\lambda)$ always be negative.
VI.1 Diversity of Persuasion with Linear Ideological Utility

A. Common Ownership Prohibited

When common ownership is prohibited, ownership of outlet 2 is determined by a comparison of $A_2$’s and $B$’s willingness-to-pay. If ideological utility is linear, then $V(x) = ax$, which implies owner $j$’s utility from owning an outlet (from equation (2)) is:

$$u_j = \pi(n(p_j - \gamma p_{-j})) + a[p_j n(p_j - \gamma p_{-j}) + \lambda p_{-j} n(p_{-j} - \gamma p_j)]$$

To determine the equilibrium ownership structure when common ownership is prohibited, we must first determine how much each potential owner is willing to pay to acquire the outlet. $A_2$’s willingness-to-pay for outlet 2 is equal to her utility from owning the outlet less her utility when $B$ owns the outlet. This is just the profits from owning outlet 2 plus the difference between her ideological utility when she owns outlet 2 and her ideological utility when $B$ owns it:

$$w_{A2}(\lambda) = \pi(n((1-\gamma)p(1))) + a[2p(1)n((1-\gamma)p(1)) - (1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))]$$

The first term in (5) represents outlet 2’s profits when $A_1$ and $A_2$ own the two outlets and they engage in the equilibrium level of persuasion $p(1)$. The second term represents the difference between $A_2$’s ideological utility when she owns outlet 2 and both ($A$-type) owners persuade at the level $p(1)$, and $A_2$’s ideological utility if $B$ owns outlet 2, so that there is $A$-type persuasion on one outlet and $B$-type persuasion on the other and both outlets persuade at the level $p(\lambda)$. Similarly, $B$’s willingness-to-pay for outlet 2 is:

$$w_B(\lambda) = \pi(n((1-\gamma)p(\lambda))) + a[(1+\lambda)p(\lambda)n((1-\gamma)p(\lambda)) - 2\lambda p(1)n((1-\gamma)p(1))]$$

With complete information, the only stable equilibrium is the one in which the potential owner with the greater willingness-to-pay owns the second outlet. The identity of this potential owner is given by the sign of $\Delta A_2 B(\lambda) = w_{A2}(\lambda) - w_{B}(\lambda)$.

$$\Delta A_2 B(\lambda) = \pi(n((1-\gamma)p(1))) - \pi(n((1-\gamma)p(\lambda))) + 2a(1+\lambda)[p(1)n((1-\gamma)p(1)) - p(\lambda)n((1-\gamma)p(\lambda))]$$

33 We assume that there is only one potential owner of each type for convenience. If there were multiple potential owners of each type, this would not change our results.

34 For the remainder of the paper, we will use female pronouns to refer to $A$-types and male ones to refer to $B$-types.
If $\Delta A_2B(\lambda) > 0$, then outlet 2 will be acquired by $A_2$, and if $\Delta A_2B(\lambda) < 0$, then it will be acquired by $B$. The $\Delta A_2B(\lambda)$ function is depicted in Figure 1 below.

**Figure 1**

![Diagram showing $\Delta A_2B(\lambda)$ function](image)

The function $\Delta A_2B(\lambda)$ is equal to zero when $\lambda = 1$, because in that case $A_2$ and $B$ are identical. If $\lambda = 0$, the function must be positive. To see this, note that at $B$’s optimal persuasion level, a marginal increase in persuasion gains $B$ an increase in ideological utility from more persuasion of her viewers, but this gain is just offset by the loss of some customers reducing both profits and ideological utility since they either view $A_1$, whose persuasion generates no benefit to $B$, or view no outlet at all. If $A_2$ were to own the outlet and chose $B$’s level of persuasion, then she would receive the same profit and the same utility from persuading her viewers (because $V$ is linear), and so would have the same willingness-to-pay. However, the fact that $p'(\lambda) > 0^{35}$ means that $A_2$ will persuade more if she owns the outlet than $B$ would, and also means that $A_1$ will persuade more if $A_2$ owns the outlet than she would if $B$ owned it. By revealed preference, $A_2$ values the additional persuasion more than it costs her in foregone profits. Also, the additional persuasion done by $A_1$ increases both $A_2$’s ideological utility and her profits. Since $\lambda = 0$, this additional $A$-type persuasion does not make $B$ any worse off. Thus, $A_2$ can do better than $B$ (by persuading more than $B$) and therefore has a higher willingness to pay than $B$. The same argument holds even more strongly for $\lambda \in (0, 1)$: the additional persuasion done by $A_2$ makes $B$ better off. By continuity, $\Delta A_2B(\lambda)$ must also be positive if $\lambda$ is slightly negative. So if $V$ is linear and the $A$ and $B$ types have similar or not too opposing ideologies, then requiring separate ownership of the two outlets will not result in diversity of ownership: both outlets will be owned by $A$-types.

---

35 Recall from Lemma 1 that this is true when $V$ is linear because in that case the viewership effect is the only effect present.
If \( \lambda \) is equal to -1, however, then \( B \) values outlet 2 more highly than does \( A_2 \). The reason is that at \( \lambda = -1 \), the gain in ideological utility that \( A_2 \) gets from each unit of persuasion is exactly the same as the loss experienced by \( B \) (and vice-versa). If \( B \) owns the outlet then both \( A \)-types and \( B \)-types will have ideological utility of zero, and if \( A_2 \) owns the outlet, \( B \) will lose the same amount of ideological utility as \( A_2 \) gains. This means that ideological utility considerations cancel out and ownership depends solely on which owner earns higher profits, which is always the owner that does less persuasion. Since persuasion is increasing in \( \lambda \) when \( V \) is linear (see Lemma 1), \( B \) owns the outlet when \( \lambda = -1 \). Since \( \Delta A_2B(\lambda) \) is positive at \( \lambda = 0 \) and negative at \( \lambda = -1 \), there must be some \( \lambda^* \in (-1, 0) \) at which it is equal to zero. This is the subject of the following proposition:

**Proposition 2:** For linear \( V \), if common ownership is prohibited, then there exists some \( \lambda^* \in (-1, 0) \) such that \( A_2 \) has a higher willingness-to-pay than \( B \) if \( \lambda \geq \lambda^* \).

**B. Common Ownership Permitted**

When common ownership is permitted, determining who will own outlet 2 is more complicated because there are three potential owners, and each potential owner’s willingness-to-pay depends on which other owner will own the outlet if she does not. To analyze this three-way equilibrium, we first determine the outcome of each of the three two-way comparisons in which each owner’s willingness-to-pay is based on the assumption that the other owner is the only other possible owner. (\( A_2 \) vs. \( B \), \( A_1 \) vs. \( A_2 \), and \( A_1 \) vs. \( B \)).

**i. Two-Way Comparisons**

The results of the \( A_2 \) vs. \( B \) two-way comparison are discussed above. It is straightforward to show that \( A_1 \) always outbids \( A_2 \) in a two-way comparison, because the only difference between them is that the profit externality effect is at work for \( A_1 \) but not for \( A_2 \).

We now analyze \( A_1 \) vs. \( B \). \( A_1 \)’s utility function when she owns both outlets is:

\[
\begin{align*}
\upsilon_M &= 2\pi(n((1 - \gamma)p^M) + 2\alpha p^M n((1 - \gamma)p^M)
\end{align*}
\]
This utility function determines $A_1$’s willingness-to-pay for outlet 2 given that the alternative is $B$ owning the outlet. Next, we define $w_{A1}$ and $w_B$ in a manner similar to (5) and (6) above:

\[ w_{A1}(\lambda) = 2\pi(n((1-\gamma)p^M)) - \pi(n((1-\gamma)p(\lambda))) + a[2p^M n((1-\gamma)p^M) - (1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))] \]

If $A_1$ owns the outlet instead of $B$ her profits will be equal to the difference between twice the per-outlet monopoly profit and the profit that she gets from owning outlet 1 (which she will continue to do regardless of who owns outlet 2). $B$’s willingness-to-pay to own outlet 2 instead of $A_1$ is:

\[ w_B(\lambda) = \pi(n((1-\gamma)p(\lambda))) + a[(1+\lambda)p(\lambda)n((1-\gamma)p(\lambda)) - 2\lambda p^M n((1-\gamma)p^M)] \]

Next, we define $\Delta A_1B(\lambda)$ as we defined $\Delta A_2B(\lambda)$: as the difference between $A_1$’s willingness-to-pay for outlet 2 and $B$’s willingness-to-pay for outlet 2 when these are the only two bidders.

\[ \Delta A_1B(\lambda) = 2\pi(n((1-\gamma)p^M)) - \pi(n((1-\gamma)p(\lambda))) - \pi(n((1-\gamma)p(\lambda))) + 2a(1+\lambda)[p^M n((1-\gamma)p^M) - p(\lambda)n((1-\gamma)p(\lambda))] \]

The $\Delta A_1B(\lambda)$ function is depicted in Figure 2 below. (The $\Delta A_2B(\lambda)$ function from Figure 1 is also depicted.) Due to the profit externality effect, this function must be positive at $\lambda = 1$. It must also be positive at $\lambda = 0$ and negative at $\lambda = -1$, for reasons very similar to those in the case of $\Delta A_2B(\lambda)$. Since $\Delta A_1B(\lambda)$ is positive at $\lambda = 0$ and negative at $\lambda = -1$, there must be some $\lambda^{**} \in (-1, 0)$ at which it is equal to zero. This is the subject of the following proposition:

**Proposition 3:** For linear $V$, if common ownership is permitted, then there exists some $\lambda^{**} \in (-1, 0)$ such that $A_1$ has a higher willingness-to-pay than $B$ for $\lambda \geq \lambda^{**}$.

