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A Study in Print

Competition in Prices and Quality Between Newspapers and Magazines

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NORWEGIAN SCHOOL OF ECONOMICS

Acknowledgements

The period during which I undertook the research presented in this thesis was out of the ordinary by any metric. Lockdown and social distancing has challenged motivation and the well-being necessary for this kind of work, but here we are.. I am, however, pleased with the result I present in this thesis, and there are some people for whom I am indebted and who will forever carry my gratitude and appreciation!

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Abstract

Media markets differ significantly from the regular product space in that media outlet differentiation is not immediately separable in n-dimensions. It is also the case that high effort costs of reading an article may put readers off from reading it, and instead read about a different topic where they do not have to concentrate as much on following along. In this thesis I present a 'short-run' model for media competition where the editor publish a news issue in three stages: first they invest in quality through the underlying journalistic effort behind a story, then they decide on the advertisement volume by producing the newspaper's layout, and lastly they compete in prices on news stands. I allow two long run variables to vary between the outlets: the size of their advertisement markets, and the effort cost of compromise – the transport cost. It is this latter difference between the outlets which is of interest in this study. By using Launhardt (1885)'s model of spatial differentiation rather than Hotelling (1929)'s, I allow one of the outlets to have disjoint demand, they have demand on both sides of their competitor. This allows me to analyse competition in prices and quality between long-form newspapers, which often require more attention to read, and tabloids, which are often easier to read. I find that outlets which cover similar news stories will wish to differentiate vertically, but that this might also occur with larger distance between the covered stories. The harder-to-read outlet will likely choose to invest more in journalistic quality of their stories to improve their perceived shelf-price. Allowing for varying transport cost complicates the matter of product differentiation, but in the media space, given the subjectivity of people's preferences, and the importance of quality authorship in information-sharing, it adds relevant insights on the qualitative decision making among media outlets.

Keywords – Industrial Organisation, Game Theory, Media Economics, Two Sided- and Platform Markets

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1 Introduction

> It would seem that every newspaper published in London is calculated for a particular set of readers only; so that, if each set were to change its favourite publication for another, the commutation would produce disgust and dissatisfaction to all.
>
> John Walter, 1785. (Bowman, 1931, pp. 41)

The President of the United States has declared journalists the 'enemy of the people'. 'Fake news' has entered the popular vocabulary. A common sentiment among social commentators is that trust in media is in sharp decline, at least in the West. As most people will know, journalists tend to view themselves an essential part of society; the fourth estate. This is not an unfounded sentiment, in Norway the constitution §100 provide that the state is mandated to 'facilitate' diversity in media, and to ensure that all voices are heard (Grunnlov; NOU1999:27; NOU2010:14); in the United States, press freedom is enshrined in the *Bill of Rights* first amendment (US Constutition); whereas the non-constitutional system of the United Kingdom has provided a long precedent for freedom of the press.

Francis Fukuyama's 2006 infamous prediction that the termination of the Cold War led to 'the end of history' hasn't seemed to hold up; we have, in the past four years alone, seen tumultuous changes in the Western world order. The commercialisation and spread of the internet has brought the world, and societies, closer than they ever were. The past three decades have brought changes to the global power balance, and firms have expanded their vertical integration globally[1]. This suggests that people everywhere are more exposed to decisions and developments elsewhere than they were before. Media, then, may be views as infrastructure of information – an arbitrer of perceptions of reality. An American seeds-scientist might want to be weary of Chinese public industrial ambitions as this might suggest industrial espionage could endanger their job, or a Norwegian salmon fisher might worry about Americans investing in onshore fish farming which would challenge their competitive advantage[2]. An efficient competitive market for media allows people to

[1] See for instance Antras and Helpman (2004) for an example of how economists are embracing the latter development.

[2] The former example may be further explored in Hvistendahl (2020) and the latter in EY (2019).

stay updated in the realms of the world in which they they wish to stay informed.

Throughout this thesis I will assume that the population finds news of great value. I will make no presumption regardig the nature of this value – be it *the Sun*'s page three, *Washington Post*'s (hereforth 'WaPo') political coverage, or the *New York Times*'s (henceforth 'NYT') 'World News' section. The previous discussion should suffice to show the relevance of the study of competition in quality between news outlets. The study will depend on the assumption that all people in society consumes news – market coverage – and whereas this is critically dubious as it pertains to any one media type (newspapers, cable news, social media, blogs, etc.), I open for specifications which allow cross-media competition.

The first recurring printed newspaper in the United States was the *[Boston] News-Letters*, which first appeared in 1704 and continued printing until 1776. A few years after its initial publication a feud appears between the *News-Letters* and (an early) competitor, the *Courant*, when the *Courant* clamined that *News-Letters* was 'a dull vehicle of intelligence'; the *Courant* was started, in part, because *News-Letters* was found too pretentious to read. Whereas *News-Letters* was the first frequently printed newspaper, the first printed paper was *Publick Occurences* published in 1690, with only one edition, which declared: 'it is designed, that the Country shall be furnished once a month (or if any Glut of Occurrences happen, oftener,) with an Account of such considerable things as have arrived unto our Notice.'[3,4]. This 330 year old quote still mandate the general purpose of media outlets today; frequency and content may vary, methodology has changed, and the media platforms have evolved, but even so news supply people with updates about developments attention to which they might find beneficial.

The media market has seen major development over the past two decades with the internet revolution in information sharing. In just two decades the news industry has shifted from almost entirely being based on established print papers to largely online based. Local news were delivered by news outlets with local monopolies, but have shifted to being almost extinct and incorporated in nationwide news-conglomerate. Figure 1.1 show the number of active Norwegian newspapers between 1990 and 2018, based on Høst

[3]The *National Humanities Centre* published, in 2006, a digitised version of *Publick Occurences* from the library of the *Massachuetts Historical Society's* archives; available at: http://nationalhumanitiescenter.org/pds/amerbegin/power/text5/PublickOccurrences.pdf

[4]For more on these conflicts, and the general development, I refer the reader to Hudson (1873), chapter two.

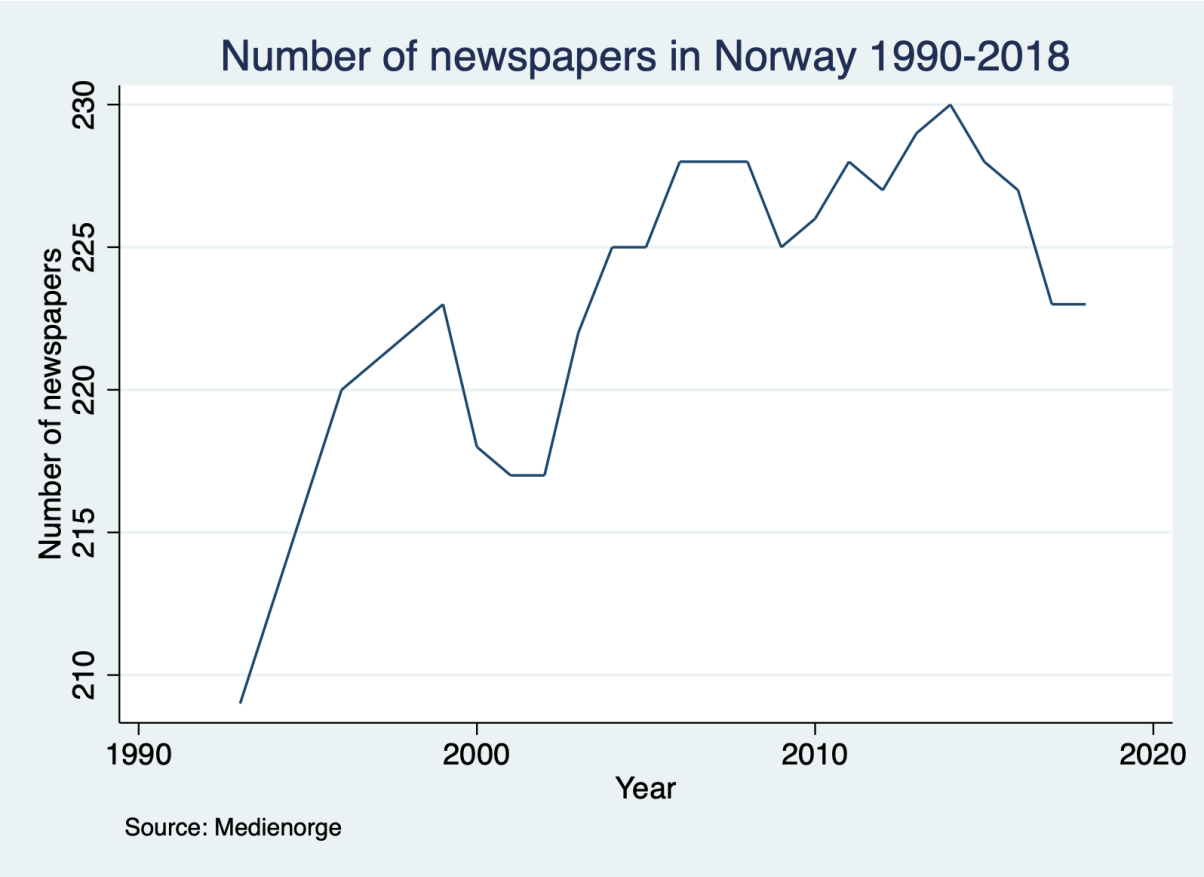


Figure 1.1: Number of Norwegian daily newspapers 1990 to 2018. From Høst (2018).

(2018)[5]; figure 1.2 is taken from Abernathy (2018, pp. 63) and shows, for the time period 2004 to 2018, the number of acquicitions, sales, and shutdown or mergers of news outlets by the seven largest investors in the American media market. In Norway, which practise active public policy in maintaining media diversity and investments[6], we observe in figure 1.1 a steady-state of around 220-225 newspapers, and some variance around here; whereas the United states, for which there is limited attention paid to public policies directed at shaping the media landscape itself we see that there appears to have been an increase in the concentration by the large investors given the number of purchases they have indulged as we see from figure 1.2. In Norway this conglomeration of the media market is primarily noticeable through Schibsted, albeit not the largest (Medienorge, 2019), which own some of the most dominant media outlets nationally and in the larger cities.

The quotation with which we fist presented this thesis is taken from John Walter in

[5]But downloaded from *Medienorge* at http://www.medienorge.uib.no/statistikk/medium/avis/361 on 2 June 2020.

[6]See for instance St.mld. nr. 30; Meld.St.8; Meld.St.38; NOU2010:14; NOU1995:3.

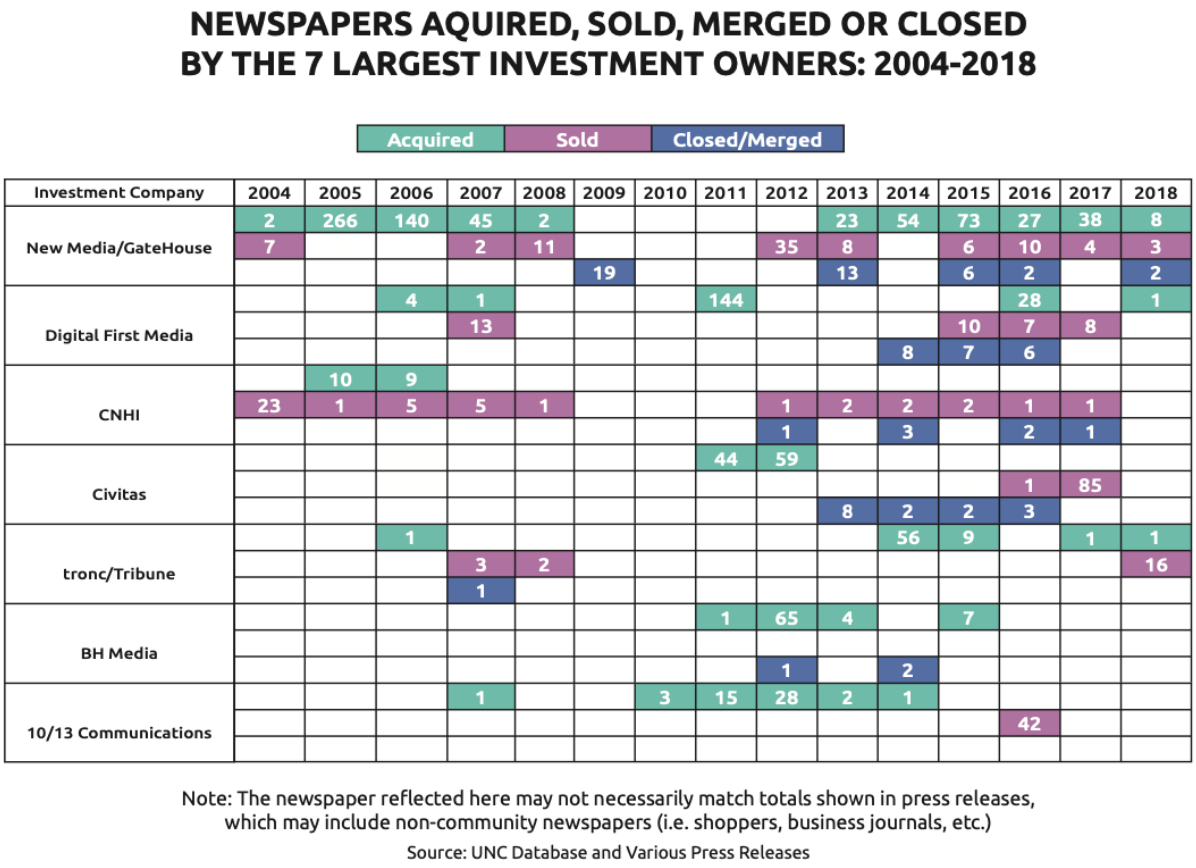


Figure 1.2: Newspaper purchases, sales, and mergers for the top American media investors. From Abernathy (2018, pp. 63).

1785. Walter, founder of the London based newspaper *the Times*[7], noted the degree to which the , then, established newspapers were directed towards their audience's interest. He established *the Times* to appeal to a broader audience. The issue identified by Mr. Walter is not unique to 18$^{\text{th}}$ century Britain, it pertains also to the United States today. In figure 1.3, from Jurkowitz et al. (2020, pp. 8), we get insight into which media outlets are trusted and not by Americans based on their self-identified political leaning. What is striking is the complete lack of overlap between 'liberal' and 'conservative' in trusted and distrusted news outlets; and how the extremities mimic each other in trust and distrust across the ideological spectrum. Unlike many previous studies, I will differentiate newspapers on topical coverage. While I have not chosen to extend people's preferences for news topics to correlate to their political identity, the framework I introduce should also be viable for extension to this purpose.

Chapter 2 will provide an introduction into the background economic research in media economics. The modern approach is by using the platform market approach. This approach was first introduced by Rochet and Tirole (2003), and the practise of expanding it to study media markets owes due to Anderson and Coate (2005). I draw methodological inspiration from Kind et al. (2013), although the objectives of this thesis differ from theirs do we share stages of newspaper decision processes.

The thesis will consider competition between newspapers, and we will see that varying restrictions on parameters allow us to study competition between news outlets in different sub-sectors of the newspaper media market. The thread I will maintain throughout the study is to compare the competition between (what I will call) 'newspapers' and 'news magazines', and I will use news outlet to encompass both. A 'newspaper' is an outlet which is aimed at the general reader – much like Mr. Walter's objective with *the Times*, – with articles which are easily read by a wide range of the population on wide-ranging topics. Whereas a 'news magazine' is a news outlet whose range of coverage is generally more narrowed and aimed at a lesser segment of the population, but where the articles are generally less accessible – like, for instance, the papers identified by Mr. Walter who 'build their fame on on the length and accuracy of their parliamentary reports' (Bowman, 1931, pp. 41). For a modern day comparison we might think of *NYT*, *WaPo*, or *the Washington Times* as newspapers; and *The New Yorker*, *The Atlantic*, or *National Review*

[7]First published as *The Daily Universal Register* then subsequently changed to the name with which we today we maintain familiarity.

Ideology adds another layer to party-line divides of most trusted and distrusted news sources

% who trust each source for political and election news (first five shown)

Democrat/Lean Dem				Republican/Lean Rep			
LIBERAL		MODERATE/ CONSERVATIVE		MODERATE/ LIBERAL		**CONSERVATIVE**	
CNN	70%	CNN	65%	Fox News	51%	Fox News	75%
New York Times	66	ABC News	63	ABC News	47	Hannity (radio)	43
PBS	66	NBC News	61	CBS News	42	Limbaugh (radio)	38
NPR	63	CBS News	60	NBC News	41	ABC News	24
NBC News	61	PBS	48	CNN	36	CBS News	23

% who distrust each source for political and election news (first five shown)

Democrat/Lean Dem				Republican/Lean Rep			
LIBERAL		MODERATE/ CONSERVATIVE		MODERATE/ LIBERAL		**CONSERVATIVE**	
Fox News	77%	Fox News	48%	CNN	43%	CNN	67%
Limbaugh (radio)	55	Limbaugh (radio)	34	MSNBC	32	MSNBC	57
Breitbart	53	Hannity (radio)	28	HuffPost	30	New York Times	50
Hannity (radio)	50	Breitbart	22	BuzzFeed	29	NBC News	50
NY Post	27	BuzzFeed	20	Fox News	29	CBS News	48

Note: Order of outlets does not necessarily indicate statistically significant differences.
Source: Survey of U.S. adults conducted Oct. 29-Nov. 11, 2019.
"U.S. Media Polarization and the 2020 Election: A Nation Divided"

PEW RESEARCH CENTER

Figure 1.3: US trust in various media outlets by political leaning. From Jurkowitz et al. (2020, pp. 8).

as news magazines. In Norway we would categorise *Aftenposten* as a newspaper, and *Morgenbladet* as a news magazine.

The thesis is written in association with the *Media Competition and Media Policy* research project at the Norwegian School of Economics, NHH. The thesis is concerned with the study of competition and strategic decision-making in the newspaper market. The aim of the project is to further understand how the media economy has developed with the shifting technological landscape, how globalisation has affected news rooms, and how readers's decreased costs from diversified, or closed, news consumption has affected the choices made. For this thesis I will make the assumption that digitalisation and globalisation have not affected news outlets basic business model, just the parameters therein. Given primary source evidence from century-old news publications provided in this chapter and the next this should be an uncontroversial assumption. I make a distinct

assumption to that people read only one news outlet, and this may be a point for future expansion.

I'd now like to extend a note on formalities in authorship. I have made an effort to maintain clear and concise language. I generally do not adhere to strict usage of arbitrary rules in deployment of the English language, but I have strided to follow the guidelines presented in Dreyer (2019). As it pertains to the usage of pronouns, I will generally avoid the issue entirely, but deploy gender-specific pronoun only where they ease the reader's separation between concepts. But, when deployed, demand side agents (consumers) will generally be considered female; supply side agents (producers) male; and the social welfare-maximising agent (state) a genderless it-agent. In platform application, the platform remains genderless, and either side assumes a given pronoun.

The outline of the thesis is as follows, in chapter 2 I review the existing literature background for the study, then in chapter 3 I introduce the framework within which I will perform the analysis, as well as associated concepts and definitions whose familiarity is necessitated. In chapter 4 I build the model step-wise and draw insights from some variations of it. Then, in 5 I use the insights from the model to infer some more general insights into the competitive world of news production. Finally, I conclude in 6. Most of the calculations for chapters 3 and 4 are presented in the appendix.

2 Literature

This thesis combines a few areas of economic study. Because newspapers' income is split between news readers and advertisers wishing to reach those readers, I will rely on the developed literature on platform economics. The media market is, as was discussed in chapter 1, today an established literature on media economics. In addition to these areas of theoretical economics, I will first briefly present the development of the newspaper (as we today know it) in the United States, and then review the general literature.

2.1 History of Economics of Media

A thesis popularised by Harari (2014) (see Burton and Bruce (1992); Khamsi (2004); Wang et al. (2017); Heleven and Van Overwalle (2016) for further support) is that humans developed language to engage in gossip. In this regard, news outlets are the ultimate extension of people' wants and desires. The first newsletters appeared in 59 B.C. in the Roman Empire, and in A.D. 618-907 in China (Endres, 2001). The initial news providers of the modern era were the postmen, "they were the ones who 'told you so' "(Hudson, 1873, pp. 52). A natural role for the postmen as their job consisted of connecting people. As printing presses became available, the costs of information sharing decreased and more 'gossip' could be more easily shared among more people.

The following quotation is taken from the final statement of the first edition of *News-Letters*:

> **'Advertisement**[8]
>
> This News-Letter is to be continued Weekly; and all Per[s]ons who have any Hou[s]es, Lands, Tenements, Farms, Ships, Ve[ss]els, Goods, Wares or Marchandizes, &c. to be Sold, or Let; or Servants Run-away, or Goods Stole or Lost; may have the fame in[s]ereted at a Rea[s]onable Rate, from *Twelve Pence* to *Five Shillings*, and not to exceed: Who may agree with *John Campbel* Po[s]t-ma[s]ter of *Bo[s]ton*.
>
> 'All Per[s]ons in Town and Country may have [s]aid News-Letter every Week, Yearly, upon rea[s]onable terms, agreeing with *John Campbel*, Po[s]t-ma[s]ter

[8]See figure A1.2 in appendix A1

for the fame'.'

as was discussed in chapter 1. Here it has been included to show that John Campbell was open to selling space in his 'newsletter' for advertisement, as well informing people of the subscription model of news[9]. The advertisement section looks eerily similar to texts available in the present media era, such as the follwoing excerpts from WaPo:

> **'Commercial Classified Ads**[10]
> Place your business' Car, Real Estate, Apartment, Job or Obituary ad in The Washington Post, Express or on washingtonpost.com and get results fast.
>
> **'Individual Classified Ads**[10]
> Place your business' Car, Real Estate, Apartment, Pet or Merchandise ad in The Washington Post, Express or on washingtonpost.com and get it sold.'

The newspaper model of charging readers a shelf (or subscription) price, then supplement that income by advertisement, has dominated the media industry for almost as long as it has existed – at least in the United States. As can be seen from the quotation taken from the the first edition of *News-Letters*, this seems to have been the model followed since the introduction of the newspaper in the United states, three hundred years ago. The purposes suggested for advertising remains largely the same today as they were then – with the obvious exception of 'servants run-away[s]'– and that people may pay a fixed price to receive new editions. This thesis is not concerned with subscription pricing strategies, but the general insights should remain the same.

2.2 Platform Markets Literature

News outlets derive their income from two sources, they make money from readers' willingness to pay for news consumption, and they make money from advertisers' willingness to pay for exposure to the readers. Whereas each of these groups can be subdivided into further segments, the overarching objectives of all agents in either segment is shared. This feature of the news media market makes it comparable to many internet service firms,

[9]Whereas I am not, in this thesis, concerned with the subscription pricing aspects of the newspapers, this remains, for many newspapers, an important revenue stream.

[10] From the Washington Post website. Available at: https://www.washingtonpost.com/mediakit/place-an-ad/. Accessed 6 June, 2020.

where for instance software developers want access to 'gamers' or regular people through platforms[11] such as 'Playstation' or 'Xbox', or 'iOS' or 'Android'. The framework used to study the behaviour of firms who facilitate these interactions is often called platform or two-sided markets[12]. The issue which makes platform markets distinctly different from a firm with numerous (independent) consumer segments or multi-product firms is that upon entry the price-structure is the key optimisation problem, where price levels are a function of the structure – they may wish to accept losses from one segment to attract a critical mass of the other, for instance. A platform such as 'Spotify', where musicians can access music-listeners, became profitable after '13 years and 96 million subscribers' (Hollister, 2019). A more comprehensive introduction to platform markets than the one which I present here is found in Rysman (2009), and an introduction to the challenges of setting price structure is found in Evans and Schmalensee (2016).

What characterises a platform market is that there are two (or more) types of economic agents for whom gains from trade are positive. Typically there is a seller segment and a buyer segment, but there can also be other qualifying objectives for the groups. In order for the analysis of platforms to be applicable there also has to be network effects between the groups; demand or willingness to pay for (at least) one group is dependent on the size of the other. A seller segment can be thought of as a software developer wishing to sell their product/service through a software platform[13], a retail shop wish to simplify payments for their consumers though credit card, or a musician wish to make their music available to as large an audience as possible through a music streaming service.

Platform markets were first introduced by Rochet and Tirole (2003, 2006), and Jean Tirole won the Nobel Prize in Economics in 2014 among other for his work on this (Nobel Committee, 2014). The predominant feature that differentiate the platform market literature from that of networked or multi-product markets is that no agents internalise the externality they impose. A person buying a razor is forced to internalise the effect

[11]There are numerous other examples, I refer the reader to Rochet and Tirole (2003, pp. XX) table 1 for further examples.

[12]The literature uses these terms interchangeably. A line of argument for using 'platform markets' rather than 'two-sided markets' is that all markets are inherently two-sided, with consumers and producers, and that 'platform market' makes clear that the subject area of interest is the firm as a mediator, or platform. I will use 'platform market' consistently throughout this thesis.

[13]These platforms tend to impose the additional challenge of exclusivity, product availability on one platform imposes large additional costs to prepare for another. An application available on a given operating system, OS X will not run on OS Y, whereas a song submitted to Spotify may also be submitted to iTunes.

purchasing a razor has on the complementary market for razor blades though the pricing strategy adopted by its producer, a *de-facto* two-part tariff, whereas a newspaper reader do not internalise their effect on advertisers.

In starting a platform, the problem it faces is that of bringing the sides together, what the literature refers to as the 'chicken and egg'-problem. This is explored in Caillaud and Jullien (2003). The general issue presented is that the primary value of the platform for either side is the other, but which side should be brought on first, and how? We will assume that the newspapers, as platforms, are established enough that this is not an issue with which we will be concerned for this thesis.

Rochet and Tirole (2003) introduce the concept of dividing the sides into the 'profit centre' and the 'loss leader'. This is to say that very often the platform's user-side has a relatively higher willingness to pay for access to the other, and as such the platform will be willing to spend much resources on attracting the side with which the other is attracted. Examples of such strategies are bonus points for credit cards, or benefits programmes as is often observed for various newspaper subscriptions.

It should also be noted that the literature on platform markets may also involve the specific complications arising from inter-platform competition. These involve mostly the degree to which agents on either side of the platform may choose to use one or more platforms to meet their needs. We refer to readers or advertisers who use only one platform as single-homers and those who use more as multi-homers. This is explored further in Ambrus and Reisinger (2006); Kim and Serfes (2006). We will, however, keep the analysis on single-homers for this thesis.

Examples of platform markets are many. I present here some additional ones. We could think of credit card companies as platforms, where consumers decide on which credit card to acquire and shops decide on which credit cards they choose to accept. People will choose credit cards whose probability of acceptance in their everyday shopping is most likely to be accepted, and shops will accept credit cards which are widely used by their customers. The credit card company make their profit from transaction fees they charge the shops. They also represent an example of a platform who accepts losses on one side, credit card holders, to attract the other, outlets. They make losses through, for example, loyalty schemes, discounts, and travel insurance. Another example is an online dating platform like Tinder. On Tinder there are three groups, males, females, and advertisers.

Men are interested in meeting women, and women are interested in meeting men; the more men use the platform, the more women will join it, and *vice versa*[14]. The advertisers were introduced to the platform after it was already established, the more users Tinder has, the more relevant it is for advertisers.

Research into the area has been extensive since, and in addition to the anecdotal evidence above, we have seen Jeon and Rochet (2010)[15] study academic publishing as a two-sided market where they find that the open-access model academic journals has tended towards lately is optimal for social welfare maximisation, but may induce socially inefficient publications if the objectives are different. Belleflamme et al. (2002); Bae and Choi (2006) study the role of 'piracy' in software markets, but Rasch and Wenzel (2013) expand on these insights to include the platform aspect into the study of piracy. They point out that the software developers have a significantly higher incentive to introduce software protection than the platform itself, for whom it may draw users. Introducing protection shifts profits away from the developers over to the platform through increased licence fees, and Rasch and Wenzel (2013) show that in general the developers benefit mostly if revenue from (legal) sales are large and consumer surplus is large.

Often, efficient regulation of markets characterised by multi-sidedness may differ significantly from others; Wright (2004) provide eight fallacies from using conventional (one-sided) economic insight in platform markets. The question of institutional design for regulation of these markets have also been addressed by economists lately. I present here an example from the United States. The United States has the past decade engaged in a larger debate on how to structure its health sector of the economy, a large volume of literature has been produced in economics to try and answer questions as how to best solve the adverse selection issue in health insurance markets, Manning et al. (1987) being the most famous one. However, Howell (2006) remarks that the health insurance market is, and should, be characterised as a platform market. The primary issue causing market failure in health insurance markets is the 'nonmarketability of bearing suitable risks' (Howell, 2006, pp. 31). She then concludes that this leads to optimal regulation focusing not primarily on competition, but on the arrangements deployed in insurance and risk management. Bardey and Rochet (2010) contribute to this debate further by studying

[14]Anecdotally, imagine if a popular notion were that all men on this platform were 'creepy', the platform might then encounter difficulty attracting the female side, making the platform unvalualble to all.

[15]As does, for instance, McCabe and Snyder (2007).

how risk heterogenety in the consumer segment differ in competition between a Preferred Provider Organisation and a Health Maintenance Organisation.

2.3 Media Economics Literature

Among the first papers to study the decision problem of the newspaper is Corden (1952). Whereas he observed that the newspaper makes their revenue from readers and advertisers, and the demand for advertisement was incorporated as a function of the newspaper' circulation, his analysis allowed only for the newspaper to set quality, and did not expand the analysis to allow both to be set by the paper. In 1967, Rosse published his thesis which looked at competition and concentration in media markets. He then proceeded with Rosse (1970) and a study of newspapers' cost-curves. Both Corden (1952) and Rosse (1970) included feedback effects between the reader and advertisement segments, but focused on the demand curves more than they studied the newspapers' decision-making processes.

Anderson and Coate (2005) cite the historical research on broadcast markets, and note that they all fail to sufficiently account for the network effects between advertisers and consumers. They note that prices and advertising levels are assumed exogenous and fixed, thus that the broadcasters do not account for their revenue upon deciding on their programming. They also note that research had, until that point, in isolation, been focused on the role of advertisers and on welfare-outcomes.

To address the shortcomings of the, then, existing literature they proposed a model which allow the study of numerous aspects of media' broadcasting decisions in totality. Their analysis is also based on Rysman (2004), which study the two-sidedness of the 'yellow pages', but they switch the assumption to be such that advertisers adversely affect consumers' payoff.

Anderson and Coate (2005) propose a model, exampled as a television network, in which there are two channels which can only carry one programme (of two types available), as well as advertising. Consumers have preferences over the programs, and get utility from viewing it – essentially a Hotelling spatial market division. The model assumes perfect information about willingness to pay for products advertised, and as such it derives the advertisers' demand function for advertisement. They then proceed to evaluate various equilibrium outcomes, and their social welfare implications.

After Anderson and Coate (2005), more literature appears expanding on, and critiquing, it. Anderson et al. (2018) for instance expanded the model to allow multi-homing. Anderson et al. (2012) expand on the underlying framework for the role of advertisement on media platforms.

Another topic which has been made contemporary by the political divisiveness observed in many countries over the past decade is that of newspaper political/ideological differentiation. Among the types of journalism which have grown over the past two decades is that of 'opinion journalism', which has been a relatively cheap way for newsroom to produce content in a pressed media market.

An example of the study of such political differentiation is Kind et al. (2013). The paper uses a three stage game, where the newspaper set their endogenous political profile and invest i journalism in their first stage, set advertisement level in their second stage, and finally compete in prices.

Classical issues in industrial organisation has been brought into the media market sphere. Argentesi and Filistrucchi (2007) use the Italian newspaper market 1973 to 2003 to introduce an approach to demand estimation for the reader and advertiser segments. The interaction between readers and advertisers in the newspaper market means that the regular price-cost markup approach does not hold because, for instance, one side could subsidise the other.