---

**Figure 2**

![Figure 2](image-url)
ii. Three-Way Comparison.

We are now ready to analyze the three-way comparison among $A_1$, $A_2$, and $B$ willingness-to-pay for outlet 2 and to compare the outcome to the outcome under the prohibited regime. The following proposition shows that when $V$ is linear, permitting common ownership never eliminates diversity, but can create diversity that would not have existed absent the threat of common ownership.

**Proposition 4:** If $V$ is linear, then $\lambda^{**} > \lambda^*$; there is no $\lambda$ for which there is diversity if common ownership is prohibited but not diversity if common ownership is permitted; and there exists a $\lambda \in (\lambda^*, \lambda^{**})$ such that in the unique stable equilibrium there is diversity if common ownership is permitted, but not if common ownership is prohibited.

Proposition 4 is represented graphically in Figure 2 above. In that figure, there is no region in which $\Delta A_1B(\lambda)$ is positive and $\Delta A_2B(\lambda)$ is negative. This means that, when $V$ is linear, eliminating common ownership restrictions never eliminates diversity. There is, however, a region between $\lambda^*$ and $\lambda^{**}$ in which $\Delta A_2B(\lambda)$ is positive while $\Delta A_1B(\lambda)$ is negative. In this region, the only stable equilibrium entails $B$ owning outlet 2 under the permitted regime, but $A_2$ owning it under the prohibited regime, resulting in a loss of diversity.

The intuition behind this result is as follows. When $V$ is linear, $p^M > p(1) > p(\lambda)$, so $A_2$ does more persuasion than does $B$, and (because the equilibrium is symmetric) $A_1$ does more persuasion when $A_2$ owns

---

36 As Propositions 2-4 indicate, we cannot prove that neither $\Delta A_1B(\lambda)$ nor $\Delta A_2B(\lambda)$ ever become positive again anywhere to the left of the point where they first become negative. Thus, while Figure 2 represents a natural depiction of the proposition, it is not necessarily entirely accurate. Specifically, it is possible to draw alternative pictures where there are additional regions in which $\Delta A_1B(\lambda)$ is positive and $\Delta A_2B(\lambda)$ is negative. It is not, however, possible to draw alternative pictures where the opposite is true, as we show in the proof to Proposition 4 that $\Delta A_2B(\lambda) > \Delta A_1B(\lambda)$ for every $\lambda < \lambda^{**}$.

37 Proposition 4 proves that whenever $\lambda < \lambda^*$ and there is diversity when common ownership is prohibited, there must also be diversity when common ownership is permitted. The reason is that $\Delta A_1B(\lambda)$ always lies below $\Delta A_2B(\lambda)$ when $\lambda < \lambda^*$. We have not, however, proven that there is necessarily diversity whenever $\lambda < \lambda^*$ and common ownership is prohibited.

38 See the proof to Proposition 4 for a discussion of why any region in which $\Delta A_2B(\lambda)$ is positive and $\Delta A_1B(\lambda)$ is negative must be a region in which permitting common ownership creates diversity. A similar argument could be used to show that any region in which $\Delta A_1B(\lambda)$ is positive and $\Delta A_2B(\lambda)$ is negative must be a region in which permitting common ownership destroys diversity. While no such region is possible in the $V$ linear case, we will see below that such regions do exist in the case where $V$ is sufficiently concave that $p'(\lambda) < 0$ for all $\lambda$. 

21
the outlet than when $B$ does. At the critical level $\lambda^*$ (where $\Delta A_2 B(\lambda)$ is equal to zero), $A_2$’s profit plus additional ideological utility from owning the outlet rather than $B$ exactly equals $B$’s profit plus additional ideological utility from owning the outlet rather than $A_2$. If, instead, the alternative is $A_1$ owning the outlet, then $B$’s willingness-to-pay increases since $A_1$ will do more persuasion than $A_2$ would. The fact that $A_1$ does more persuasion than $A_2$ also means that $A_1$’s willingness-to-pay to own the outlet instead of $B$ is higher than $A_2$’s: she could choose to do persuasion of $p(1)$ and have the same willingness-to-pay as $A_2$ but instead chooses to do $p^M > p(1)$. We know, however, that $A_1$’s willingness-to-pay from increasing her persuasion does not increase as fast as $B$’s willingness-to-pay does, which means that $\Delta A_1 B(\lambda)$ will be negative at the critical level $\lambda^*$. There are two reasons for this. First, the concavity of the $n(\cdot)$ function means that the profit cost of additional persuasion is increasing in the level of persuasion, which reduces the benefit of additional persuasion to $A_1$ but does nothing to reduce the amount that $B$ dislikes it. Second, the increment of persuasion that $A_2$ does above what $B$ would do is matched by an increment of $A$-type persuasion of the same size by $A_1$, so $A_2$ gets the full ideological benefit of the increment but only pays half the cost. This is not true of the increment that $A_1$ does above what $A_2$ would do: for that increment $A_1$ pays all of the cost. This second reason applies even if the $n(\cdot)$ function is linear.

The results of this section are summarized in the “$V$ Linear Case” column of Table 1. As is clear from Figure 2, Case 1 is impossible when $V$ is linear: $\Delta A_1 B(\lambda)$ cannot be positive while $\Delta A_2 B(\lambda)$ is negative. In Case 2, which can only occur when $\lambda \in (-1, \lambda^*)$, $B$ owns the outlet both when common ownership is prohibited and when it is permitted, so there is diversity regardless of the policy, and the policy has no effect on the equilibrium level of persuasion. In Case 3, which can only occur when $\lambda \in (\lambda^{**}, 1)$, there is no diversity regardless of policy, but there will be common ownership if it is permitted ($A_1$ always out-bids $A_2$), which increases the equilibrium persuasion level (Proposition 1). In Case 4, which always occurs if $\lambda \in (\lambda^*, \lambda^{**})$, permitting common ownership actually creates diversity, which of course means no common ownership and which reduces the equilibrium persuasion level.
Table 1: Summary of the Effects of a Change from the Prohibited Regime to the Permitted Regime

<table>
<thead>
<tr>
<th>Case</th>
<th>( \Delta A_1^2B(\lambda) &gt; 0 &gt; \Delta A_2^1B(\lambda) )</th>
<th>Diversity?</th>
<th>( V ) Linear</th>
<th>( p'(\lambda) &lt; 0 ) for all ( \lambda )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equilibrium When Common Ownership is Prohibited</td>
<td>N/A</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Equilibrium When Common Ownership is Permitted</td>
<td>N/A</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Equilibrium When Common Ownership is Prohibited</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Equilibrium When Common Ownership is Permitted</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Persuasion Level?</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Common Ownership?</td>
<td>–</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Persuasion Level?</td>
<td>–</td>
<td>↑</td>
<td>↑</td>
</tr>
</tbody>
</table>

VI.2 Diversity of Persuasion with Highly Concave Ideological Utility

We also have analytic results for the case in which \( V \) is sufficiently concave that \( p'(\lambda) < 0 \) for all \( \lambda \).

When common ownership is prohibited, ownership of outlet 2 is determined by a comparison of \( A_2 \)'s and \( B \)'s willingness-to-pay. In this case, owner \( j \)'s utility from owning an outlet is:

\[
 u_j = \pi(n(p_j - \gamma p_{-j})) + V(p_j n(p_j - \gamma p_{-j}) + \lambda p_{-j} n(p_{-j} - \gamma p_j))
\]

We begin by examining the policy regime in which common ownership is prohibited.

A. Common Ownership Prohibited.

As before, suppose that outlet 1 is owned by \( A_1 \). As in the \( V \) linear case, any potential owner’s willingness-to-pay to acquire outlet 2 is equal to the profits from owning outlet 2 plus the difference between her ideological utility when she owns outlet 2 and her ideological utility when outlet 2 is owned by someone of the other type. So, for arbitrary \( V \), we have:
\[ w_{A2}(\lambda) = \pi(n((1-\gamma)p(1))) + V(2p(1)n((1-\gamma)p(1))) - V((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))) \]

\[ w_B(\lambda) = \pi(n((1-\gamma)p(\lambda))) + V((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))) - V(2\lambda p(1)n((1-\gamma)p(1))) \]

A2 will own outlet 2 if and only if the following is positive:

\[
\Delta A_2 B(\lambda) = \pi(n((1-\gamma)p(1))) - \pi(n((1-\gamma)p(\lambda))) + [V(2p(1)n((1-\gamma)p(1))) - V((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda)))] + [V(2\lambda p(1)n((1-\gamma)p(1))) - V((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda)))]
\]

The \( \Delta A_2 B(\lambda) \) function is depicted in Figure 3 below.