An additional early, important, work shaping modern media economics is Hamilton (2004). The key take-away from which is 'when news sell "eye- balls" to advertisers, the question becomes what content can attract readers or viewers rather than what value will consumers place on content' (Hamilton, 2004, pp. 29). Other literature, such as Anderson and Gabszewicz (2006) expand on this notion to study the role of advertisement on programming choice. They note that whereas one would traditionally expect consumers to have sovereignty in product type and range availability media markets are often characterised by this sovereignty belonging to the advertisers' willingness to pay for access to certain consumer demographics. The role of advertisement in economic analysis is presented in Braithwaite (1928), who discuss the role of advertisement costs to the producer. She also discuss advertisement costs associated with 'creating demand' versus merely 'announcing supply', as well as the role of reptuation for the firm.

We can safely assume that the size of the reader segment, the more favourable an

advertiser will be to a medium, but the reverse effect is more obscure. Advertisement can be informational and thus provide the reader with positive utility, or it may be distracting, and thus provide negative utility. Research into the effect of advertisement on the readers has also evolved. Wilbur (2008) is among the first to do so, by assuming a platform market setup, he estimates advertiser demand for audiences and audience demand for programs, and find that the cross-group externality is, indeed, persistent. In general, consumers respond negatively to increases in advertising – a 10% in advertisement time decreases the median audience size by 25%, *ceteris paribus* – and they find that the advertiser market has, since the 1970s, become quite competitive.

The study of advertisment has also been extending to newspapers with multi-homing consumers. Athey et al. (2018) find that multi-homing news readers push down advertisement prices, and single-homing among the advertisers. They also find that media outlets are incentives to invest in quality and work to expand their number of unique readers to attract advertisers who wish to minimise the number of duplicate ads exposure. A similar study is conducted by Anderson et al. (2018), in which the authors find that in the presence of readers using multiple media platforms using incremental pricing[16], platform entry decreases ads prices and mergers increase them. They also find that media platforms value single-homing consumers more than they do multi-homing consumers and as such an equilibrium might occur biased towards the preferences of single-homing readers, against multi-homing readers. The insights into the effects of changes in market composition – concentration – is, however, met with mixed empirical evidence. Jeziorski (2014) find that mergers in the radio markets increased listener surplus and lowered advertisement surplus. Brown and Alexander (2005) find that increased concentration in a local TV market is associated with increased advertisement prices, as well as viewership. Studies from Chipty (2007) and Tyler Mooney (2011) find no definite prediction as to direction of advertisement prices or volume.

[16] A term introduced in Anderson et al. (2018) referring to a strategy where the media platform charge advertisers only for exclusive 'eye-balls'.

3 Methodology

I am interested in the relationship between the news outlets's content decisions and its effect on their choice of pricing strategy. In order to enagge in this study, I postulate a path for news production in a newsroom, and then proceed to present a game in three stages; investing in quality, setting advertisement volume, and competing in prices. The progression closely mirrors that followed in for instance Kind et al. (2013).

The first decision made in news publishing is the *what*, what to cover? Whereas the endogeneity here could be of interest – especially in relation to the quality-investments I shall discuss later – I have chosen to take this as a predetermined factor for the editor; I assume this is exogenous and predetermined to the model. The reason for this assumption is both to simplify the maths, but also because it would distract attention from the outcome variables of primary interest. A further justification for this assumption is that, at the time of preparing a specific issue, the editor is faced with a given newsroom where the journalists at hand are already provided with their set of sources and specialisation, thus making the choice set of topics to cover restricted by the present establishment.

After the editor has decided on a topic to cover, they must decide on the *how*, how to cover it? Here, the editor may decide to invest numerous resources in the journalism behind it. Referring back to the discussion on the role of journalism, and what it is, from chapter 1 I postulate the role of the journalist as ensuring the presentation of information. The investigative journalist presents the consumers with information state entities wish to keep hidden, the metro desk journalist present the reader with information about developments in the local community, and the foreign affairs correspondent present the reader with information about developments in the world at large.

Quality journalism is inherently a subjective measure. Whereas some may follow Trine Eilertsen's 'Reformhjørnet', others may follow Mads Hansen's Instagram account[17]; some prefer their economics 'takes' from Gregory Mankiw and others prefer theirs from Paul Krugman; and, as was seen in figure 1.3, one man's 'quality journalism' is another woman's distrusted 'fake news'. For our study I think of quality in two dimensions: comprehensiveness of coverage, and the comprehension of journalism – how thorough is

[17]See podcast 'Aftenpodden' for the former and https://www.instagram.com/mads_hansen11/?hl=en for the latter.

the coverage, and how easy is it to understand.

The first dimension, how thorough should the news coverage be, is an investment in resources to acquire information. This is done through interviewing sources, getting documents, and generally through the journalist's familiarity with the subject they're covering. In Norway, for instance, many newspapers publish identical articles, mere copies of widely available ones from the 'Norwegian News Agency' (NTB). Publishing articles acquired directly from NTB would then present the basic news item, but not much more. Then, the editor may choose to use a relevant correspondent to expand on the NTB article, put it in context, add comments from additional sources, or present even further (related) news items to the article. The editor may also decide to devote their investigations resources to conduct an investigation related to the news item – if it has to do with a government initiative, for example, an investigation may delve into the political back and forth or 'horse-trading' which has been conducted among the political parties. This latter decision would provide the news outlet with a more comprehensive news coverage of the same news item, but it may be resource-intensive to enact, and for my purposes higher quality.

The second dimension is an investment in making the news item understandable, and thus accessible, to the audience. Just as in Boston in the early 17$^{\text{th}}$ century the *Courant* came to be, in part, because people found Latin phrases used in *News Letters* to be inaccessible and wanted news presented in a more 'common' language, John Walter started *the Times* to be more accessible than the more specialised newspapers in existence[18]. Similarly, if all newspapers simply publish the news item as presented by NTB the readers are just as well of no matter where they read it. If we, instead, assume that the editor has chosen to expand on the news item, they then have to decide on presentation. If the journalist spend much time investigating, but are left scrambling to have the article ready by deadline, we may safely assume that the authorship of the article is going to be poorer than if they were allowed time to produce the article. Similarly, a newspaper like 'Morgenbladet' in Norway may assume their readership is more well-versed in culture and politics than maybe a tabloid like 'VG' will, thus the production of an article with the same with in comprehensiveness will probably require a larger investment in comprehension for VG than Morgenbladet as Morgenbladet could avoid 'spelling everything out clearly'[19].

[18]See chapter 1.

[19]With this I mean not to suggest Morgenbladets readers are more clever than VG's; a similar

Another example to showcase this investment is how to present statistics or economic news. The Covid-19 pandemic has resulted in large unemployment in many countries, and finding a good approach to showcasing the extent to which the crisis has affected employment demands able and creative resources, the NYT frontpage for 9 May 2020, see appendix A2, is a good example of creative use of techniques in presentation of news to make them widely available and understood.

Once the articles have been written and the newspaper's content is set, the editor turns to the layout of the newspaper. This is where they design how the pages should look in print – or on their website – and thus have the power to decide on how much space to devote to advertisement. The editor may choose to devote much space per page, or entire pages, to advertisement, or they may choose to keep it relatively rare.

Finally, once the newspaper's content has been produced and its layout set they go to print. Now, all the editors can do is compete in prices for the consumers. Once the product has been produced, the editor can only change prices they charge the consumers.

In order to set that framework into a formal model, I will introduce some concepts and definitions with which I will need familiarity to draw inference. First I will introduce the tools I will use to study how firms differentiate their products, this is the framework from which I will derive the reader-demand curve. Then I will briefly introduce game theory and the equilibrium-solutions I use to determine the news outlets's behaviour.

3.1 Differentiation

My study involves news outlets not only differing in prices and the quality of their journalism, they also sometimes choose to cover different subjects. To study this, I look at the economics of differentiation. Firms can differentiate horizontally and/or vertically. Horizontal differentiation involves differing feature sets of the product, whereas vertical differentiation involves the quality of the product. These ideas are fairly abstract, and I deploy the convention introduced by Lancaster (1979) and define *horizontal differentiation is when two products split the market at equal prices* and *vertical differentiation is when one product capture the whole market at equal prices.*

analogy could be pulled between general sports outlet 'ESPN' and empirical politics and sports page 'FiveThirtyEight' in the United States – I merely intend to show that specialised readership allows shortcuts in writing up articles.

3.1.1 Hotelling (1929) and Launhardt's models

The most utilised tool in the economist's toolkit for studying products which are differentiated is Hotelling (1929)'s model. It is a spatial model of product differentiation, meaning it intuitively builds on the assumption that firms sell products that are homogeneous, but where the differentiation is introduced as a cost of travel for purchase. The model arose as Harold Hotelling observed that price differentials do not, in fact, lead to an automatic monopoly for the cheapest firm. He observed that the decline in demand for the firm increasing their prices is a gradual process and not an abrupt run on the firm. Hotelling postualted the market to be located on a street of length l, which I will assume has length 1, represented by figure 3.1. Whereas I will deploy a utility interpretation of the model, the underlying intuition is better explained in a physical market. As such, I imagine a street being 1 km long, with housing density equal along the street. There are two firms selling a homogeneous product, non-brand cutlery for instance, who can choose which property on which to locate. In figure 3.1 the firm A has located on a, and firm B has located on $1 - b$. A consumer faced with both products would be indifferent between them, and thus choose the cheapest one. The ingenuity of the Hotelling model is that, in addition to the shelf[20] price set by the firms, he introduced the concept of transport cost. The consumer, in figure 3.1 illustrated by x, has to pay some cost to go to the shop in order to buy the product, this is thought of as either cost of petrol, public transport, or mail delivery. In figure 3.2 I have expanded figure 3.1 to also represent the priced faced by the consumers along the line. The shelf prices are represented by the straight vertical lines, and the transport costs are the lines pivoting out from the shelf prices.

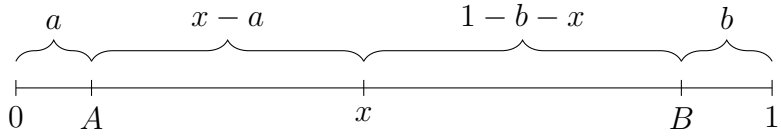


Figure 3.1: Hotelling's line

The cheapest product will for any consumer along the line be the one for whom the shop has the lowest line in figure 3.2. The model assumes that the cost for the consumer

[20]The literature use a variety of terms to explain the concept, "mill prices" is also popular, because the current study relates to newspapers and magazine sales I find "shelf prices" to be a more explanatory terminology.

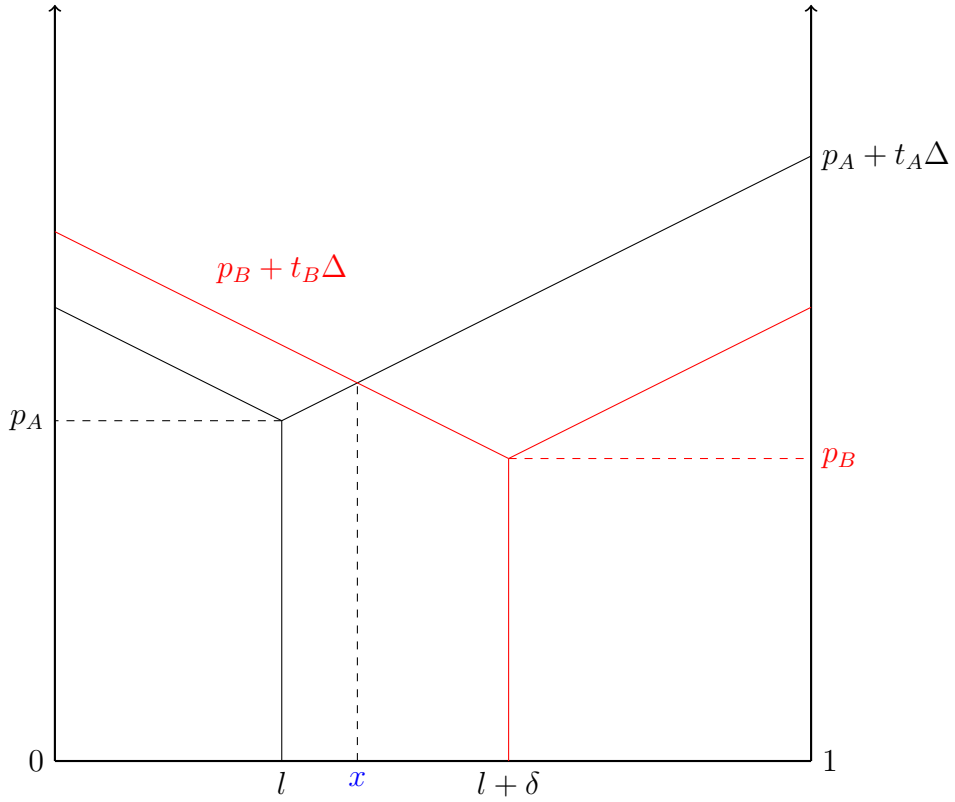


Figure 3.2: Hotelling's prices and demand. Δ represents distance from the firm's location.

to attain the product is the same from both shops[21], this means that as long as the differences in prices is less than $p_i < p_j + t(1 - a - b)$, the condition for which one firm is cheaper for *all* consumers, the market will be split on the segment of the street between their locales. Both firms will thus be guaranteed their outer segment, and share the one between them.

A model of multi-dimensional differentiation presented by Launhardt (1885), rediscovered by Pinto (1977), and explored further by Ferreira and Thisse (1996) is the "Launhardt model". This model will look very familiar from the Hotelling framework. I maintain the assumptions that there are consumers uniformly distributed along a segment $x \in [0, 1]$ with mass 1. There are two firms competing selling a homogeneous good. The firms choose location $a_i \in [0, 1]\ \forall i \in \{1, 2\}$, where I specify $a_1 = a$ and $a_2 = a+\delta,\ \delta \in [0, 1]$. In addition, I allow the firms to have access to different technology for product delivery; specifically, I assume $t_1 \leq t_2 \implies 0 < \tau \equiv \frac{t_1}{t_2} \leq 1$. I derive the firms' demand by finding the indifferent consumer(s). As in Hotelling, the consumers face prices $p_i + t_i|a_i - x|$, where p_i is the firm's sat shelf price, t_i is the transport cost from the firm, and $a_i,\ x$ are

[21] Hotelling's original paper takes the perspective of the firm's available delivery technology.

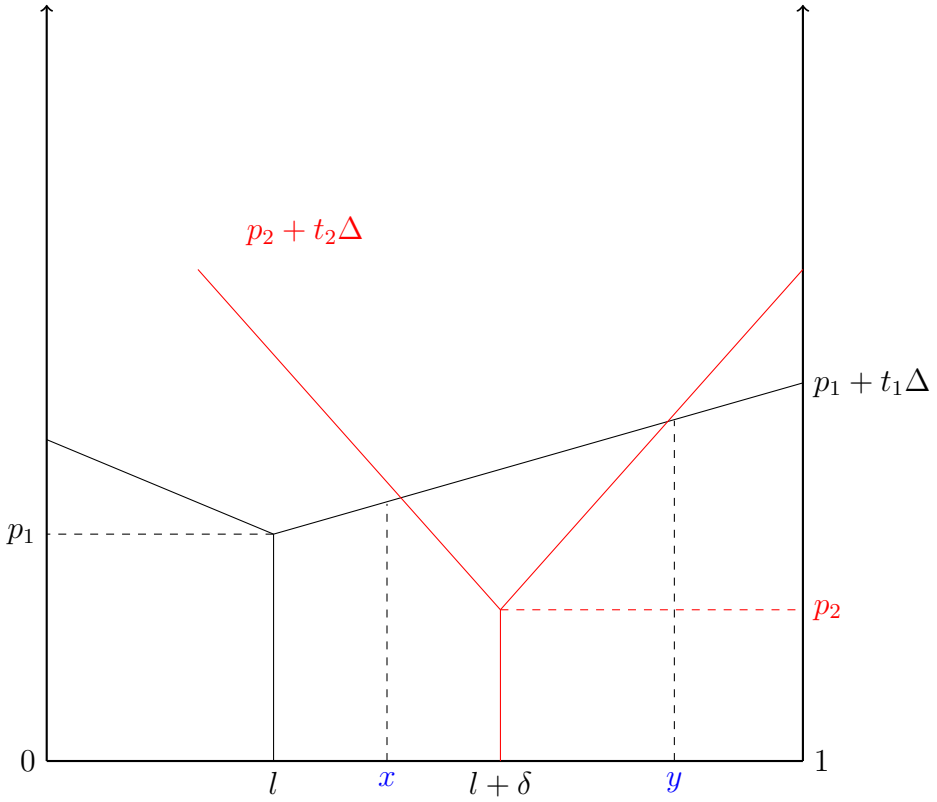


Figure 3.3: An example of the Launhardt model. Δ represents distance from the firm's location.

the firms' and consumers' location on $[0, 1]$, respectively. Firm 1, by having a lower t_i, can exploit the more efficient technology by charging a higher price and still retain a higher market share than its competitor. I also observe that firm one will here, unlike in the Hotelling model, manage to get consumers from the market segment $[a + \delta, 1]$. I illustrate a case of the Launhardt model in figure 3.3. From the figure it is clear that B has continous demand, and that A's is disjoint.

The Hotelling model is a special case of the Launhardt model, where $t_1 = t_2 = t$. Demand is derived in Ferreira and Thisse (1996) and are presented in appendix A3, because of the various available transportation technologies, there are three possible indifferent consumers of which at most two may be realised. The indifferent consumer equal to the one in Hotelling I will call x, the one right of B is y, and to A's left is z. I present this further in figure4.3 in chapter 4.

The two-dimensionality of the model is compared to Lancaster (1979)'s defintions and is captured by:

- **Horizontal differentiation** $\delta > 0, \tau = 1$:
  Firms have the same technology, $t_1 = t_2$, and when they offer products at equal prices, $p_1 = p_2$, they both have positive demand.

- **Vertical differentiation** $\delta = 0, \tau < 1$:
  Firm 1 has access to superior delivery technology such that $t_1 < t_2$. The firms offer perfect substitutes and as a result firm 1 will be virtually cheaper for all consumers and they capture the whole market.

As it pertains to our study of media markets, I consider horizontal differentiation, $\delta > 0$, as differentiation in news coverage, and vertical differentiation, $\tau \neq 0$, as differences in the readability. τ can be considered a measure of how easy is it to read and comprehend A relative to B; as $\tau \to 1$ the outlets have comparable effort cost of reading, and as $\tau \to 0$ B is approaching infinitely more costly to read.

3.2 Equilibrium concepts

As is often the case in industrial organisation, I will make extensive use of game theory[22,23]. The primary trait of our analysis which necessitates deployment of this particular toolkit is the interaction between the news outlets. Price and content-quality strategies chosen by one editor influences which decisions will be made by their competitor.

The game as postulated will be a dynamic game with complete information. A dynamic game means there as numerous stages at which the editors make decisions, and the decisions they make at one stage affect the outcome for both news outlets at the other. Complete information may also be thought of as complete observability. This implies that the editors can perfectly observe the internal structures and strategies chosen by their competitor. This point is a drawback of the model as the editor of the New York Times cannot possibly perfectly know the quality investments made at the New Yorker or New

[22]For this thesis, as it pertains to game theory, I rely on concepts and definitions from primarily from Osborne and Rubinstein (1994), supplemented by Maschler et al. (2013)

[23]The author also appreciate the lecture notes from Professor Pierpaolo Battigalli for lecture notes provided for the spring 2018 run of the graduate course *Game Theory: Analysis for Strategic Thinking* at Bocconi Univeristy for an introduction to formal game theory.

York Post. However, because I also assume that the outlets with which I indulge during this study are established through the exogenous placement on coverage, I can think that editors, who are the ultimate market insiders, have clear ideas about the preferred price strategies and quality capabilities of their competitior. Thus, I should be able to be left with some meaningful insights, even in these conditions.

Definition 1 (Strategic Game)**.** *A Strategic game is a situation in which there is:*

- *a defined set, N, of players;*
- *for each of which there is a nonempty set of available actions, $a \in A_i \ \forall i \in N$;*
- *a preference relation over outcomes for each player, $\succsim_{i \in N}$ on $A = \times_{j \in N} A_j$, which I will represent by the player maximising their payoff function*[24]*: $v_i : A_i \to \mathbb{R}$.*

In short, I will refer to games by the convention $\langle N, (A_i), (v_i) \rangle$, where N is the set of players, (A_i) is the set of sets containing the players' available actions, and v_i is the set of payoff functions. I note that what makes the game a useful tool lies in the third item from the definition, it is that each player's preference relation is defined over the joint set of available actions, players have preferences also over their opponent's actions.

Having defined a game, I must proceed to introduce and define some further concepts which I will make ample usage of in order to use the modelling framework. First, I introduce the *best response* function, then I introduce the workhorse equilibrium concept of *Nash equilibrium*. The model will use an extension of Nash equilibrium, *Subgame Perfect Equilibrium*, which I will also define and discuss later.

Definition 2 (Best Response)**.** *A best response correspondence, $B_i : (A_{-i}) \rightrightarrows A_i$ provides one (or more) $a_i^* \in A_i$ such that for any a'_{-i}, the player will always prefer a_i^* over any other $a_i \in A_i$: $(a_i^*, a'_{-i}) \succsim (a_i, a'_{-i})$.*[25]

What this function provides us is a concept where I confine those actions available for the player from which they will actually be left with outcomes they find acceptable, *irrespective of the opponents' actions*. For our purposes I will have action sets defined such that I have not to deal with sets being returned from a correspondence, and I will thus only be left with a best response function, $B_i(a_{-i}) = a_i^*$, following convention from

[24] Often referred to as their von Neumann-Morgenstern utility function.

[25] I use the convention that subscript '-i' implies "all players except i".

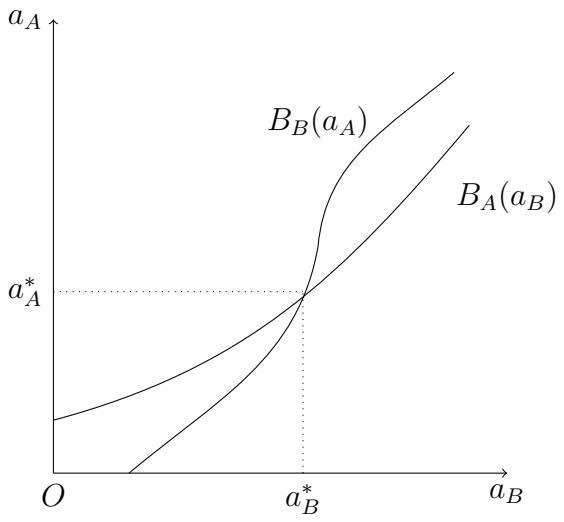


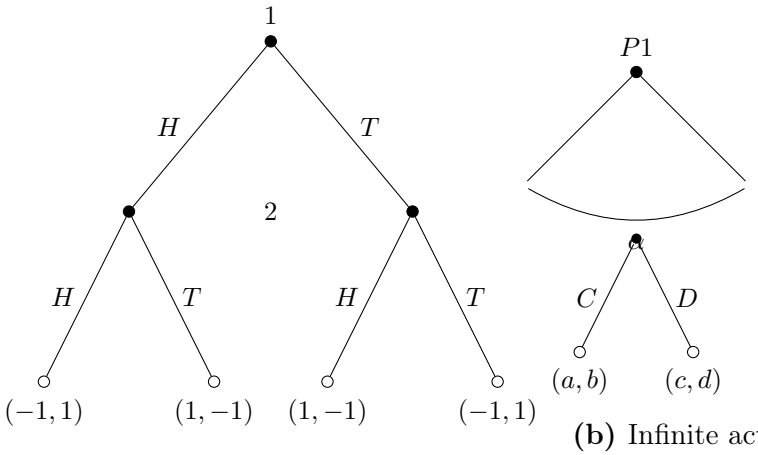
Figure 3.4: Best response functions and Nash equilibrium

among others Tirole (1988) I will usually refer to the best response function as a 'reaction function'.

Definition 3 (Nash Equilibrium)**.** *A Nash Equilibrium* (NE) *is a set of strategies.* (a_i^*, a_{-i}^*)*, for each player such that* $B_i(a_{-i}^*) = a_i^* \ \forall i \in N$*. In other words, every player* $i \in N$ *has an action,* a_i^**, such that no player has any incentive to deviate from the equilibrium actions;* $(a_i^*, a_{-i}^*) \succsim (a_i, a_{-i}^*)$*.*

NE is an outcome where all players are satisfied. There might exist outcomes, or worlds, in which some or all are better off (see Prisoner's Dilemma), but given the circumstances they can do no better. This condition assumed a non-cooperative game, i.e. in which the players do not coordinate, or if they do it's through the mutual benefit within the market mechansim.

I will be concerned with a dynamic game, this is a game in which sequential choices are made. For the context of this thesis the editors will make sequential simultaneous decisions. In figure 3.5 I see illustrated how a sequential game works. The left hand figure represents the known game of 'matching pennies', where player one first declares a bet of Heads or Tails, and then player two does the same. Player 1, knowing how well player 2 will do for different outcomes will take this into consdieration upon making their pick. If the pick is known, player one know that if they pick H, player 2 will pick H and they get payoff $(-1, 1)$, I know this beccause, *given that player 1 picks H*, player 2 can choose whether they want a payoff of 1 (H) or -1(T), as seen from figure 3.5a. This method of inferring a game's outcome by first deciding on what is rational in the final act, then



(a) Finite action sets for both players

(b) Infinite action set for P1

Figure 3.5: Multiperiod games with discrete and contionous action variables

work our back upwards towards the inital move is called *Backwards Induction* and is the approach I will use to solve the model in section 4.

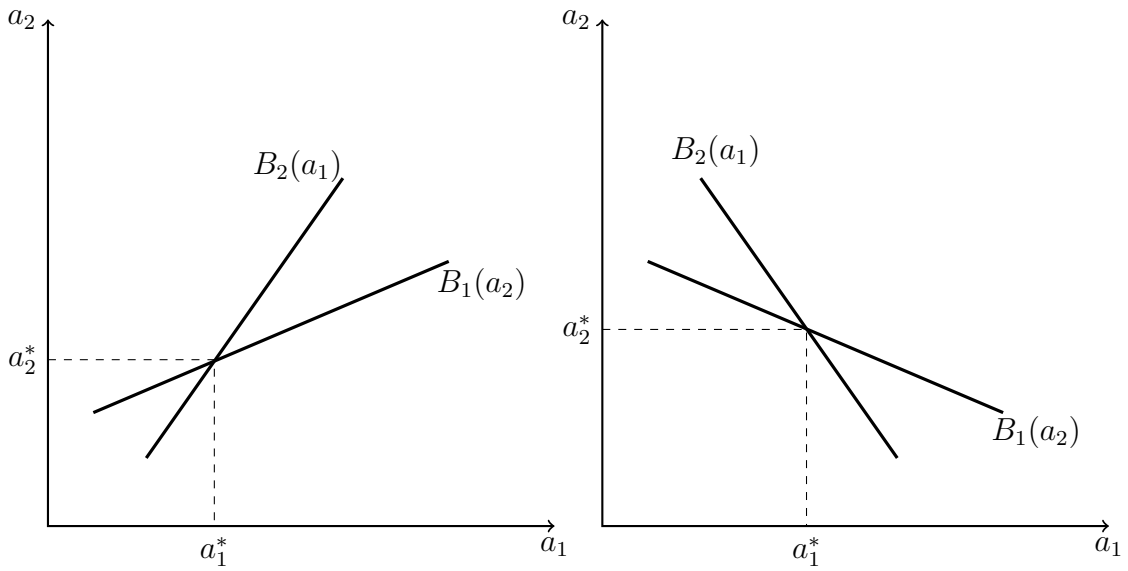
Every decision step in a game is called a subgame, and if I determine a strategy which is a NE in every subgame for all players, I have a Subgame Perfect Equilibrium.

Definition 4 (Subgame Perfect Equilibrium)**.** *A Subgame Perfect Equilibrium* (SPE) *is a set of strategies* (s_i^*, s_{-i}^*) *such that* $(a_i^*, a_{-i}^*) \succsim_k (a_i, a_{-i}^*) \forall a_i \in s_i \forall i \in N, k \in K$*, where* K *is the number of subgames – i.e. the set of strategies are NE in every subgame.*

3.3 Other useful concepts

Definition 5 (Strategic Complements/Substitutes)**.** *In a situation where the players's decision variable is positive in the opponents's action variable,* $\frac{\partial a_i}{\partial a_j} > 0$*, the responses are said to be* strategic complements*; conversely, if the relationship is negative,* $\frac{\partial a_i}{\partial a_j} < 0$*, the responses are said to be* strategic substitutes*.*

When we have variables which are strategic complements, this means that the player's best response to certain change is to mirror the direction of the opponent's play. Bertrand competition is an example of this type of strategic variables. Because the firms then compete in prices will a price decrease of the competitor, assuming $p > MC$, lead to a firm itself needing to lower theirs. See figure 3.6a for a visual representation, Nash equilibrium occurs where the lines intersect. If the firm then fails to lower theirs will the competitor capture the whole market. A strategic substitute is a scenario where a firm's



(a) Strategic Complements **(b)** Strategic Substitutes

Figure 3.6: Types of response variables

optimal response to a move by the competitor is to go the other direction. For instance, if, in a Cournot competitive market, a firm increases supply, unless the firm then lowers their own output the price will significantly decrease and the losses form the flooded market are more than they had needed be. See figure 3.6b for an example of this.

We should also note that while we study the strategic interaction between firms through whether or not action variables are strategic complements or substitutes, an important consideration, as is discussed in Farhi and Hagiu (2008) is whether one side subsidies the other in equilibrium.

4 Model

This is a short-run study, and the only endogenous variables are the short run decision variables. I will study the decision making process from the point of the editor in chief, the 'editor'. When preparing the production of a published issue, the editor's choices about which stories to cover are dictated by the newspaper's historic commitment to certain issues. They also have a given set of journalistic resources available. The editor first decides how comprehensively to cover a story, how much of the resources to devote to it, where more resources are assumed to produce a higher quality issue. When the stories have been written, the editor knows their quality level, and they know the competitor's stories[26]. Then, the editor decides on the layout of the issue, and as such can decide on how many advertisement-inserts to make space for, i.e. they decide on how much advertisement to include in the issue. This is also observable for their competitor. Lastly, the issue has been printed, and the they now compete in shelf prices for consumers. Formally, it is three-stage game set as:

1. Stage 1: Invest in quality, j_i
2. Stage 2: Set advertisement volume: a_i
3. Stage 3: Compete in prices: p_i

where $i \in \{A, B\}$. My equilibrium concept will be the subgame perfect equilibrium (SPE) found through backwards induction.

My model assumes that topics to cover for the news outlets are continuously distributed along a line of length 1. The extremities of these line are 'opposing' topics for coverage, they may for instance be thought of as: 'sport' and 'politics', 'celebrities gossip' and 'local zoning regulations', or 'Mars' and 'Venus'. The centre location suggests coverage of a variety of topics; the more general news outlets are located close to the centre of the line and more specialised outlets are located towards the extremities. Each publication issue from the outlets follow the same production timeline, and each captures a complete news period. I model the decision-making process for every period. Each period is independent

[26]Because each outlet is committed to their historic stories this is common knowledge, in knowing the quality, you can imagine they are able to follow the journalists on Twitter, through non-formal channels get hear-say, may observe legal action to acquire information, etc.

of previous periods. There are two news outlets, A and B. There are news happening continuously along the line, and the outlets cover the story at their given location.

The model is meant to study the publication of a single issue, and as such the editor's newsroom endowment is given. The implication of this is that they have a news profile dictating what to cover, and they have the authorship and presentation capacity of their current staff. The former means that the outlets' location on the coverage line is exogenous to the model, it is provided[27]; and the implication of the latter is that the effort cost of consumption, t_i, is also given[28]. This assumption of static newsroom resources makes the model suitable for short run analysis of media behaviour, and it allows me to focus on the daily trade-offs made by the editors without the distraction and added complexity endogeneity in location and transport cost would add.

Formally, the location on the coverage spectrum is given by l_i, i.e. $l_A = l$ and $l_B = l + \delta$, where $l + \delta \leq 1$. See figure 4.1 for an illustration of the new outlets' positioning. Without loss of generality I will assume that $l_A \leq l_B$, i.e. outlet A will always be positioned (weakly) to the left of B.