As in the \( V \) linear case, prohibiting common ownership does not guarantee diversity; \( A_2 \) owns the outlet for some values of \( \lambda \). However, here the conditions under which this happens are the opposite of what they were in the \( V \) linear case represented by Figure 1 above. In the present case there will be ideological diversity if the two ideologies are similar or if they are opposed but not too opposed.

The intuition is as follows. As in the \( V \) linear case, \( \Delta A_2 B(\lambda) \) must be equal to zero when \( \lambda = 1 \). When \( \lambda = 0 \), there are two effects present and both push in the direction of \( B \) having a higher willingness-to-pay for the outlet. The first is the concavity effect: the fact that outlet 1 already does \( A \)-type persuasion means that \( B \) would value outlet 2 more than \( A_2 \) would, even if the equilibrium persuasion levels were the same. The second is the fact that, when \( p'(\lambda) < 0 \), \( B \) does more persuasion than does \( A_2 \) (see Lemma 1). This additional persuasion benefits \( B \) but has no effect on \( A_2 \), which increases \( B \)'s willingness-to-pay relative to \( A_2 \)'s. Furthermore, the fact that the equilibrium is symmetric means that \( A_1 \) does more persuasion when \( B \) owns the outlet than when \( A_2 \) owns the outlet, which reduces \( A_2 \)'s willingness-to-pay.\(^{39}\) By a similar ar-

\[^{39}\] The concavity effect also operates on the additional increment of persuasion that \( B \) does that \( A_1 \) would not, which also pushes in the direction of \( B \) owning the outlet.
argument, $B$ owns the outlet when $\lambda$ is positive and by continuity $B$ owns when $\lambda$ is negative but not too negative.

When $\lambda = -1$, ideological utility cancels out, so the outlet will go to the type that has higher profits, which is the type that engages in less persuasion. In the $V$ linear case this was $B$, but in this case it is $A_2$. This means that $\Delta A_2B(\lambda)$ must be equal to zero at some $\lambda \in (-1, 0)$, which is the subject of the following proposition.

**Proposition 5:** For $V$ sufficiently concave so that $p'(\lambda) < 0$ for all $\lambda$, if common ownership is prohibited, then there exists some $\tilde{\lambda} \in (-1, 0)$ such that $A_2$ has higher willingness-to-pay for outlet 2 if and only if $\lambda \leq \tilde{\lambda}$.

**B. Common Ownership Permitted.**

**i. Two-Way Comparison**

The results of the $A_2$ vs. $B$ two-way comparison were discussed above. The profit externality effect guarantees that $A_1$ will always pay more than $A_2$ in a two-way comparison. To analyze the $A_1$ vs. $B$ two-way comparison, we begin by looking at $A_1$'s utility function when she owns both outlets.

\[ u_m = 2\pi(n((1-\gamma)p^M)) + V(2p^M n((1-\gamma)p^M)) \]

Next, we define $w_{A_1}$ and $w_B$ in a manner similar to (13) and (14) above:

\[ w_{A_1}(\lambda) = 2\pi(n((1-\gamma)p^M)) - \pi(n((1-\gamma)p(\lambda))) + V(2p^M n((1-\gamma)p^M) - V((1+\lambda) p(\lambda)n((1-\gamma)p(\lambda))) \]

\[ w_B(\lambda) = \pi(n((1-\gamma)p(\lambda))) + V((1+\lambda) p(\lambda)n((1-\gamma)p(\lambda)) - 2\lambda p^M n((1-\gamma)p^M)) \]

The difference between (17) and (18) gives us $\Delta A_1B(\lambda)$:

\[ \Delta A_1B(\lambda) = 2\pi(n((1-\gamma)p^M)) - \pi(n((1-\gamma)p(\lambda))) - \pi(n((1-\gamma)p(\lambda))) - V((1+\lambda) p(\lambda)n((1-\gamma)p(\lambda)) - 2\lambda p^M n((1-\gamma)p^M)) \]

---

40 This is a product of the anti-symmetry assumption; the concavity effect is completely counteracted by the convex portion of $V$, which means that $B$'s loss of ideological utility from losing the outlet to $A_2$ is the same as $A_2$'s gain, and vice-versa, so ideological utility cancels out of the willingness-to-pay calculation.
The $\Delta A_1B(\lambda)$ function must be positive at $\lambda = 1$ because of the profit externality effect. As in the case of $\Delta A_2B(\lambda)$ above, the concavity effect always pushes in the direction of $B$ owning the outlet. However, as discussed above, the level of persuasion done by $A_1 (p^M)$ can be greater or less than the level done by $B (\rho(\lambda))$. This means that there are many different possible configurations of the $\Delta A_1B(\lambda)$ function. We do know that $\Delta A_1B(\lambda)$ must be negative at some value of $\lambda$, which is the subject of the following Lemma.

**Lemma 2:** If $V$ is sufficiently concave so that $p'(\lambda) < 0$ for all $\lambda$, then there exists a $\lambda'' \in (-1, 1)$ such that $\Delta A_1B(\lambda'') < 0$.

Figures 4a and 4b below depict two configurations (among many possible ones) of the $\Delta A_1B(\lambda)$ function that are of interest for reasons that will be made clear below. (The $\Delta A_2B(\lambda)$ function from Figure 3 is depicted as well.) In Figure 4a, the $\Delta A_1B(\lambda)$ function is positive at $\lambda = 1$, becomes negative at $\lambda''$, and then becomes positive again at $\lambda'''$, which is to the right of $\bar{\lambda}$, the point at which $\Delta A_2B(\lambda)$ crosses, so that $\Delta A_1B(\lambda)$ and $\Delta A_2B(\lambda)$ never cross. In Figure 4b, $\Delta A_1B(\lambda)$ is positive at $\lambda = 1$, becomes negative at $\lambda''$, and then becomes positive again at $\lambda'''$, which in this case is to the left of $\bar{\lambda}$.

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41 This is true for every $\lambda$ except -1. At $\lambda = -1$, the anti-symmetry of $V$ eliminates the concavity effect.
**ii. Three-Way Comparison.**

We are now ready to analyze the three-way case and compare the outcome to the outcome under the prohibited regime. As we saw above, $B$ is willing to pay more than $A_2$ in a two-way comparison whenever $\lambda$ is positive, but $A_1$ pays more than $B$ whenever $\lambda$ is between $\lambda^{##}$ and 1. This means that there is always a region between $\lambda^{##}$ and 1 in which the “intuitive” thing happens: permitting common ownership causes $A_1$ to own the outlet instead of $B$, eliminating the diversity that would prevail under the prohibited regime. This can be seen in both Figure 4a and Figure 4b above. The effect of this on the level of persuasion is ambiguous: the viewership and profit externality effects tend to cause more persuasion, but the concavity effect tends to cause less.

In both Figure 4a and Figure 4b there is a region between $\max[\lambda^{##}, \lambda^\star]$ and $\lambda^{##}$ in which both $\Delta A_1 B(\lambda)$ and $\Delta A_2 B(\lambda)$ are negative, in which case $B$ owns the outlet under both regimes so that permitting common ownership has no effect on diversity or on the level of persuasion. Similarly, in both figures there is a region between -1 and $\min[\lambda^{##}, \lambda^\star]$ in which there is no diversity regardless of whether or not common ownership is permitted. In this case, permitting common ownership will cause $A_1$ to buy the outlet from $A_2$, which will have no effect on diversity, but which will cause an increase in the level of persuasion due to the profit externality effect.

The difference between Figure 4a and Figure 4b is that $\lambda^{##} > \lambda^\star$ in the former and $\lambda^{##} < \lambda^\star$ in the latter. That is, Figure 4a contains a region in which $\Delta A_1 B(\lambda) > 0$ and $\Delta A_2 B(\lambda) < 0$, so there is a second region in which permitting common ownership results in the elimination of diversity (again, with an ambiguous effect on the level of persuasion). In contrast, in Figure 4b there is a region in which $\Delta A_1 B(\lambda) < 0$ and $\Delta A_2 B(\lambda) > 0$. In this region, permitting common ownership creates diversity that was not there before. This has the effect of increasing the level of persuasion, because $B$ persuades more than does $A_2$ when $p'(\lambda) < 0$ for all $\lambda$. So permitting common ownership when $V$ is sufficiently concave that $p'(\lambda) < 0$ for all $\lambda$ always has a region of $\lambda$ in which diversity is lost, and can have an additional region in which it is lost or can have a region in which it is created.
The results of this section are summarized in the “$p'(\lambda) < 0$ for all $\lambda$” column of Table 1 in a manner analogous to the summary of the “$V$ linear” results above. See Appendix 2 for a numerical example of Case 4, in which permitting common ownership creates diversity.