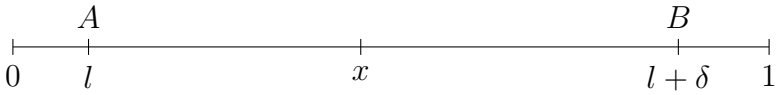


Figure 4.1: News outlets' location on news coverage

Consumers get intrinsic value from consuming news. Their utility from reading news is assumed sufficiently high that there will always be market coverage, i.e. all consumers will read news. The consumers have a specific topic which interest them most, whether they are sports-fans, political junkies, or generalists who just want to know what happens around them. I assume that people are distributed along the line uniformly, and normalise the population to have unit density. I specify utility and prices such that I can compare them, this can be thought of as 'pricing' quality. The consumer's utility function is:

$$U_i = v + j_i - p_i - t_i(|l_i - x|) \tag{4.1}$$

where v represents the intrinsic utility from news consumption, j_i is the quality of the

[27]For instance, in the US *ESPN* will cover sports news, *the Hill* will cover Capitol Hill, and *TMZ* will cover celebrity gossip.

[28]For instance, a lower t may be achieved by having a data/graphics department who specialise in making graphical representation of data and statistics.

journalism, p_i is the shelf price the consumer pays to purchase the edition from the news outlet, t_i is the effort cost of reading the given news outlet, and $|l_i - x|$ is the (absolute) degree to which the reader has to compromise away from their preferred news topic. The media economics literature debate whether readers view ads as informative or distracting, or whether they're indifferent to them. I assume they are indifferent. The t variable is considered normalised such that the reader whose news interests perfectly aligns with their consumed news outlet has 0 effort cost. The consumer will consume news from the outlet from which they get the most utility. Without loss of generality, I will assume that $t_B \geq t_A$ such that I can define $\tau = \frac{t_A}{t_B} \leq 1$ to be a measure of the degree of vertical differentiation – i.e. the degree to which the outlets differentiate in the general accessibility of their journalism.

To get a grasp of the trade-off faced by the readers I have illustrated the costs in figure 4.2. The vertical line represents the (quality-adjusted) fixed prices of the newspapers, $\tilde{p_i} \coloneqq p_i - j_i$. In the figure, I note that outlet 2, located at $l + \delta$, is perceived to charge a relatively lower shelf price, by $j_B - j_A > 0$, than newspaper 1, because they provide higher quality content. The horizontal lines represent the transportation costs. They represent the traditional 'vertical' differentiation because if $\delta = 0$ and $\tilde{p_i} = \tilde{p_j}$ then (essentially) all readers find newspaper B less attractive to read, $D_B = 0$, and newspaper A capture the whole market. This is discussed further when I present the model in 'quality competition' and in figure 4.7.

The news outlets have two sources of income, consumers purchasing the published issues from a news stand and advertisers buying advertisement inserts in the issue. I assume that advertisers have two objectives with advertisement: first, they wish to reach a large audience; and secondly, they wish some degree of exclusivity in the advertisement space. Essentially, they want their ads to be seen by many; if an issue has many advertisement inserts theirs is more likely to be missed by readers, and if the issue has few readers their ad will have limited reach. I assume that the newspapers face no costs of distribution[29], and I also assume that the outlets do not have any costs associated with maintaining their advertisement market. They do, however, have investment costs associated with journalistic quality. As this is a short run model this investment cost is best thought of as the opportunity cost of devoting a larger share of their journalist stock to a single story.

[29]For constant marginal costs the results do not change.

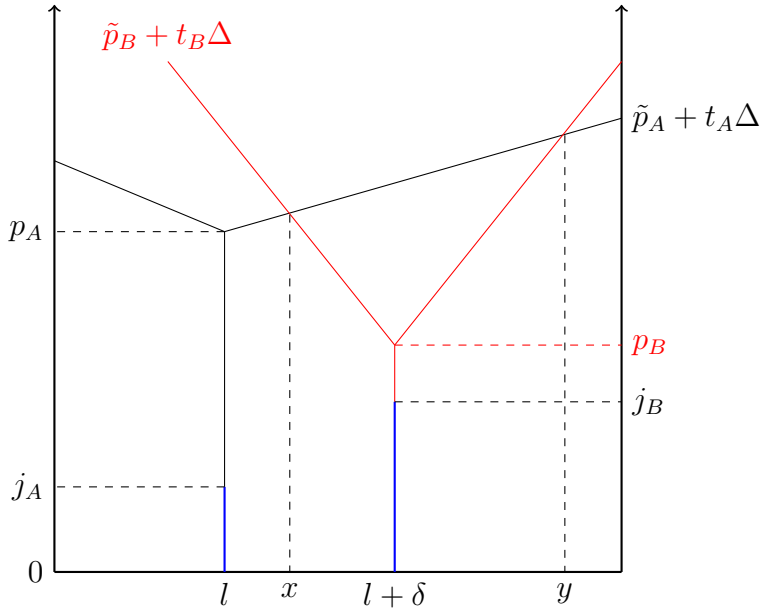


Figure 4.2: Internal placement with specialised news outlet and quality differences. The blue lines indicate the degree to which journalistic quality has affected the consumers' utility.

They have the following profit function:

$$\pi_i = \underbrace{p_i D_i}_{Readers} + \underbrace{\Phi_i a_i D_i}_{Advertisement} - \underbrace{C(j_i)}_{Investment\ Cost} \tag{4.2}$$

where the per-issue ads-market demand function is given by $\Phi_i = \phi_i - \alpha a_i$. The investment cost of journalism is $C(j_i) = \frac{\beta}{2} j_i^2$. I also have that the parameters $\alpha, \beta, \delta, \phi, l, t, v \in \mathbb{R}_+$ are positive real numbers and exogenous parameters to the model.

The revenue from shelf sales to readers is the price charged multiplied by the number of issues sold. The advertisement revenue stream can be thought of as follows. $\Phi_i a_i$ is the total advertisement revenue per printed issue, where a_i is the advertisement volume, or number of advertisement inserts, and Φ_i is the advertisement demand function which determine the per-insert price, it is decreasing in a_i. The advertisement markets between the news outlets are assumed independent, meaning that each outlet has a local monopoly in their ads markets. The per issue ads revenue is then multiplied by the number of issues sold. The cost function is assumed to be quadratically increasing in j_i, which means that marginal improvements in quality are ever more resource-intensive[30]. The outlets' demand

[30]Think for instance of the unemployment article featured in appendix A2, in order to present the Corona-impact on the US labour market would require more resources than improving on coverage which simply copies the latest *BLS* press release. The cost function can thus be thought of as encapsulating both the direct costs associated with expanding the journalistic skill sets in a news room, but also the

in decreasing in t_i, meaning they prefer providing a lower effort cost of reading over a high, $\underline{t} \succcurlyeq \bar{t}$ for $\underline{t} \leq \bar{t}$.

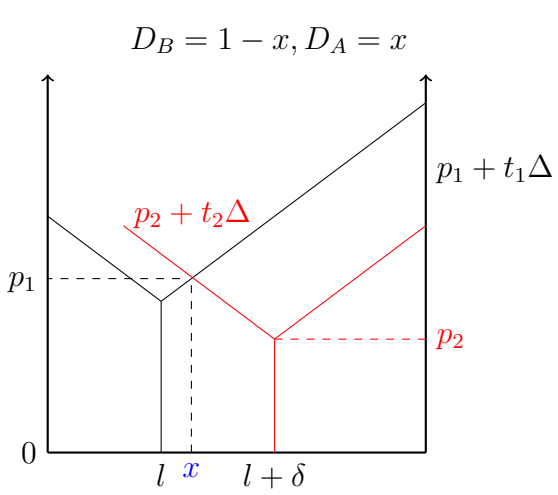
The two objectives for the advertisers are included in this specification. The positive network effect the number of consumers have on the advertisers' interest in the newspaper is captured through the inclusion of D_i in the advertisement term of the profit function. Their preference for exclusivity is captured by $\frac{\partial \Phi}{\partial a_i} = -\alpha < 0$, i.e. the price advertisers are willing to pay ad-inserts in the issue is decreasing in the total advertisement volume therein.

4.1 Demand

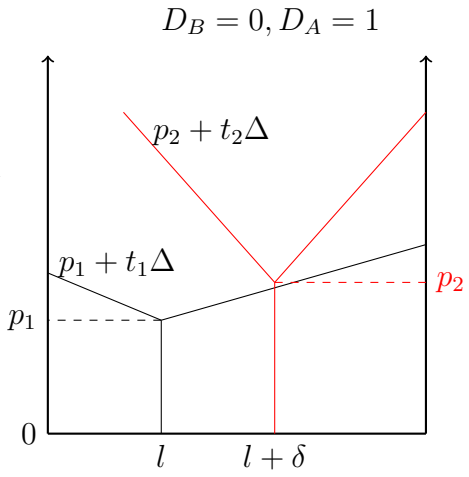
As is discussed in chapter 3 when I present the Hotelling and Launhardt models, the outlets' demand is determined by where on the line the reader who is indifferent between them is located. When the firms differentiate horizontally – in what they cover, $\delta \neq 0$ – and vertically – in how accessible to author the article, $\tau < 1$ – there emerge three possible indifferent readers, x, y, and z – where maximally two exist in a given market. The first is located between the outlets, $x \in [l, l + \delta]$; then they can be located on either extremity of the outlet, $y \in [l + \delta, 1]$ and $z \in [0, l]$. See figure 4.3. In figure 4.3a I have represented a general Hotelling-like market, with the outlets having a monopoly on their outer side, and share the space between them. In figure 4.3b, outlet A always provides the cheapest issue. Figure 4.3c is when the differentiation is mainly in quality, and is discussed further in a later sub-chapter.

The primary innovation this thesis introduced is the altercation of the market such that outlet A may have a disjoint demand function, as seen in figure 4.3d. This allows the study of competition between outlets where the accessibility to the readers are higher for some products than others. A non-media interpretation of this discontinuity could be thought of where A and B are fast-food restaurants, where A has delivery through a service such as *Deliveroo*, *Foodora*, etc., and B has their own in-house delivery option. Because platforms such as Deliveroo and Foodora can reasonably be considered as having a cheaper transportation cost than a restaurant's in-house option, consumers who are located closer to B could still find it cheaper to have their burger delivered from A. For this model, the cost t, may be considered a reflection of the literary accessibility of an

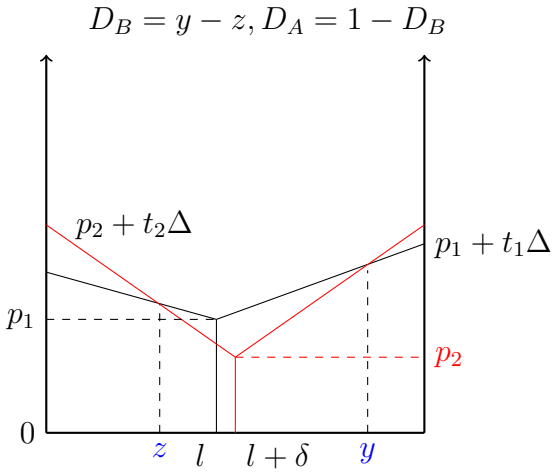
opportunity costs arising by deploying those resources on one single story.



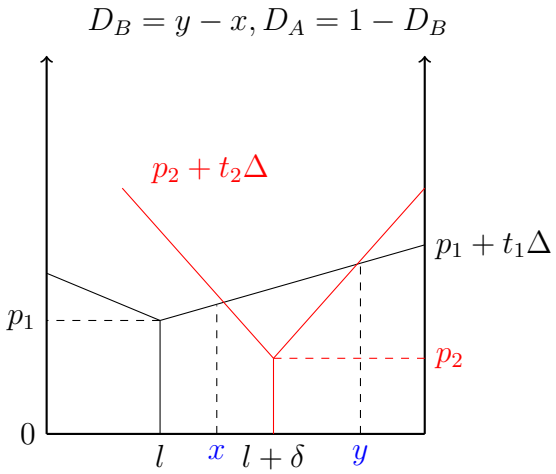
(a) Hotelling-like division



(b) B is always more expensive



(c) Little horizontal differentiation



(d) Disjoint demand in A

Figure 4.3: Demand in markets with differentiation in two dimensions. Δ represents distance from outlet i.

article. Either in terms of how well an author the journalist is, or more likely in terms of the compactness with which it is written and the use of jargon or prior/common knowledge in reading the article. For example, if the coverage segment stretches from 0 = 'sport' to 1 = 'zoning regulation', and I evaluate the competition between Norwegian VG ($l_{VG} = 0.4$) and Morgenbladet($l_M = 0.6$) – suggesting they cover more general news. Morgenbladet traditionally author longer articles which assume a larger degree of prior knowledge than VG does. This suggests they are competing in a Launhardt framework, where $t_M > t_{VG}$. If this is the competition presented in figure 4.3d, then those readers who are very interested in the 'nitty-gritty' details of regulations will prefer to read the low-effort authorship of VG rather than Morgenbladet – because even though Morgenbladet's stories are somewhat more interesting to them it does not sufficiently make up for the larger effort-cost of reading them.

In the model presented in the next chapter I will assume the latter characteristic exogenous to the model. Whereas, as I also discuss above, accept that there exist justification for why this may be determined in the short run – during the production of a specific issue – I find that an alternative narrative holds intuitively true, and eases the tractability of the model. Being a good communicator is a skill that requires time intensive investments for most people, and in the media the journalists must master a variety of communication mediums. For this thesis, I this maintain that the level of authorship for a given journalistic stock is sticky in the short run, but that a (potential future) long-run extension would allow the editor to invest in improving this aspect. My conjecture is that allowing the editor to invest in the transport cost also in the short run would not change the results as obtained for now.

The indifferent reader located on the right extremity, y, has more specialised topics which interest them. For them, in a regular Hotelling framework, outlet B – remember, $l_A \leq l_B$ – would have monopoly power, but because the Launhardt framework better characterises parts of the media market, outlet A may compete for them. In the cases where readers in $y \in [y, 1]$ chooses to read from outlet A, their compromise is that their news is not focused on their particular interest-area, but they would rather get the introduction to another topic area that A's relatively low 'effort cost of reading' implies rather than invest more resources in trying to comprehend an article closer to their interest, but yet assuming background knowledge beyond what they have (as is implied by the

'effort cost of reading'). A non-academic economist might, for instance, still prefer to read *Nature* over *Econometrica*; the former, while belonging to an entirely different academic field is written with jargon and convention such that it is still far more accessible, even to the average economist, than the top ranked journals of economics.

Consumers are assumed to care about the relative prices, relative to what is covered and with what quality. I will thus often use the notation $\tilde{p_i} \coloneqq p_i - j_i$ in discussion about the shelf-prices. In appendix A3 I derive the indifferent consumers and get that they are given by:

$$\begin{aligned} x =& l + \frac{\tilde{p_B} + t_B\delta - \tilde{p_A}}{t_A + t_B} \\ y =& l + \delta + \frac{\tilde{p_A} + t_A\delta - \tilde{p_B}}{t_B - t_A} \\ z =& l - \frac{\tilde{p_A} - t_B\delta - \tilde{p_B}}{t_B - t_A} \end{aligned} \tag{4.3}$$

where the negative sign for z is maintained because given the assumption that $t_B \geq t_A$, the constraint for this indifferent reader is given by $p_A > p_B + t_B\delta$.

4.2 Equilibrium

I will in this subsection review the general outline of how I will proceed through the general stages, then the following four subheadings within this chapter will discuss and present findings for the four general cases of the model. The cases are characterised by how the outlets' choices in location and differentiation leads to differing demand functions.

The intuition behind using backwards induction to solve the game is as follows. The editor first has to invest in the quality. The editor will invest in quality if they believe it will positively affect their profits. They look ahead to how the published issue's quality affects its advertisement market and the 'news stand competition'. It will affect their advertisement revenue stream through the advertisers' preference for a wide audience, which is affected by sales to readers. Readers will purchase the outlet's issue if they find it to be relatively cheapest – relative to what is covered and with what quality. Thus the editor will first have to know their shelf pricing strategy, then they set their advertisement strategy, which is used to determine how much to invest in quality.

4.2.1 Stage 3 – setting prices, p_i

Setting the outlet's issue shelf price is the final decision before publication, the implication of this is that they have already committed page space to advertisement, and written the articles with a given quality level.

As such, the editors care only about setting the price which then maximise their profits. The FOC thus becomes:

$$\frac{\partial \pi_i}{\partial p_i} = D_i + (p_i + \Phi_i a_i)\frac{\partial D_i}{\partial p_i} = 0 \tag{4.4}$$

i.e. thet will set a shelf price such that any marginal changes negatively affects profits. The following SOC should thus also follow:

$$\frac{\partial^2 \pi_i}{\partial p_i^2} = 2\frac{\partial D_i}{\partial p_i} < 0 \tag{4.5}$$

which tells us that provided the shelf price has negative impact on the outlet's demand the analysis should suffice – ensured by assuming the 'law of demand' holds.

The firm term accounts for the changes in profits resulting from the change in demand by varying shelf prices. For the second term, $(p_i + \Phi_i a_i)$ is the per-unit revenue to the outlet from each sold issue. p_i is the shelf price, and because I have assumed zero marginal costs in distribution, this is all revenue, and $\Phi_i a_i$ is the total revenue from selling the advertisement for each printed issue in a given circulation. This per-issue revenue is then multiplied by the change in demand for a unit increase in price, the effect of which is to account for the changed revenue from the 'preceding' sales to a price hike.

4.2.2 Stage 2 – setting advertisement volume, a_i

When the articles have been written by the journalists the issue is typeset; this is the stage where the editors also have to decide on how much space on their pages to devote to advertisement, a_i. At this stage, the quality levels have already been determined, but the editors may think ahead to stage 3 where they compete in prices. I can think of the units in the advertisement volume as 'ads-inserts'.

The FOC which represents the editors optimisation problem at stage 2 is:

$$\begin{aligned}\frac{\partial \pi_i}{\partial a_i} =& \frac{\partial p_i}{\partial a_i} D_i + p_i \frac{\partial D_i}{\partial p_i}\frac{\mathrm{d}p_i}{\mathrm{d}a_i} + p_i \frac{\partial D_i}{\partial p_j}\frac{\mathrm{d}p_j}{\mathrm{d}a_i} + \frac{\partial \Phi_i}{\partial a_i} a_i D_i \\ &+ \Phi_i D_i + \Phi_i a_i \frac{\partial D_i}{\partial p_i}\frac{\mathrm{d}p_i}{\mathrm{d}a_i} + Phi_i a_i \frac{\partial D_i}{\partial p_j}\frac{\mathrm{d}p_j}{\mathrm{d}a_i} = 0 \\ =& \overbrace{\Big[D_i + (p_i + \Phi_i a_i)\frac{\partial D_i}{\partial p_i}\Big]}^{=0} \frac{\partial p_i}{\partial a_i} \\ &+ D_i\big[\Phi_i + \frac{\partial \Phi_i}{\partial a_i} a_i\big] + \big[p_i + \Phi_i a_i\big]\frac{\partial D_i}{\partial p_j}\frac{\mathrm{d}p_j}{\mathrm{d}a_i} = 0\end{aligned} \tag{4.6}$$

$$\frac{\partial \pi_i}{\partial a_i} = \underbrace{D_i\big[\Phi_i + \frac{\partial \Phi_i}{\partial a_i} a_i\big]}_{\text{Ads-Demand Effect}} + \underbrace{\big[p_i + \Phi_i a_i\big]\frac{\partial D_i}{\partial p_j}\frac{\mathrm{d}p_j}{\mathrm{d}a_i}}_{\text{Strategic Effect}} = 0 \tag{4.7}$$

where I have been able to exploit the 'Envelope Theorem' to simplify the expression. This theorem may be applied because the FOC from stage 1 (eq. 4.4) is repeated within the stage 2 FOC (eq. 4.6). The reason for this re-appearance is because editors think ahead to the next stage, but because the game is solved by backwards induction a value for shelf prices have already been identified.

In the expression given by equation 4.6's first term, the 'strategic effect', captures the extent to which one outlet's decision influence how their competitor behave. The strategic effect breaks down how one outlet's advertisement decision influence the other's price strategy, then this in turn affect the demand faced by the outlet. This change in demand is then scaled by the per-unit revenue from sales. The 'ads-demand effect' adjusts the advertisement revenue stream. Because the advertisers prefer exclusivity the per-insert ads price is declining in advertisement volume. $\Phi_i = \phi - \alpha a_i$ is the demand function the outlets face from advertisers, and this is a monopoly power effect. Each outlet is a monopolist in their advertisement market, and as such their marginal revenue function, $MR_i^A = \phi - 2\alpha a_i$, has a slope twice as steep as the demand function. The the marginal revenue from "one extra ads-insert" is then scaled by the total number of issues sold, D_i. I find that for all the cases presented below, the result remains:

$$a_i = \frac{\phi_i}{2\alpha} \tag{4.8}$$

4.2.3 Stage 1 – Investing in quality, j_i

The first stage in the editor's decision process is deciding on how much resources to devote to quality investments in preparing articles for the issue to be published. At this stage, they can account for how their decision affects both the advertisement market as well as the news stand competition. As such, this stage involves the most complex decision problem. This stage involves setting quality in two dimensions, both in journalistic quality, and in terms of how low to set the effort cost of reading.

To reduce notation, and without losing insight, I used the subgame perfect equilibria functions for shelf prices and advertisement volume in finding the following FOCs.

$$\begin{aligned}\frac{\partial \pi_i}{\partial j_i} = &\overbrace{\left[D_i + (p_i + \Phi_i a_i)\frac{\partial D_i}{\partial p_i}\right]}^{=0}\frac{\partial p_i}{\partial j_i} \\ &+ \underbrace{\left[(p_i + \Phi_i a_i)\frac{\partial D_i}{\partial j_i} - \overbrace{\beta j_i}^{MC}\right]}_{\text{Demand Effect}} + \underbrace{(p_i + \Phi_i a_i)\frac{\partial D_i}{\partial p_j}\frac{\mathrm{d}p_j}{\mathrm{d}j_i}}_{\text{Strategic Effect}} = 0\end{aligned} \tag{4.9}$$

I am again able to make use of the 'Envelope Theorem' to simplify the FOC. The 'demand effect' captures the increased demand associated with higher journalistic quality; because the readers view shelf prices as relative to the quality of journalism, higher journalistic quality is a *de facto* decrease in $\tilde{p}$. The 'strategic effect' captures how the competitor's shelf pricing strategy is affected by their quality level, and then how this, in turn, affects the demand.

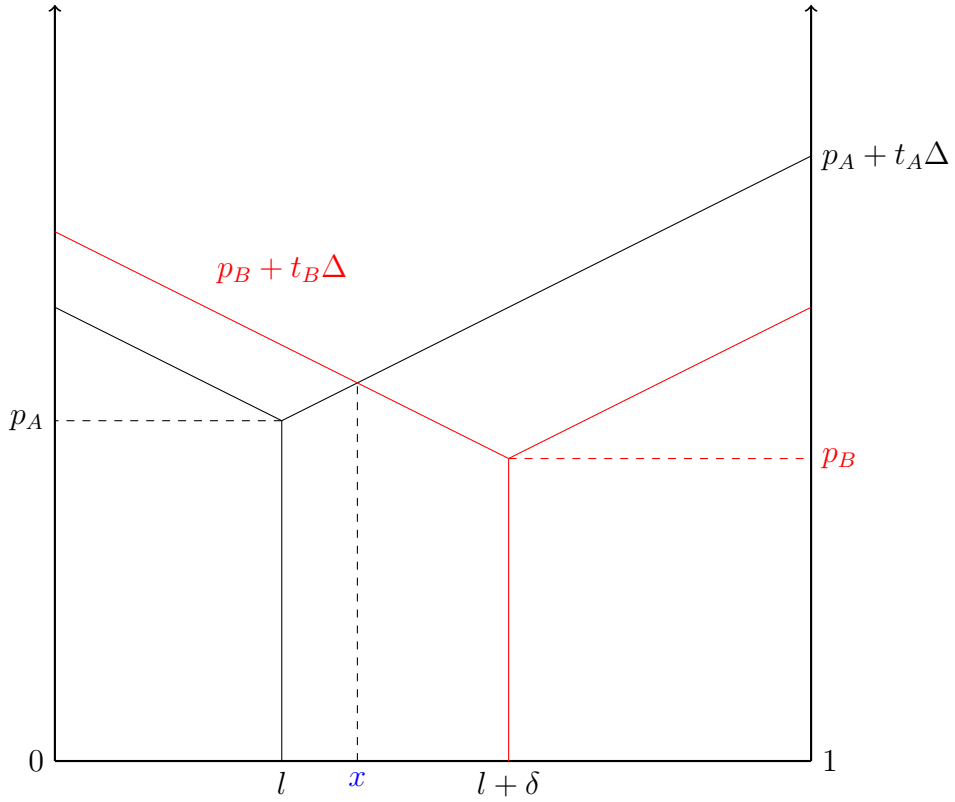


Figure 4.4: Differentiation in coverage only; Hotelling solution. Note that I use Δ to represent distance from l_i.

4.3 Coverage Differentiation

The news outlets differentiate only horizontally, not vertically – i.e. they cover different stories, but with equal authorship, $l \in [0, 1), \delta > 0$ and $t_A = t_B = t \implies \tau = 1$. This is essentially a regular Hotelling solution, and as such demand $D_A = x, D_B = 1 - x$.

$$\begin{aligned} D_A = x &= l + \frac{\delta}{2} + \frac{p_B - p_A}{2t} + \frac{j_A - j_B}{2t} \\ D_B = 1 - x &= 1 - l - \frac{\delta}{2} + \frac{p_A - p_B}{2t} + \frac{j_B - j_A}{2t} \end{aligned} \tag{4.10}$$

From the demand functions I note that the traditional Hotelling-insight holds, where the outlets have monopoly over over their outer market-segments, and share the cent er between them, corrected for relative price and quality differentials.

This specification may reflect competition between the traditional city newspapers. In Norwegian cities, historically, there were often a newspaper produced by the labour movement, and a one more conservative targeted one – e.g. VG and Aftenposten, Bergensavisen and Bergens Tidene, or Rogalands avis and Stavanger Aftenblad. The labour

newspaper wrote more about topics which interested the workers, and the conservative one about stories which were of interest to the capitalists. As can be noted from the reaction functions and Nash equilibria, the size of the advertisement market is the determinant of the outcome here. An empirical study must be conducted to determine whether which ϕ_A or ϕ_B is greatest. It may, reasonably, be assumed both that $\phi_A > \phi_B$ because the working class has a higher propensity to consume than the capitalists, but on the other hand, the consernatives might have more money to spend.

4.3.1 Stage 3 - setting prices, p_i

The stage 3 reaction functions are

$$\begin{aligned} p_A(p_B) =& tl + \frac{p_B + t\delta}{2} + \frac{j_A - j_B}{2} - \frac{\Phi_A a_A}{2} \\ p_B(p_A) =& t(1-l) + \frac{p_A - t\delta}{2} + \frac{j_B - j_A}{2} - \frac{\Phi_B a_B}{2} \end{aligned} \tag{4.11}$$

which provides the Nash equilibria

$$\begin{aligned} p_A^{NE} =& \frac{2t + t(2l - \delta)}{3} + \frac{j_A - j_B}{3} - \frac{2\Phi_A a_A}{3} - \frac{\Phi_B a_B}{3} \\ p_B^{NE} =& \frac{4t - t(2l + \delta)}{3} + \frac{j_B - j_A}{3} - \frac{\Phi_A a_A}{3} - \frac{2\Phi_B a_B}{3} \end{aligned} \tag{4.12}$$

From the reaction function I note that $\frac{\partial p_i}{\partial p_j} = \frac{1}{2} > 0$ which means that prices are strategic complements. At this stage, the outlets are engaged price competition, and this generally an expected behaviour in Bertrand-dominated markets. $\frac{\partial p_i}{\partial a_i} < 0$ which tells us that the outlet's advertisement volume and their shelf prices are strategic substitutes, a stage 2 increase in advertisement volume leads to an optimal response being to lower prices. This dynamic exists because more advertisement volume lowers the price per ads-insert, and as such, the outlet compensate by increasing the number of sold issues. I note that absent all other factors, prices equal the transport cost, t, and deviations therefrom are driven by either 'quality price premium/loss', or advertisement market trade-offs.

4.3.2 Stage 2 - setting ads-volume, a_i

The outlets act as monopolists in each their advertisement market, I only obtain Nash equilibria in a_i:

$$a_i = \frac{\phi_i}{2\alpha}$$

Because there is no direct competition in the advertisement space I do not obtain a reaction function here. This result mirrors general monopoly pricing results and are thus expected.

4.3.3 Stage 1 - Investment in quality, j_i

The quality reaction function and Nash-equilibrium are:

$$\begin{aligned} j_A(j_B) =& \frac{2t + t(2l - \delta)}{9\beta t - 1} - \frac{j_B}{9\beta t - 1} + \frac{\phi_A^2 - \phi_B^2}{4\alpha\big[9\beta t - 1\big]} \\ j_B(j_A) =& \frac{4t - t(2l + \delta)}{9\beta t - 1} - \frac{j_A}{9\beta t - 1} + \frac{\phi_B^2 - \phi_A^2}{4\alpha\big[9\beta t - 1\big]} \end{aligned} \tag{4.13}$$

From equation 4.13 it is noted that $\frac{\partial j_i}{\partial j_j} < 0$, meaning journalistic quality are strategic substitutes. The third term also tells us that the outlet with the largest advertisement market, and thus also highest per ad-insert price, will use quality to make the most of their relative advertisement market advantage, $\phi_i^2 - \phi_j^2$, from the increased demand quality investments provide.

The NE is: $j_i = \frac{p_i + \Phi_i a_i}{2\beta t}$, which tells us that the quality is increasing in per-unit sales revenue, i.e. increasing in both shelf-prices and $\Phi_i a_i$. It is also noted that quality is decreasing in β, the quality investment constant. The relative importance of sales revenue is also decreasing in t, the effort cost of reading for consumers. This is because the larger their compromise cost to read news articles, the relatively less important is the shelf price competition compared to location. Quality affects the demand through decreasing the perceives, or quality-adjusted, shelf price, and as such it follows that if the readers wish mainly to minimise their compromise distance, the lower the returns to quality journalism investments are.

$$\begin{aligned} j_A^{SPE} =& \frac{\phi_A^2 - \phi_B^2}{4\alpha\big[9\beta t - 2\big]} + \frac{2t + t(2l - \delta)}{9\beta t - 2} - \frac{2(3 - \delta)}{9\beta\big[9\beta t - 2\big]} \\ j_B^{SPE} =& \frac{\phi_B^2 - \phi_A^2}{4\alpha\big[9\beta t - 2\big]} + \frac{4t - t(2l + \delta)}{9\beta t - 2} + \frac{2(3 - \delta)}{9\beta\big[9\beta t - 2\big]} \end{aligned} \tag{4.14}$$

From equation 4.14 it is noted that the relative ads-market premium/loss effect is maintained in the subgame perfect equilibrium, and this effect is less the larger the advertisement crowding out effect, α, is. I find that for B journalistic quality is decreasing in horizontal differentiation, δ, whereas for A the effect is ambiguous – A's quality in increasing in higher differentiation given $\beta < \frac{2}{9t}$ or $t < \frac{2}{9\beta}$[31].