The analytic results above are for the polar cases where $V$ is linear and where $V$ is sufficiently concave so that $p'(\lambda) < 0$ for all $\lambda$. In Appendix 3 we perform a numerical analysis of the model that allows for intermediate concavity of $V$. The results are broadly consistent with what would have been expected on the basis of the analytical model; the results for intermediate levels of concavity are intermediate between those of the polar cases. We find that increasing the concavity of the ideological utility function increases the size of the parameter space for which eliminating common ownership restrictions eliminates diversity.

VII. Discussion

Our notion of persuasion is more general than simple media bias, which can be found in other papers in this literature. It covers the case of a media owner who presents the parts of a news story that are most favorable to her ideology, but it also covers other cases not involving bias, such as when an outlet presents a factual account of an issue simply to raise public awareness of it. Our notion of persuasion also includes use of the media to influence social norms. If peoples’ perception of an idea (or a kind of behavior) as normal and acceptable (rather than deviant) is increasing in the frequency with which they are exposed to the idea, then ideological media owners may find it worthwhile to engage in costly repetition of that idea.

Our model hypothesizes that owners will engage in persuasion even though it makes viewers less well off, which raises the question of whether such behavior can be sustained if there is free entry. That is, if the market for media services consumed by viewers were perfectly contestable, then one might think that

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42 Raising public awareness of an issue might still reduce media profits if doing so is less entertaining than the alternative content. Since any one individual’s awareness of an issue will have very little effect on public policy, most people will have little incentive to become informed about the issue, and therefore many will have little interest in doing so.
an entrant could simply duplicate the content of a persuading incumbent, eliminate the persuasion, and
steal all of the incumbent’s viewers.

For a number of reasons the assumptions of contestability seem inappropriate for the media services
markets. First, it is unlikely an entrant could duplicate the content of an incumbent. To the extent that an
incumbent has contractual rights to certain differentiated content, it would be impossible for an entrant to
duplicate it. Second, if an incumbent has developed some reputational capital over time, it seems unlikely
a new entrant could duplicate this.

Third, to the extent that there are sunk costs to entering a media market, a new entrant may find the
strategy of entering purely to offer less persuasion than the incumbent unprofitable. The reason is that the
incumbent will respond by eliminating persuasion on her own outlet, resulting in a situation of identical
competitors driving quasi-rents down to zero.

Even if there are no sunk costs, the incumbent could reduce her price below marginal cost to compens-
sate the viewer for enduring the persuasion and win back all her customers. Even if services are not sold
directly to viewers, the incumbent could invest in increasing the quality of her content beyond the point
where the marginal revenue product equals the marginal cost. Such investment could drive the outlet’s
profits below zero. This would drive out the profit maximizing entrant, and would be undertaken by the
ideologue owner if the value of this persuasion outweighs the financial loss. Thus, as a practical matter it
would seem that there is enough product differentiation across outlets to allow an owner to engage in
more than the profit maximizing level of persuasion without losing all of her viewers to another outlet.

Our assumption that media owners persuade by modifying their outlets’ content at the expense of prof-
its is tantamount to assuming that this method of persuasion is in some cases less expensive than direct
advertising. We justify this assumption by noting that persuading by owning an outlet and modifying its
content sometimes has important advantages over persuading through advertising. The most obvious of
these is that outlet owners can persuade passively; for example, a news program could de-emphasize or
even omit a particular story. An advertiser cannot do this, and must persuade actively. For those kinds of
persuasion in which passive persuasion is effective (i.e., can be achieved with only a small reduction in
profits), an outlet owner will have a cost advantage over an advertiser. Other advantages of this kind include the ability of media owners to subtly insert persuasion into an entertaining program, again in some cases at relatively little cost to the outlet owner. The superiority of persuading by modifying content over persuading by direct advertising is greater the more difficult it is for advertisers to capture viewers’ attention, because the media outlet has already secured (and profitably sold to advertisers) their attention by virtue of the content itself.43

VIII. Conclusion

The importance of a media that presents a diversity of views is well recognized, and thus it is important to ask if the marketplace will provide a diversity of viewpoints. We have presented a model in which owners with differing ideologies compete for the ownership of one of two competing outlets. We have shown that there are conditions under which a single owner would in equilibrium own both outlets, suggesting that the market may not always generate the maximum possible diversity in ownership.

We show that when common ownership is permitted, one of two things will happen: either the two outlets will be owned by owners of different types (and there will be viewpoint diversity), or they will both be owned by a monopolist (and there will not be viewpoint diversity). We further show that instituting a rule prohibiting common ownership does not guarantee diversity; there are parameter values for which, though the two outlets have different owners, the owners are of the same ideological type. Perhaps more surprisingly, we also show that prohibiting common ownership does not even necessarily make diversity more likely. Although there are parameter values for which there is diversity if and only if common ownership is prohibited, there are also parameter values for which there is diversity if and only if common ownership is permitted. Finally, we show that mergers between outlets whose owners have identical ideologies increase the level of persuasion, and mergers between outlets whose owners have different ideologies can increase or decrease the level of persuasion.

43 Other kinds of persuasion, such as endorsement of a particular political candidate, may not have this property and may therefore be more likely to appear as direct advertisements.
The key feature of this model is that media owners are assumed to use their outlets to persuade viewers to adopt positions consistent with their preferred ideologies. This assumption can motivate additional research. One line of such research would be to examine the determinants of which ideologies are represented in the media. Another might involve determining the types of political or social behavior most amenable to media persuasion, the ways that media persuasion influences these behaviors, and the ways in which these changed behaviors affect the environment in which subsequent persuasion takes place. For example, media persuasion may influence tax policy, which would affect the economic environment, which would in turn influence the policies about which media owners subsequently wish to persuade. Analyses of this kind can help us understand why beliefs and attitudes are so different in different countries. Analyses of the welfare effects of persuasion would also be valuable, and empirical tests of these theories would be interesting as well.
Appendix 1: Proofs

Proof that there is no asymmetric equilibrium in which there is a strictly positive level of effective persuasion for both owners:

The following equations represent the first-order conditions for the utility maximizing level of persuasion for the owners of outlets $j$ and $-j$.

\[(A1a) \quad [n(p_j - \gamma p_{-j}) + p_j n'(p_j - \gamma p_{-j}) - \gamma \lambda p_j n'(p_j - \gamma p_j)]
\]
\[\quad V'(p_j n(p_j - \gamma p_{-j}) + \lambda p_j n(p_j - \gamma p_j)) + n'(p_j - \gamma p_{-j}) \pi'(n(p_j - \gamma p_{-j})) = 0\]

\[(A1b) \quad [n(p_{-j} - \gamma p_j) + p_{-j} n'(p_{-j} - \gamma p_j) - \gamma \lambda p_{-j} n'(p_{-j} - \gamma p_{-j})]
\]
\[\quad V'(p_{-j} n(p_{-j} - \gamma p_j) + \lambda p_{-j} n(p_{-j} - \gamma p_j)) + n'(p_{-j} - \gamma p_j) \pi'(n(p_{-j} - \gamma p_j)) = 0\]

The proof is by contradiction. We assume (without loss of generality) that $p_j > p_{-j}$. We show that, when this is true, the expression on the left-hand side of $(A1b)$ is strictly greater than the expression on the left-hand side of $(A1a)$. If these two expressions are not equal to each other, then they cannot both be equal to zero, so the first-order conditions cannot both be satisfied. The concavity of $n$ and $\pi$ guarantee that $n'(p_j - \gamma p_{-j}) \pi'(n(p_j - \gamma p_{-j})) < n'(p_{-j} - \gamma p_j) \pi'(n(p_{-j} - \gamma p_j))$. It will prove useful to divide the rest of the proof into three parts: (i) showing that the square-bracketed terms in $(A1a)$ and $(A1b)$ are both positive; (ii) showing that the square-bracketed term in $(A1b)$ is larger than the one in $(A1a)$; and (iii) showing that $V'$ in $(A1b)$ is larger than the one in $(A1a)$. Once these results are shown, the main result follows directly from our assumptions about $n$, $V$, and $\pi$.

\[i. \quad \text{The square-bracketed terms are both positive.}\]

If these terms are negative, then the expressions on the left-hand side of $(A1a)$ and $(A1b)$ must be strictly less than zero, a contradiction.

\[ii. \quad \text{The square-bracketed term in (A1b) is larger than the one in (A1a).}\]

Subtracting the square-bracketed term in $(A1a)$ from the square-bracketed term in $(A1b)$ and rearranging gives:

\[(A2) \quad n(p_{-j} - \gamma p_j) - n(p_j - \gamma p_{-j}) + (1 + \gamma \lambda)[p_{-j} n'(p_{-j} - \gamma p_j) - p_j n'(p_j - \gamma p_{-j})]\]

This expression is positive because $n$ and $n'$ are decreasing functions.

\[iii. \quad V' in (A1b) is larger than the one in (A1a).\]

Since $V'$ is a decreasing function, the result is proved if the argument of $V'$ in $(A1a)$ is larger than the argument of $V'$ in $(A1b)$. With a bit of manipulation, the difference between the two arguments can be written as:

\[(A3) \quad (1 - \lambda)[p_j n(p_j - \gamma p_{-j}) - p_{-j} n(p_{-j} - \gamma p_j)]\]

If $(A3)$ is non-positive, then it is possible for the owner of outlet $j$ to deviate and reduce the amount of persuasion on her outlet to $p_j$ (thereby increasing her profits), without suffering any reduction in her ideological utility. This cannot be true in equilibrium.

The main result follows directly from our assumptions about $n$, $V$, and $\pi$. 

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Proof of Lemma 1:
Imposing symmetry, the two first-order conditions in (41a) and (41b) reduce to:

\[ n((1 - \gamma) p(\lambda)) + (1 - \gamma \lambda) p(\lambda) n'(1 - \gamma) p(\lambda) \] \[ n'((1 - \gamma) p(\lambda)) \pi'((n(1 - \gamma) p(\lambda))) + \]

This condition implicitly defines \( p(\lambda), \) the equilibrium level of persuasion on each outlet. Differentiating both sides of (44) with respect to \( \lambda \) gives us \( p'(\lambda). \)

\[ p'(\lambda) = \frac{pn[n + (1 - \gamma \lambda) pn] V''(1 + \lambda) pn - \gamma pn V'(1 + \lambda) pn - (1 - \gamma)n^\pi' - (1 + \lambda)[n + (1 - \gamma \lambda) pn] V''((1 + \lambda) pn) - (1 - \gamma)n^2 \pi^n} \]

Note that in (45), \( n, n', \) and \( n'' \) are all functions of \((1 - \gamma)p(\lambda), \) which is suppressed for notational clarity. Similarly, the \( \pi' \) and \( \pi'' \) are functions of \( n((1 - \gamma)p(\lambda)), \) and \( p \) always has the argument \( \lambda; \) these are suppressed as well. The denominator in (45) above is positive. To see this, note that \( [n + (1 - \gamma \lambda) pn]' \) is the derivative of the argument of \( V \) with respect to \( p_{ij}. \) This must be positive because if it were not, it would be possible to reduce \( p_j \) and increase both profits and persuasion utility, which cannot be true in equilibrium. If this expression is positive, then the expression \( [n + (1 - \gamma \lambda) pn]' \) must be positive as well since \( \lambda \in [-1, 1]. \) For case (i), the numerator in (45) is positive. For case (ii), the sign of the numerator is ambiguous. As \( V'' \) goes to minus infinity (as \( V \) becomes more concave), the numerator goes to minus infinity as well. As \( \gamma \) goes to zero, the numerator becomes strictly negative.

Proof of Proposition 1:
If there is no common ownership, then the first order condition for \( p(\lambda) \) is given by (44) above. The first-order condition for a monopolist owner of both outlets is:

\[ (A6) \]

This condition implicitly defines \( p^M, \) the equilibrium level of persuasion on each outlet under a monopoly owner. To compare the level of persuasion under separate ownership with that under common ownership, we compare the two first-order conditions. Specifically, we exploit the fact that the left-hand side of (44) and the left-hand side of (6A) must both be equal to zero, and therefore must be equal to each other:

\[ [n((1 - \gamma) p^M) + (1 - \gamma \lambda) p(\lambda) n'(1 - \gamma (p^M))] V''((2 p^M n((1 - \gamma) p^M)) + \]

a. Assume that \( \lambda = 1 \) and that \( p^M < p(1). \) As in the proof (above) that there is no asymmetric equilibrium for positive levels of persuasion, both square-bracketed terms must be positive for (44) and (A6) to hold. The concavity of \( n \) and \( \pi \) guarantee that \( (1 - \gamma)n'(1 - \gamma (p^M)) \pi'(n(1 - \gamma p^M)) > n'(1 - \gamma p(1)) \pi'(n(1 - \gamma p(1))) \) and that the square-bracket term on the left-hand side of (A7) is greater than the square-bracketed term on the right-hand side. We know that \( p^M n((1 - \gamma) p^M) \) is in-
creasing in $p^U$ and that $p(\lambda)n(1-\gamma)p(\lambda)$ is increasing in $p(\lambda)$. If this were not the case, then both profits and ideological utility could be increased by reducing persuasion. This means that $V^*$, and therefore the entire expression, is greater on the left-hand side as well, a contradiction.

b. As shown in Lemma 1 above, when $V$ is linear, $p'(\lambda) > 0$, so $p(\lambda)$ is greatest when $\lambda = 1$. So the result follows directly from the result in (a) above.

**Proof of Proposition 2:**
As discussed in the text, $\Delta A_2B(\lambda)$ is equal to:

\[
\Delta A_2B(\lambda) = \pi(n((1-\gamma)p(1)) - \pi(n((1-\gamma)p(\lambda))) + 2a(1+\lambda)[p(1)n((1-\gamma)p(1)) - n((1-\gamma)p(\lambda))]
\]

Taking the first-order Taylor’s Series expansion of $\pi$ at $n((1-\gamma)p(1))$ and using the fact that $\pi$ is increasing and concave and $p$ is increasing since $V$ is linear, we know that:

\[
\pi(n((1-\gamma)p(1)))[n((1-\gamma)p(\lambda)) - n((1-\gamma)p(1))]|(n((1-\gamma)p(1))) > \pi(n((1-\gamma)p(\lambda)))
\]

Replacing the right-hand side of (49) with the left-hand side in (48) and simplifying:

\[
\Delta A_2B(\lambda) > [p(1) - p(\lambda)](1-\gamma)n'(1-\gamma)p(1))\pi'(n((1-\gamma)p(1))) + 2a(1+\lambda)[p(1)n((1-\gamma)p(1)) - p(\lambda)n((1-\gamma)p(\lambda))]
\]

Similarly, taking a first-order Taylor’s Series approximation of the difference between the two $n$ functions and substituting:

\[
\Delta A_2B(\lambda) > [p(1) - p(\lambda)](1-\gamma)n'(1-\gamma)p(1))\pi'(n((1-\gamma)p(1))) + 2a(1+\lambda)[p(1)n((1-\gamma)p(1)) - p(\lambda)n((1-\gamma)p(\lambda))]
\]

Evaluating the FOC from (44) at $\lambda = 1$ and substituting for $n'(1-\gamma)p(1))\pi'(n((1-\gamma)p(1)))$, and doing a bit of algebraic manipulation:

\[
\Delta A_2B(\lambda) > a\{-((1-\gamma)[p(1) - p(\lambda)][n((1-\gamma)p(1)) + (1-\gamma)p(1)n'(1-\gamma)p(1))] + 2(1+\lambda)\{(p(1) - p(\lambda)]n((1-\gamma)p(1)) - p(\lambda)n((1-\gamma)p(1)) - n((1-\gamma)p(\lambda))}]
\]

Again taking the first-order Taylor’s Series expansion of the difference between the two $n$ functions and substituting:

\[
\Delta A_2B > a[p(1) - p(\lambda)]\{-((1-\gamma)[n((1-\gamma)p(1)) + (1-\gamma)p(1)n'(1-\gamma)p(1))] + 2(1+\lambda)[n((1-\gamma)p(1)) + (1-\gamma)p(\lambda)n'(1-\gamma)p(1)]\}
\]

Replacing the $p(\lambda)$ on the second line with $p(1)$ makes the expression smaller, so the inequality continues to hold. This allows us to rewrite (413) as:

\[
\Delta A_2B(\lambda) > a[p(1) - p(\lambda)](1+\gamma + 2\lambda)[n((1-\gamma)p(1)) + (1-\gamma)p(1)n'(1-\gamma)p(1)]
\]
We know from the proof of Lemma 1 that the term in the second set of square brackets is positive, so the right-hand side has the sign of \((1 + \gamma + 2\lambda)\). This means that as long as \(\lambda < 1\), the expression is positive when \(\lambda \geq -(1+\gamma)/2\), and negative otherwise. Because the above expression is an inequality rather than an equality, the actual crossing of the \(\Delta A_2B(\lambda)\) curve must be at some value of \(\lambda\) to the left of \(-(1 + \gamma)/2\). We know that this crossing must be to the right of \(-1\), however, because we know \(\Delta A_2B(\lambda)\) must be negative when \(\lambda = -1\).44

**Proof of Proposition 3:**
This proof is almost identical to the proof of Proposition 2, and so it is omitted.

**Proof of Proposition 4:**
It is useful to divide the proposition into four parts: (i) proving that \(\Delta A_2B(\lambda)\) and \(\Delta A_1B(\lambda)\) cross once and only once for \(\lambda \in [-1, 1]\); (ii) proving that this crossing always occurs at a positive value of both functions; (iii) proving that there is no equilibrium in which there is diversity if common ownership is prohibited but no diversity if it is permitted; and (iv) proving that in the unique stable equilibrium for \(\lambda \in (\lambda^*, \lambda^{**})\) there is diversity if common ownership is permitted but not if it is prohibited. We prove each of these results in turn.

i. \(\Delta A_2B(\lambda)\) and \(\Delta A_1B(\lambda)\) cross once and only once for \(\lambda \in [-1, 1]\).