4.3.4 Subgame Perfect Equilibrium

The subgame perfect equilibrium is:

$$\begin{aligned} p_A^{SPE} =& \frac{\phi_A^2 - \phi_B^2}{6\alpha\big[9\beta t - 2\big]} - \frac{2\phi_A^2 + \phi_B^2}{12\alpha} + \frac{4(\delta - 3)}{27\beta\big[9\beta t - 2\big]} + \frac{2t(2l - 1)}{3\big[9\beta t - 2\big]} + \frac{2t + t(2l - \delta)}{3} \\ p_B^{SPE} =& \frac{\phi_B^2 - \phi_A^2}{6\alpha\big[9\beta t - 2\big]} - \frac{\phi_A^2 + 2\phi_B^2}{12\alpha} - \frac{4\delta}{27\beta\big[9\beta t - 2\big]} + \frac{2t(1 - 2l)}{3\big[9\beta t - 2\big]} + \frac{4t - t(2l + \delta)}{3} \end{aligned}$$

$$a_i^* = \frac{\phi_i}{2\alpha} \tag{4.15}$$

$$\begin{aligned} j_A^{SPE} =& \frac{\phi_A^2 - \phi_B^2}{4\alpha\big[9\beta t - 2\big]} + \frac{2t + t(2l - \delta)}{9\beta t - 2} + \frac{2\delta - 6}{9\beta\big[9\beta t - 2\big]} \\ j_B^{SPE} =& \frac{\phi_B^2 - \phi_A^2}{4\alpha\big[9\beta t - 2\big]} + \frac{4t - t(2l + \delta)}{9\beta t - 2} - \frac{2\delta - 6}{9\beta\big[9\beta t - 2\big]} \end{aligned}$$

from which the outlets will face demand

$$\begin{aligned} D_A^* =& \frac{\phi_A^2 - \phi_B^2}{12\alpha t\big[9\beta t - 2\big]} + \frac{\phi_A^2 - \phi_B^2}{24\alpha t} + \frac{2(\delta - 6)}{27\beta t\big[9\beta t - 2\big]} + \frac{2l + 3\delta - 2}{6} + \frac{2l - 1}{9\beta t - 2} \\ D_B^* =& \frac{\phi_B^2 - \phi_A^2}{12\alpha t\big[9\beta t - 2\big]} + \frac{\phi_B^2 - \phi_A^2}{24\alpha t} - \frac{2(3 + \delta)}{27\beta t\big[9\beta t - 2\big]} + \frac{4(1 - l) - 3\delta}{6} + \frac{1 - 2l}{3\big[9\beta t - 2\big]} \end{aligned} \tag{4.16}$$

[31] The reason the symmetry I would assume from the regular Hotelling framework does not hold here is because the location setup is different, usually in Hotelling one would set $L_i = l \in [0, 1]\{A, B\}$ where l_i would be $l_A = L_A, l_B = 1 - L_B$, whereas in this setup the location of B is set as a distance from A, $l_A = l, l_B = l + \delta$.

and make profits[32]

$$\begin{aligned}
\pi_A =& \Big[\frac{\phi_A^2-\phi_B^2}{6\alpha\big[9\beta t-2\big]}+\frac{\phi_A^2-\phi_B^2}{12\alpha}+\frac{4(\delta-3)}{27\beta\big[9\beta t-2\big]}+\frac{2t(2l-1)}{3\big[9\beta t-2\big]}+\frac{2t+t(2l-\delta)}{3}\Big] \\
&\times\Big(\frac{\phi_A^2-\phi_B^2}{12\alpha t\big[9\beta t-2\big]}+\frac{\phi_A^2-\phi_B^2}{24\alpha t}+\frac{2(\delta-6)}{27\beta t\big[9\beta t-2\big]}+\frac{2l+3\delta-2}{6}+\frac{2l-1}{9\beta t-2}\Big) \\
&-\frac{\beta}{2}\Big(\frac{\phi_A^2-\phi_B^2}{4\alpha\big[9\beta t-2\big]}+\frac{2t+t(2l-\delta)}{9\beta t-2}+\frac{2\delta-6}{9\beta\big[9\beta t-2\big]}\Big)^2 \\
\pi_B =& \Big[\frac{\phi_B^2-\phi_A^2}{6\alpha\big[9\beta t-2\big]}+\frac{\phi_B^2-\phi_A^2}{12\alpha}-\frac{4\delta}{27\beta\big[9\beta t-2\big]}+\frac{2t(1-2l)}{3\big[9\beta t-2\big]}+\frac{4t-t(2l+\delta)}{3}\Big] \\
&\times\Big(\frac{\phi_B^2-\phi_A^2}{12\alpha t\big[9\beta t-2\big]}+\frac{\phi_B^2-\phi_A^2}{24\alpha t}-\frac{2(3+\delta)}{27\beta t\big[9\beta t-2\big]}+\frac{4(1-l)-3\delta}{6}+\frac{1-2l}{3\big[9\beta t-2\big]}\Big) \\
&-\frac{\beta}{2}\Big(\frac{\phi_B^2-\phi_A^2}{4\alpha\big[9\beta t-2\big]}+\frac{4t-t(2l+\delta)}{9\beta t-2}-\frac{2\delta-6}{9\beta\big[9\beta t-2\big]}\Big)^2
\end{aligned} \tag{4.17}$$

I have, within the time span of this thesis, been unable to engage in much simulations to test the outcomes of the result, but in figures 4.5 and 4.6 I have done a simple simulation to show how demand changes when the relative advertisement market size varies for the two outlets. Please note that this results are very sensitive to changes in the other parameters. In figure 4.5 I vary ϕ_A relative to $\phi_B = 0.9$, and I find that outlet A will prefer to have a relatively small advertisement market, compared to B, when B's is large; conversely, B benefits from relative comparability in advertisement market size. Because the outlets have equal transport costs for the reader, this difference is driven by the optimal responses to the ads volume to include in the published issue. In figure 4.6, a similar trend is observed, but here I vary ϕ_B compared to a base $\phi_A = 0.5$. For the outlet facing a competitor with a medium sized ads market, they will find it preferable to transition to having a relatively large advertisement market. This result is also dependent on a relatively small degree of horizontal differentiation, $\delta = 0.2$.

[32]Simplifying the expressions is a time-consuming task which adds little insights and was therefore not prioritised.

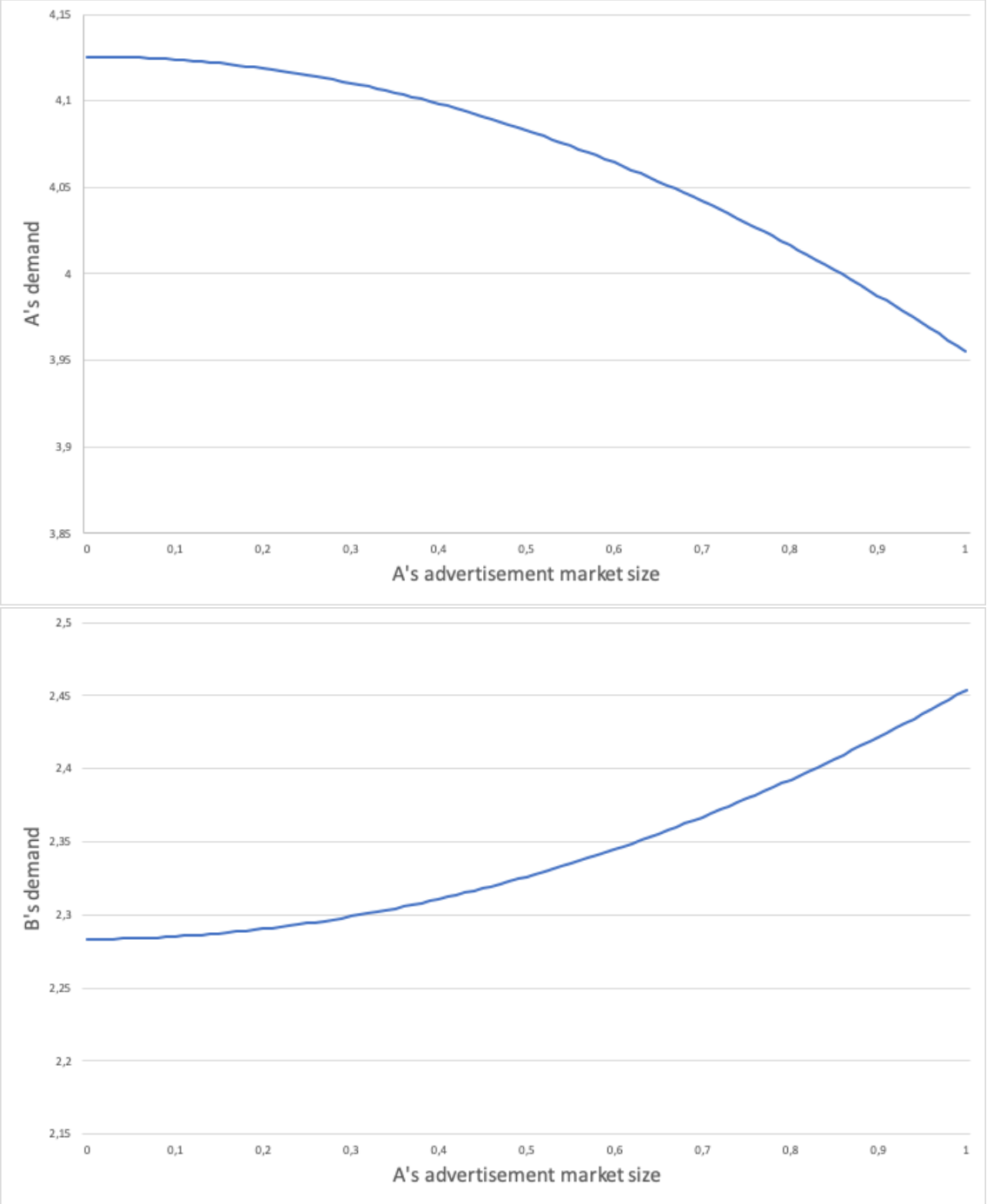


Figure 4.5: How A and B's demand changes in ϕ_A, for $\phi_B = 0.9, \alpha = 0.4, \beta = 0.2$, $t = 0.5, l = 0.4, \delta = 0.2$.

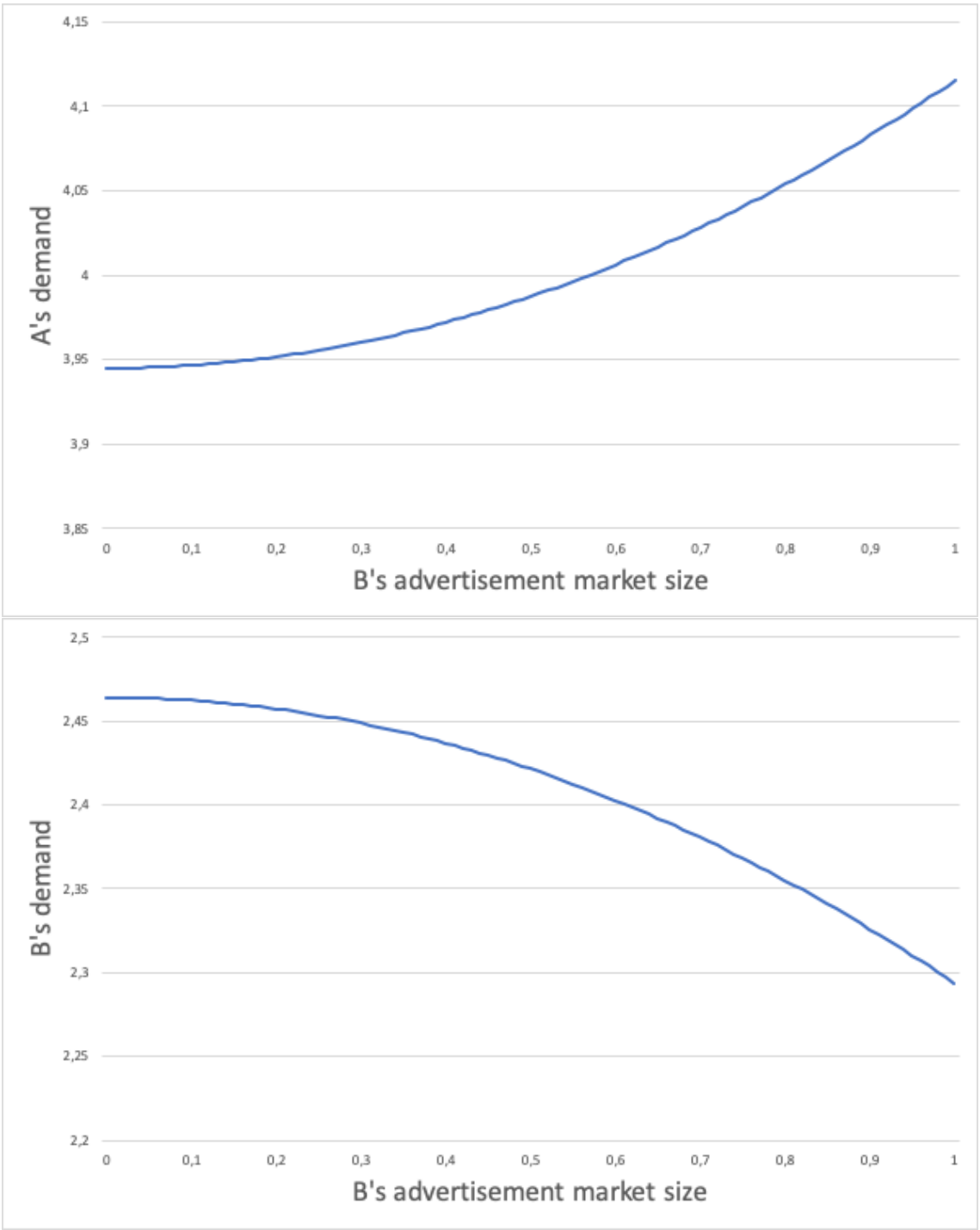


Figure 4.6: How A and B's demand changes in ϕ_B, for $\phi_A = 0.5, \alpha = 0.4, \beta = 0.2$, $t = 0.5, l = 0.4, \delta = 0.2$.

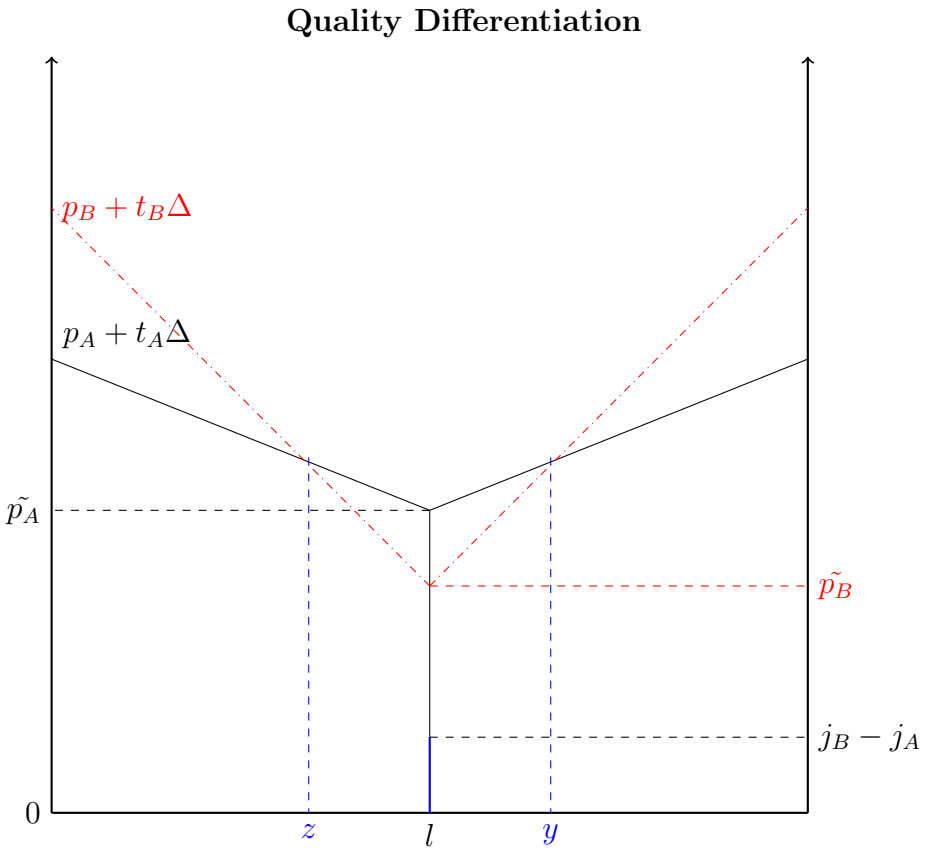


Figure 4.7: Representation of a market with only vertical differentiation. Straight lines represent outlet 1, dash-dotted lines represent outlet 2.