The difference between \(\Delta A_1B(\lambda)\) and \(\Delta A_2B(\lambda)\) can be written as follows:

\[
\begin{align*}
\Delta A_1B(\lambda) - \Delta A_2B(\lambda) &= 2a(1 + \lambda)[p^M n((1 - \gamma)p^M) - p((1 - \gamma)p(1))] \\
&+ 2\pi(n((1 - \gamma)p^M)) - \pi(n((1 - \gamma)p(1)) - \pi(n((1 - \gamma)p(\lambda)))
\end{align*}
\]

Differentiating this with respect to \(\lambda\) and using the first-order condition from (A44) gives:

\[
\begin{align*}
a\{(1 - \gamma)[n((1 - \gamma)p(\lambda)) + (1 - \gamma\lambda)p(\lambda)n'((1 - \gamma)p(1))]p'(\lambda) + \\
2[p^M n((1 - \gamma)p^M) - p((1 - \gamma)p(1))]
\end{align*}
\]

We know from the proof to Lemma 1 that the expression in square brackets on the first line must be positive in equilibrium. By a similar argument, the expression in square brackets on the second line must be positive as well: additional persuasion reduces profits, so it can only be worth doing if it increases ideological utility. So (A15) must be positive, which means that if \(\Delta A_2B(\lambda)\) and \(\Delta A_1B(\lambda)\) cross, they only do it once. Furthermore, we know that they must cross once. We showed in the text that \(\Delta A_1B(\lambda)\) is larger than \(\Delta A_2B(\lambda)\) at \(\lambda = 1\). At \(\lambda = -1\), however, \(\Delta A_2B(\lambda)\) must be larger. The reason is that when \(\lambda = -1\) the ideological utility terms cancel out. Since \(A_1\) does more persuasion than \(A_2\), \(A_1\) has lower profits and therefore is willing to bid less than \(A_2\) would.

ii. The crossing of \(\Delta A_2B(\lambda)\) and \(\Delta A_1B(\lambda)\) is at a positive value of both functions.

We want to show that the crossing occurs when both \(\Delta A_2B(\lambda)\) and \(\Delta A_1B(\lambda)\) are positive, as this guarantees that there exists a region of \(\lambda\) in which \(\Delta A_2B(\lambda) > 0\) and \(\Delta A_1B(\lambda) < 0\) but there is no region in which the reverse is true. To do this, we set (A15) equal to zero and solve for \(\pi(n((1 - \gamma)p(\lambda)))\). Substituting this into the expression for \(\Delta A_2B(\lambda)\) allows us to calculate its

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44 Note that the right-hand side of (A14) is equal to zero when \(\lambda = 1\), just like the \(\Delta A_2B(\lambda)\) curve itself. So the inequality is technically not strict. The reason is that the Taylor’s series approximations and the substitutions made the expression smaller for all values of \(\lambda < 1\), but left unchanged for \(\lambda = 1\).
sign at the value of \( \lambda \) for which \( \Delta A_2 B(\lambda) \) and \( \Delta A_1 B(\lambda) \) are equal. Naturally, the sign of \( \Delta A_2 B(\lambda) \) must be the same.

\[
(17) \quad 2\{a(1+\lambda)[2p(1)n((1-\gamma)p(1))-p(1)n((1-\gamma)p(1))]-p(\lambda)n((1-\gamma)p(\lambda))\} + \\
\pi(n((1-\gamma)p(1)))-\pi(n((1-\gamma)p(\lambda)))\}
\]

We want to show that this is positive, so we replace the profit difference term on the second line with a first-order Taylor’s Series approximation such that we know the following is less than the last expression:

\[
(18) \quad 2\{a(1+\lambda)[2p(1)n((1-\gamma)p(1))-p(1)n((1-\gamma)p(1))]-p(\lambda)n((1-\gamma)p(\lambda))\} + \\
[n((1-\gamma)p(1))-n((1-\gamma)p(\lambda))]\pi'(n((1-\gamma)p(1)))\}
\]

We now substitute in for \( \pi'(n((1-\gamma)p(1))) \) using the first order condition from (44) evaluated at \( p(1) \). Doing so gives the following expression:

\[
(19) \quad 2a\{(1+\lambda)[p(1)n((1-\gamma)p(1))-p(1)n((1-\gamma)p(1))]-p(\lambda)n((1-\gamma)p(\lambda))\} + \\
[p(1)n((1-\gamma)p(1))-p(\lambda)n((1-\gamma)p(\lambda))] + \\
(1-\gamma)[p(1)n((1-\gamma)p(1))+(1-\gamma)p(1)n'(1-\gamma)p(1))\}
\]

We now rewrite \( p(1)n((1-\gamma)p(1))-p(1)n((1-\gamma)p(M) \) using another Taylor’s Series approximation to obtain the following expression which is strictly smaller:

\[
(20) \quad 2a\{(1+\lambda)[p(1)n((1-\gamma)p(1))-p(1)n((1-\gamma)p(1))]-p(\lambda)n((1-\gamma)p(\lambda))\} + \\
[p(1)n((1-\gamma)p(1))+(1-\gamma)p(1)n'(1-\gamma)p(1))\}
\]

Since we want to show that this expression is positive, we can replace the \( p(1) \) in the square bracket term on the second line with \( p(1) \) (since it is smaller). Doing this, the expression simplifies to:

\[
(21) \quad 2a\{(1+\lambda)[p(1)n((1-\gamma)p(1))-p(1)n((1-\gamma)p(1))]- \\
[p(1)n((1-\gamma)p(1))+(1-\gamma)p(1)n'(1-\gamma)p(1))\}
\]

The term in square brackets on the first line must be positive. So for the expression to be negative, the second line must be negative, which implies that \( \gamma + \lambda > 0 \) at the \( \lambda \) where \( \Delta A_2 B(\lambda) \) and \( \Delta A_1 B(\lambda) \) cross. But we know that \( (1+\gamma + 2\lambda) < 0 \) whenever \( \Delta A_2 B \) is negative, which contradicts \( \gamma + \lambda > 0 \).

### iii.

*There is no equilibrium in which there is diversity if common ownership is prohibited but no diversity if it is permitted.*

Together, parts (i) and (ii) show that there exists a \( \lambda^{***} > \lambda^{**} \) such that \( \Delta A_1 B(\lambda) > \Delta A_2 B(\lambda) \) if and only if \( \lambda > \lambda^{***} \). If \( \lambda > \lambda^{**} \), then \( \Delta A_1 B(\lambda) > 0 \). If \( \Delta A_2 B(\lambda) > 0 \), then there is no diversity in the prohibited regime since the only two potential owners are A2 and B and A2 values the outlet.
more than $B$. For $\lambda < \lambda^{**}$ we know that if there is diversity in the prohibited regime, then $\Delta A_2B(\lambda) < 0$. This means that an $A$-type owning outlet 2 cannot be an equilibrium in the permitted regime either. This follows since if an $A$-type did own outlet 2 then $B$ would be willing to pay more than the maximum willingness-to-pay for either $A$-type even when the $A$-types both believe the alternative is $B$. So, we have proven that whenever there is diversity in the prohibited regime there must also be diversity in the permitted regime.45

iv. In the unique stable equilibrium, there exists a $\lambda \in (\lambda^*, \lambda^{**})$ such that there is diversity if common ownership is permitted but not if it is prohibited.

We also know from parts (i) and (ii) that for $\lambda \in (\lambda^*, \lambda^{**})$, $\Delta A_2B(\lambda) < \Delta A_2B(\lambda)$ and $0 < \Delta A_2B(\lambda)$. We also know that at $\lambda^*$, $\Delta A_2B(\lambda^*) < \Delta A_2B(\lambda^*) = 0$. By continuity, there must exist a $\lambda > \lambda^*$ such that $\Delta A_2B(\lambda) < 0 < \Delta A_2B(\lambda)$. For such $\lambda$, there is clearly no diversity in the prohibited regime. In the permitted regime, however, the outlet will be owned by $B$ (i.e., there will be diversity). The reason is as follows.

It is straightforward to show that:

$$\pi + V_B - V_{BA} > \pi A_1 + V A_1 - V_{A1B} > \pi A_2 + V A_2 - V_{A2B}$$

(The notation in (A22) is slightly different from that used in the text. $V_{BA}$, for example, is the ideological utility that $B$ gets if $A_1$ owns the outlet, when each outlet is doing its equilibrium level of persuasion.) There cannot be an equilibrium in which $A_1$ owns the outlet because $A_1$ would always want to sell it to $B$ (since $\Delta A_1B(\lambda) < 0$). There also cannot be an equilibrium in which $A_2$ owns the outlet because $A_2$ would always want to sell it to $A_1$. This is true despite the fact that if $A_2$ knows that $A_1$ will then sell it to $B$. The reason is that, as seen in (A22), $B$’s valuation for owning the outlet instead of $A_1$ is greater than $A_2$’s valuation for owning the outlet instead of $B$. This means that $A_1$ can offer to buy the outlet from $A_2$ at a price that $A_2$ will accept (knowing that it will then be sold to $B$), and can then turn around and sell it to $B$ for more than that. If $B$ owned the outlet, she would not want to sell it to $A_1$ (again because $\Delta A_1B(\lambda) < 0$). She also would not want to sell it to $A_2$ (despite the fact that $\Delta A_2B(\lambda) < 0$), because $A_2$ will sell it to $A_1$, requiring $B$ to buy it back for more than what it sold it to $A_2$ for. So, $B$ owning the outlet is the only stable equilibrium.

Proof of Proposition 5:

It is useful to divide the proposition into two parts: (i) proving that $\Delta A_2B(\lambda) < 0$ for all $\lambda \geq 0$; and (ii) proving that there is a unique $\lambda^* \in (-1, 0)$ such that $\Delta A_2B(\lambda) > 0$ when $\lambda < \lambda^*$ and that $\Delta A_2B(\lambda) < 0$ when $\lambda > \lambda^*$. We prove each of these results in turn.

i. $\Delta A_2B(\lambda) < 0$ for all $\lambda \geq 0$

As discussed in the text, $\Delta A_2B(\lambda)$ is equal to:

$$\Delta A_2B(\lambda) = \pi(n((1 - \gamma)p(l))) - \pi(n((1 - \gamma)p(\lambda)))$$

$$+ V(2p(l)n((1 - \gamma)p(l))) - V((1 + \lambda)p(\lambda)n((1 - \gamma)p(\lambda)))$$

$$+ V(2\lambda p(l)n((1 - \gamma)p(l))) - V((1 + \lambda)p(\lambda)n((1 - \gamma)p(\lambda)))$$

This can be rewritten as the sum of three differences:

45 The single-crossing property proved above guarantees that there will also be no such region for $\lambda < \lambda^*$. 

37
\[ \Delta A_2 B(\lambda) = \pi(n((1-\gamma)p(1))) - \pi(n((1-\gamma)p(\lambda))) \]

\[ + V(2p(1)n((1-\gamma)p(1))) - V((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))) \]

\[ + V(2\lambda p(1)n((1-\gamma)p(1))) - V((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))) \]

(424)

We proceed by replacing each of the three differences in (424) with something we know is larger, and showing that the resulting expression is always negative when \( \lambda \geq 0 \). For the first difference, we take the first-order Taylor’s Series expansion of \( \pi \) at \((1-\gamma)p(\lambda)\), replacing \( \pi(n((1-\gamma)p(1))) \) with \( \pi(n((1-\gamma)p(\lambda))) + [n((1-\gamma)p(1)) - n((1-\gamma)p(\lambda))]\pi'(n((1-\gamma)p(\lambda))) \). Since \( \pi \) is concave, this amounts to replacing a smaller term with a larger one. Now the first difference in equation (423) can be replaced with the Taylor’s Series approximation \( [n((1-\gamma)p(1)) - n((1-\gamma)p(\lambda))]\pi'(n((1-\gamma)p(\lambda))) \). Since \( V \) is concave when \( \lambda > 0 \), a similar exercise can be done for the second difference. A similar exercise can also be done for the third difference, except that when \( \lambda = 0 \) the expression that replaces the difference will be the equal to the original difference and not greater. This gives us:

\[ \Delta A_2 B(\lambda) < [n((1-\gamma)p(1)) - n((1-\gamma)p(\lambda))]\pi'(n((1-\gamma)p(\lambda))) \]

\[ + [2p(1)n((1-\gamma)p(1)) - (1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))] \]

\[ V'((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))) \]

\[ + [2\lambda p(1)n((1-\gamma)p(1)) - (1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))] \]

\[ V'((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))) \]

(425)

Due to the concavity of \( n \), we can make the expression in (425) larger by using a Taylor’s Series approach like the one used above and replacing \( n((1-\gamma)p(1)) - n((1-\gamma)p(\lambda)) \) with \( (1-\gamma)[p(1)-p(\lambda)]n'(1-\gamma)p(\lambda)) \). Substituting using the first-order condition in (44) and rearranging gives:

\[ \Delta A_2 B(\lambda) < \{2(1+\lambda)[p(1)n((1-\gamma)p(1)) - p(\lambda)n((1-\gamma)p(\lambda)))] \]

\[ + (1-\gamma)[p(\lambda)-p(1)]n((1-\gamma)p(\lambda)) + (1-\gamma\lambda)p(\lambda)n'(1-\gamma)p(\lambda)) \}

\[ V'((1+\lambda)p(\lambda)n((1-\gamma)p(\lambda))) \]

(426)

Once again, we can make the expression in (426) larger by making the same substitution that we made in (425). The resulting expression is negative \( \text{iff} \) the following is positive:

\[ (1+\gamma+2\lambda)n((1-\gamma)p(\lambda)) + (1-\gamma)[2(1+\lambda)p(1) - (1-\gamma\lambda)p(\lambda)]n'(1-\gamma)p(\lambda)) \]

(427)

The above expression is decreasing in \( p(1) \), so replacing \( p(1) \) with \( p(\lambda) \) is conservative. Doing this and simplifying gives the expression:

\[ (1+\gamma+2\lambda)n((1-\gamma)p(\lambda)) + (1-\gamma)(1+\gamma\lambda+2\lambda)p(\lambda)n'(1-\gamma)p(\lambda)) \]

(428)

This expression is positive because \( (1+\gamma+2\lambda) > (1+\gamma\lambda+2\lambda) \) when \( \lambda > 0 \) and because it must be the case that \( n((1-\gamma)p(\lambda)) - (1-\gamma\lambda)p(\lambda)n'(1-\gamma)p(\lambda)) > 0 \) or else the first-order condition in (44) could not hold. \( \square \)
ii. Proving there is a unique $\lambda^* \in (-1, 0)$

We know from step (i) above that $\Delta_{A_2} B(0) < 0$. To prove the present result, it is sufficient to show (a) that $\Delta_{A_2} B(-1) > 0$, and (b) that $\Delta_{A_2} B(\lambda)$ is monotonically decreasing when $\Delta_{A_2} B(\lambda) > 0$. Since $\Delta_{A_2} B(\lambda)$ is continuous, this guarantees that it must cross the horizontal axis once and only once, which implies a unique $\lambda^*$.

a. Proving that $\Delta_{A_2} B(-1) > 0$

To see this, rewrite (A24) for the case where $\lambda = -1$:

$$\Delta_{A_2} B(-1) = \pi(n((1-\gamma)p(1)) - \pi(n((1-\gamma)p(-1))) + V(2p(1)(1-\gamma)p(1))) + V(-2p(1)(1-\gamma)p(1)))$$

Because of the anti-symmetry of $V$, the terms on the second line cancel out. The intuition is that if outlet 2 is acquired by someone of type $A$, the increase in ideological utility of that owner will have the same magnitude as the decrease in ideological utility of a potential owner of type $B$. Thus, only the profit effect remains. Since, by assumption, total persuasion is decreasing in $\lambda$, and since profits are decreasing in total persuasion, (A29) is greater than zero, which means that outlet 2 will be acquired by someone of type $A$—there will not be diversity. $\square$

b. Proving that $\Delta_{A_2} B(\lambda)$ is always monotonically decreasing when it is positive.

Due to the lengthy and tedious nature of this proof, we omit it from the current draft. It is available from the authors upon request. $\square$

Proof of Lemma 2:

Recall from Proposition 1 that $p^M$ is greater than $p(\lambda)$ for sufficiently large $\lambda$ but may be smaller than $p(\lambda)$ for very small $\lambda$. If $p^M < p(-1)$ then there exists a value of $\lambda$ where $p^M = p(\lambda)$. At this $\lambda$, $B$ will value the outlet more than will $A_1$; if $A_1$ and $B$ engage in the same level of persuasion, then they will both earn the same profits from owning the outlet, but $B$ will enjoy a larger increase in ideological utility from owning the outlet (due to the concavity effect), and so will value it more. If such a $\lambda$ does not exist, then $p^M > p(-1)$. In this case, $B$ will value the outlet more than $A_1$ at $\lambda = -1$ (the ideological utility terms cancel at $\lambda = -1$, and $B$ will earn more profit since she will do less persuasion). In either case, there exists a $\lambda$ for which $B$ out-bids $A_1$. $\square$

Appendix 2: Numerical Example

We have now established the (somewhat counter-intuitive) result that if $A_2$ values outlet 2 more than $B$, but $B$ values it more than $A_1$, then there is an equilibrium under the permitted regime in which there is ownership diversity where there was none under the prohibited regime. But we have not yet shown that these conditions are ever met when $p'(\lambda) < 0$ for all $\lambda$. To show that they can be met, it is sufficient to provide a numerical example. To do this, we assume the following functional forms for the equations in the model.

$$(A30a) \quad n_j = N - \beta(p_j - \gamma p_{-j})$$

$$(A30b) \quad \pi_j = zn_j$$

$$(A30c) \quad V(y) = ay - by^2; b > 0$$
Equation (A30a) means that there is a total population of viewers \( (N) \) who will watch each outlet if there is no persuasion, and the number of actual viewers decreases linearly at a rate of \( \beta \) in the level of persuasion \( (p_j - \gamma p_j) \) (which in equilibrium is itself a function of the other parameters of the model); (A30b) means that outlet profits are linear in the number of viewers; and (A30c) means that \( V \) is quadratic and concave in effective persuasion. Using these equations, we can generate an expression for the equilibrium level of persuasion (the expression is unwieldy and is therefore omitted).

The next step is to choose a set of parameter values such that \( p'(\lambda) < 0 \) for all \( \lambda \) and show that there is a \( \lambda \) for which \( \Delta A_2 B(\lambda) > 0 \) but \( \Delta A_1 B(\lambda) < 0 \). Such an example is illustrated in the plot below. The solid line represents the \( \Delta A_2 B(\lambda) \) curve when \( a = 1, N = 1, b = 3/4, \gamma = 1/3, \beta = 1, \) and \( z = 2/3 \).\(^{46}\) Note that, as required by Proposition 5, there exists a \( \tilde{\lambda} \in (-1, 0) \) such that \( \Delta A_2 B(\lambda) \) is negative to the right of it and positive to the left. The dashed line represents the \( \Delta A_1 B(\lambda) \) curve for the same parameter values. As is clear from the plot below, there exists a region (between about -.8 and -.98) in which the solid line is positive and the dashed line is negative.

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**Appendix 3: Numerical Analysis**

We have provided analytical results for two polar cases: one in which \( V \) is linear, and one in which \( V \) is sufficiently concave that \( p'(\lambda) < 0 \) for all \( \lambda \). In the former case, relaxing common ownership restrictions never eliminates diversity, and for a region of \( \lambda \) it generates diversity that would not otherwise have existed. In the latter case, relaxing common ownership restrictions always eliminates diversity when \( \lambda \) is sufficiently close to one, but there are also parameter values for which it generates diversity that would not have existed otherwise. The analytic results do not allow us to make any quantitative statements about the magnitudes of these different effects. The first goal of this appendix is to generate quantitative results of this kind. The second goal is to show that our analytic results are applicable for intermediate levels of the concavity of \( V \). That is, we show that intermediate levels of concavity generate results that are in between the results of the polar cases. To do these things, we present a numerical analysis of the model.

The numerical analysis proceeds as follows. We assume the same functional forms described in equation (A30). For there to be a positive level of persuasion in equilibrium, the ideological utility from the first unit of persuasion must exceed the cost. With the specific functional forms in (A30c), this condition becomes \( Na > z\beta \). Normalizing \( N \) to one, this condition becomes \( a > z\beta \). It will prove useful to rewrite (A30c) as:

\[ a > z\beta \]

\(^{46}\) A plot of \( p \) (omitted) evaluated at these parameter values shows that \( p'(\lambda) < 0 \) for all \( \lambda \).
\[(A30c')\]

\[ay - by^2 = a \left( \frac{1}{y} - \frac{b}{a} \right) y^2\]

The parameter \(a\) represents the ideological utility associated with the first bit of persuasion. Rewriting \(V\) in this way lets us represent ideological utility in units of \(a\) (i.e., in units of the amount of ideological utility from the first bit of persuasion). Normalizing \(a\) to one allows us to rewrite the above condition as \(z < 1/\beta\).

Under this setup, there are four free parameters in the model: \(b, \gamma, \beta,\) and \(z\). We generated a data set consisting of 10,000 observations of these four parameters. For each observation, \(b\) was drawn randomly from a uniform distribution \(U[0, 4]\); \(\gamma\) was drawn randomly from \(U[0, 1]\), \(\beta\) was drawn from \(U[0, 3]\), and \(z\) was drawn from \(U[0, 1/\beta]\) (as per the condition above). For any given observation, it is possible to plot \(\Delta A_2 B(\lambda)\) and \(\Delta A_1 B(\lambda)\) and directly observe the presence, size, and location of any regions of \(\lambda\) in which eliminating common ownership restrictions eliminates diversity that would have existed if common ownership were prohibited (Region 1), as well any regions in which eliminating common ownership restrictions creates diversity (Region 2). Since it is not practical to visually inspect a plot for each set of parameter values, we achieve the same result by calculating the roots of \(\Delta A_2 B(\lambda)\) and of \(\Delta A_1 B(\lambda)\) for each set, and using these to identify the regions. The resulting parameter values and regions constitute our “data.”

The summary statistics for the full dataset are presented in the top panel of Table 2 below. Region 1 exists for some value of \(\lambda\) 93.5\% of the time, \(^{48}\) and its mean size, conditional on it existing, is .672. \(^{49}\) Region 2 exists for some value of \(\lambda\) 36.3\% of the time, and its mean size, conditional on it existing, is .144. So in our data, Region 1 is more likely to exist than Region 2, and it is larger when it does exist. From this fact alone, we cannot confidently infer anything about the frequencies or the sizes of the two regions we might observe empirically, because we do not know what are plausible values for our parameters; the distributions of the parameter values that we used to generate the data are arbitrary. But the middle and bottom panels of Table 2 provide some information about the relative magnitudes and frequencies. Each row in the middle panel summarizes the data for a particular range of \(b\). In the first row, (for \(b\) between 0 and 0.1), Region 2 is more common than Region 1 (but smaller if it exists). Region 2 is also more common than Region 1 in the second and third rows, but by the fourth row (\(b\) between 0.3 and 0.4), the result is reversed and Region 1 becomes more common. The bottom panel of Table 2 show similar results. This panel is like the middle panel, except the increments of \(b\) are larger and cover the whole range of \(b\) in the data (from 0 to 4). This panel shows that Region 2 is more common only for the lowest range of \(b\), while Region 1 is more common for all the others. In all of these cases (including at very low levels of \(b\)), the average size of Region 1 (conditional on it existing) is larger than the average size of Region 2. \(^{50}\)

The analytic results would have led us to expect that Region 2 would be more common for small values of \(b\); recall that when \(b = 0\), Region 2 always exists and Region 1 never does. In contrast, the result that Region 1 is more common than Region 2 for all other values of \(b\) is a product of the simulation; it could not have been inferred from the analytic results alone. Note that the fact that Region 1 is (for all but very low values of \(b\)) generally larger and more common than Region 2 does not necessarily mean that Region 1 is more important. Recall that when \(V\) is linear, Region 2 always exists for some \(\lambda \in (-1, 0)\). In contrast, when \(V\) is sufficiently concave that \(p'(\lambda) < 0\) for all \(\lambda\), Region 1 always exists near \(\lambda = 1\). So the diversity gained in Region 2 may be, on average, “more” diverse than the diversity lost in Region 1. In

\(^{47}\) Note that this exercise is not always “intermediate” between the two polar cases; some sets of parameter values satisfy the condition that \(p'(\lambda) < 0\) for all \(\lambda\) and other sets satisfy the condition for some, but not all, values of \(\lambda\).

\(^{48}\) There are sometimes two non-contiguous Region 1s; in these cases we add them together.

\(^{49}\) Recall that the range of \(\lambda\) is from -1 to 1, so the maximum possible size for either region is 2.

\(^{50}\) Similar results hold for a finer analysis in which each cell contains a range of \(b\) and a range of the other parameter of the model.
fact, this is the case. The average midpoint of Region 2 (weighted by the size of the Region) is -.837, while the comparable average for Region 1 is .436.\(^5\)

The more important purpose of the numerical simulations is to show that increasing \(b\) (and holding the other parameters constant) tends to make Region 1 more common and Region 2 less common. One way to approach this would be in a regression framework. However, the two regions are generated by a complicated interaction of all the functions in the model, and there is cause for concern that a parametric specification would not be appropriate. Instead, we can use Table 2 to show the result without making any parametric assumptions. The results regarding the frequency of the regions are as one would expect: virtually every comparison shows that as \(b\) gets larger (and holding the ranges of the other parameters constant), Region 1 is more likely to exist and Region 2 gets less likely to exist. The average sizes of the regions, conditional on their existing, do not appear to be strongly related to \(b\).\(^5\)

<table>
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<th># of Obs.</th>
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<th>% Region 1 Exists</th>
<th>Mean Size if Exists</th>
<th>Region 2 Exists?</th>
<th>% Region 2 Exists</th>
<th>Mean Size if Exists</th>
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\(^5\) In some cases, there are two Region 1s in a given observation. In these cases, the midpoint for the observation is calculated by weighting by the sizes of the regions.

\(^5\) Once again, similar results hold for a finer analysis in which each cell contains a range of \(b\) and a range of the other parameter of the model.
References:


Los Angeles Times, November 2, 2004, LATimes.com