4.4 Quality Differentiation

If the news outlets do not differentiate horizontally, only vertically – i.e. they cover the same stories but with different costs of reading – I are in a market as depicted in figure 4.7. Thus, $l \in [0,1], \delta = 0$ and $t_A \neq t_B \implies \tau < 1$. If they both charge the same price, $p_A = p_B$, outlet A would capture the whole market[33]. If, however, $p_A - j_A > p_B - j_B$, both outlets manage to capture some of the market. In figure 4.7, I have set $p_A = p_B$, but $j_A < j_B$, such that $\tilde{p_A} > \tilde{p_B}$[34]. In this market, I observe that outlet B is going to have demand $D_B = y - z$ and A, $D_A = 1 - D_2$. When I solve the demand functions by using

[33] There would, in fact, be a single indifferent consumer, but because of the continuum of the line, this is a negligible consumer.

[34] $\tilde{p_i} = p_i - j_i$.

the indifferent consumers identified in appendix A3, I find the following equations:

$$\begin{aligned} D_A &= 1 - \frac{2(p_A - p_B)}{t_B - t_A} + \frac{2(j_A - j_B)}{t_B - t_A} \\ D_B &= \frac{2(p_A - p_B)}{t_B - t_A} + \frac{2(j_B - j_A)}{t_B - t_A} \end{aligned} \tag{4.18}$$

which are independent of location[35]. This suggests that the results I find for no horizontal differentiation also holds for little horizontal differentiation; indeed, for any given $\overline{t_B}$, as long as p_B and δ are sufficiently small that the reader located at l, same as A, will prefer to read B, this case should be able to provide insights – formally, $\{\delta \in [0,1] \mid p_B + t_B\delta \leq p_A\}$.

Scenarios where this framework could be deployed to study competition could be, for instance, between American news outlets *Fox News* versus *National Review*, where they both cover favourably conservative issues, or *NBC News* versus *the Nation* on the progressive side. Alternatively, it could be used to study the competition between the *Journal of Economic Perspectives* and the *Quarterly Journal of Economics*, where they both are general-interest academic journals for economists, but the former aims at publishing articles written in a considerably more accessible way than the latter.

4.4.1 Stage 3 – setting prices, p_i

I have the reaction functions:

$$\begin{aligned} p_A(p_B) =& \frac{t_B - t_A}{4} + \frac{p_B}{2} + \frac{j_A - j_B}{2} - \frac{\Phi_A a_A}{2} \\ p_B(p_A) =& \frac{p_A}{2} + \frac{j_B - j_A}{2} - \frac{\Phi_B a_B}{2} \end{aligned} \tag{4.19}$$

where I note that $\frac{\partial p_i}{\partial p_j} = \frac{1}{2} > 0$ for both outlets, meaning that prices are strategic complements. If one outlet increases their shelf price by 1NOK, the profit maximising behaviour of the other outlet is to raise theirs by 0.50NOK. I also note that $\frac{\partial p_i}{\partial j_i} > 0$ and that $\frac{\partial p_i}{\partial j_j} < 0$, which is unsurprising given the demand functions, which has the same property. The result is that the editor with the relatively greatest journalistic quality may charge a 'quality premium', whereas the other has relatively less revenue from readership sales. Outlet A is provided with an 'accessibility premium' by having a lower cost of reading, $t_A < t_B$. This allows them to charge a relatively higher price than B.

[35] Because $\tilde{p_A} - \tilde{p_B} > 0$ in order for $D_B > 0$ I know that the demand $D_A + D_B = D = 1$ is maintained.

The Nash equilibrium shelf prices are:

$$\begin{aligned} p_A^{NE} =& \frac{t_B - t_A}{3} + \frac{j_A - j_B}{3} - \frac{2\Phi_A a_A}{3} - \frac{\Phi_B a_B}{3} \\ p_B^{NE} =& \frac{t_B - t_A}{6} + \frac{j_B - j_A}{3} - \frac{\Phi_A a_A}{3} - \frac{2\Phi_B a_B}{3} \end{aligned} \tag{4.20}$$

which are relatively symmetric, but where outlet A maintains their 'accessibility premium'.

4.4.2 Stage 2 – setting ads-volume, a_i

Again, ads-volume is:

$$a_i = \frac{\phi_i}{2\alpha} \tag{4.21}$$

Which is both Nash- and SPE equilibrium condition.

4.4.3 Stage 1 – investment in journalism, j_i

The reaction functions are

$$\begin{aligned} j_A(j_B) =& \frac{4(t_B - t_A)}{9\beta(t_B - t_A) - 4} + \frac{\phi_A^2 - \phi_B^2}{\alpha\big[9\beta(t_B - t_A) - 4\big]} - \frac{4j_B}{9\beta(t_B - t_A) - 4} \\ j_B(j_A) =& \frac{2(t_B - t_A)}{9\beta(t_B - t_A) - 4} + \frac{\phi_B^2 - \phi_B^2}{\alpha\big[9\beta(t_B - t_A) - 4\big]} - \frac{4j_A}{9\beta(t_B - t_A) - 4} \end{aligned} \tag{4.22}$$

And the SPEs are – note that the NE will always be $j_i = \frac{p_i + \Phi_i a_i}{6t\beta}$, I think:

$$\begin{aligned} j_A^{SPE} =& \frac{4}{9\beta} + \frac{\phi_A^2 - \phi_B^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]} \\ j_B^{SPE} =& \frac{6\beta(t_B - t_A) - 8}{3\beta\big[9\beta(t_B - t_A) - 8\big]} + \frac{\phi_B^2 - \phi_A^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]} \end{aligned} \tag{4.23}$$

The outlet with the larger advertisement market should, optimally, also have a relatively higher journalistic quality. The mechanism through which this is profitable is by noting that the outlet will price monopolistically in the advertisement space, and increasing journalistic quality will increase demand, which in turn

4.4.4 Subgame Perfect Equilibrium

The subgame perfect equilibrium is:

$$
\begin{aligned}
p_A^* =& \frac{t_B - t_A}{3} + \frac{2\phi_A^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]} - \frac{(2\phi_A^2 + \phi_B^2)\big(3\beta(t_B - t_A)\big)}{4\alpha\big[9\beta(t_B - t_A) - 8\big]} + \frac{16\beta(t_B - t_A) - 8}{27\beta\big[9\beta(t_B - t_A) - 8\big]} \\
p_B^* =& \frac{t_B - t_A}{6} + \frac{2\phi_B^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]} - \frac{(2\phi_B^2 + \phi_A^2)\big(3\beta(t_B - t_A)\big)}{4\alpha\big[9\beta(t_B - t_A) - 8\big]} + \frac{8 - 16\beta(t_B - t_A)}{27\beta\big[9\beta(t_B - t_A) - 8\big]}
\end{aligned}
$$

$$
a_i^* = \frac{\phi_i}{2\alpha}
$$

$$
\begin{aligned}
j_A^* =& \frac{4}{9\beta} + \frac{\phi_A^2 - \phi_B^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]} \\
j_B^* =& \frac{6\beta(t_B - t_A) - 8}{3\beta\big[9\beta(t_B - t_A) - 8\big]} + \frac{\phi_B^2 - \phi_A^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]}
\end{aligned}
\tag{4.24}
$$

from which the outlets will face demand and make profits

$$
\begin{aligned}
D_A^* =& \frac{2}{3} + \frac{3\beta(\phi_A^2 - \phi_B^2)}{2\alpha\big[9\beta(t_B - t_A) - 8\big]} - \frac{16\big(1 - 2\beta(t_B - t_A)\big)}{27\beta(t_B - t_A)\big[9\beta(t_B - t_A) - 8\big]} \\
D_B^* =& \frac{1}{3} + \frac{3\beta(\phi_B^2 - \phi_A^2)}{2\alpha\big[9\beta(t_B - t_A) - 8\big]} + \frac{16\big(1 - 2\beta(t_B - t_A)\big)}{27\beta(t_B - t_A)\big[9\beta(t_B - t_A) - 8\big]}
\end{aligned}
\tag{4.25}
$$

From equations 4.25 I note that the base demand split at equilibrium is 2/3 for A and 1/3 for B. This encapsulates that the less accessibly read outlet, B, will capture a relatively smaller segment of readers around the coverage topic – note that, whereas I have chosen to locate the outlets at the centre in figure 4.7, the actual placement on the line is not of importance[36]. From the equilibrium demand it should also be noted that the outlet with the larger advertisement market will act such that they capture a larger share of the market.

[36]I have, for time constraint reasons, not evaluated the specific effects of placements close enough to the edges that outlet B captures the out-most reader on either end *(i.e. $D_B = 1 - z$ or $D_B = y$)*, but my conjecture is that the general effects are maintained, but lessened as the outlet no longer have symmetric demand on either side. This is an aspect of this study I would wish to research further.

Subgame perfect profits are

$$\begin{aligned}
\pi_A =& \Big[\frac{t_B - t_A}{3} + \frac{\phi_A^2\big(9\beta(t_B - t_A)\big)}{4\alpha\big[9\beta(t_B - t_A) - 8\big]} - \frac{(2\phi_A^2 + \phi_B^2)\big(3\beta(t_B - t_A)\big)}{4\alpha\big[9\beta(t_B - t_A) - 8\big]} + \frac{16\beta(t_B - t_A) - 8}{27\beta\big[9\beta(t_B - t_A) - 8\big]}\Big] \\
& \times \Big(\frac{2}{3} + \frac{3\beta(\phi_A^2 - \phi_B^2)}{2\alpha\big[9\beta(t_B - t_A) - 8\big]} - \frac{16\big(1 - 2\beta(t_B - t_A)\big)}{27\beta(t_B - t_A)\big[9\beta(t_B - t_A) - 8\big]}\Big) \\
& - \frac{\beta}{2}\Big(\frac{4}{9\beta} + \frac{\phi_A^2 - \phi_B^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]}\Big)^2 \\
\pi_B =& \Big[\frac{t_B - t_A}{6} + \frac{\phi_B^2\big(9\beta(t_B - t_A)\big)}{\alpha\big[9\beta(t_B - t_A) - 8\big]} - \frac{(2\phi_B^2 + \phi_A^2)\big(3\beta(t_B - t_A)\big)}{4\alpha\big[9\beta(t_B - t_A) - 8\big]} + \frac{8 - 16\beta(t_B - t_A)}{27\beta\big[9\beta(t_B - t_A) - 8\big]}\Big] \\
& \times \Big(\frac{1}{3} + \frac{3\beta(\phi_B^2 - \phi_A^2)}{2\alpha\big[9\beta(t_B - t_A) - 8\big]} + \frac{16\big(1 - 2\beta(t_B - t_A)\big)}{27\beta(t_B - t_A)\big[9\beta(t_B - t_A) - 8\big]}\Big) \\
& - \frac{\beta}{2}\Big(\frac{6\beta(t_B - t_A) - 8}{3\beta\big[9\beta(t_B - t_A) - 8\big]} + \frac{\phi_B^2 - \phi_A^2}{\alpha\big[9\beta(t_B - t_A) - 8\big]}\Big)^2
\end{aligned} \tag{4.26}$$

The multi-dimensional differentiation literature has tended to conclude that max-min differentiation provide the most stable equilibria. Whereas the transport cost is a long-run variable, exogenous to the model, understanding how changes in it affect the short run decision-making should be useful in understanding longer-run observed investments in its reduction. Quality differentiation has the property that there is *de facto* minimum horizontal differentiation, $\delta = 0$, and I will now explore the effect of varying vertical differentiation. For very similar t_i's, $\tau \to 1$, the advertisement market becomes relatively more dominant in the demand – this is because the third term will approach 0, and the denominator for the second term of the demand functions will increase in magnitude, but become negative.

The simulations run on the demand functions for quality competition is represented in figures 4.8 and 4.9. Figure 4.8 looks at how the outlets' demand changes with $\phi_A^2 - \phi_B^2$, i.e. the left hand side informs us that if the relative difference between the squared ads market sizes is 1, then B has negative demand, and A has positive. As one moves towards the right on the graph, the relationship switches, and the converse holds – the symmetry here suggests is ensuring for the validity of the model. For the values in the figure there appears not to be a positive demand equilibrium for both outlets, this is the result of my decision to choose parameter values to easy illustration, I was, again, prevented from engaging in much simulations for time constraint reasons. In figure 4.9 shows how the

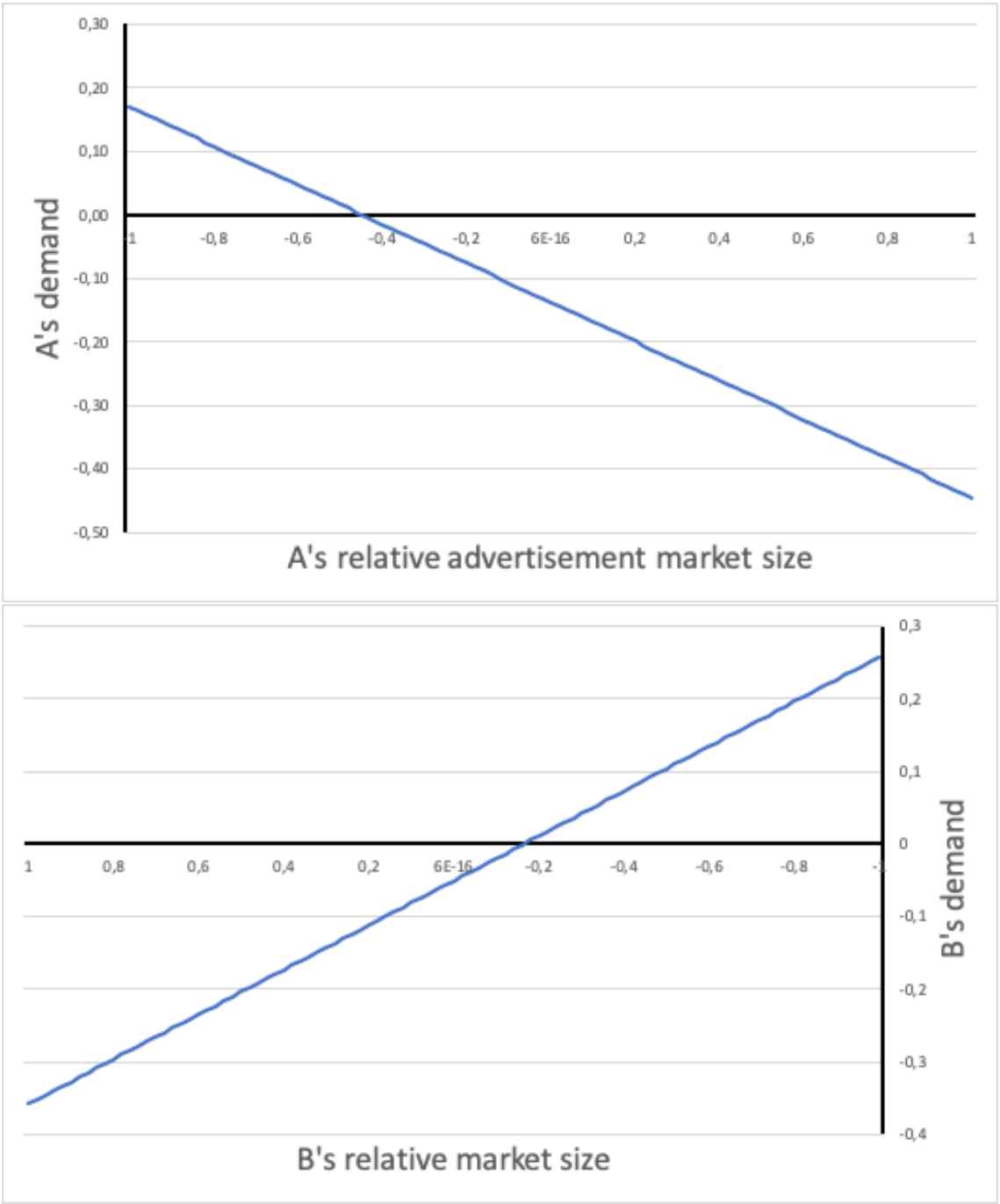


Figure 4.8: How demand changes for the outlets for $\phi_A^2 - \phi_B^2 \in [-1, 1]$; the axis are set up such that the left hand side represent the same values for both outlets in both graphs. $t_A = 0.4, t_B = 0.6, \alpha = 0.5, \beta = 0.8$.

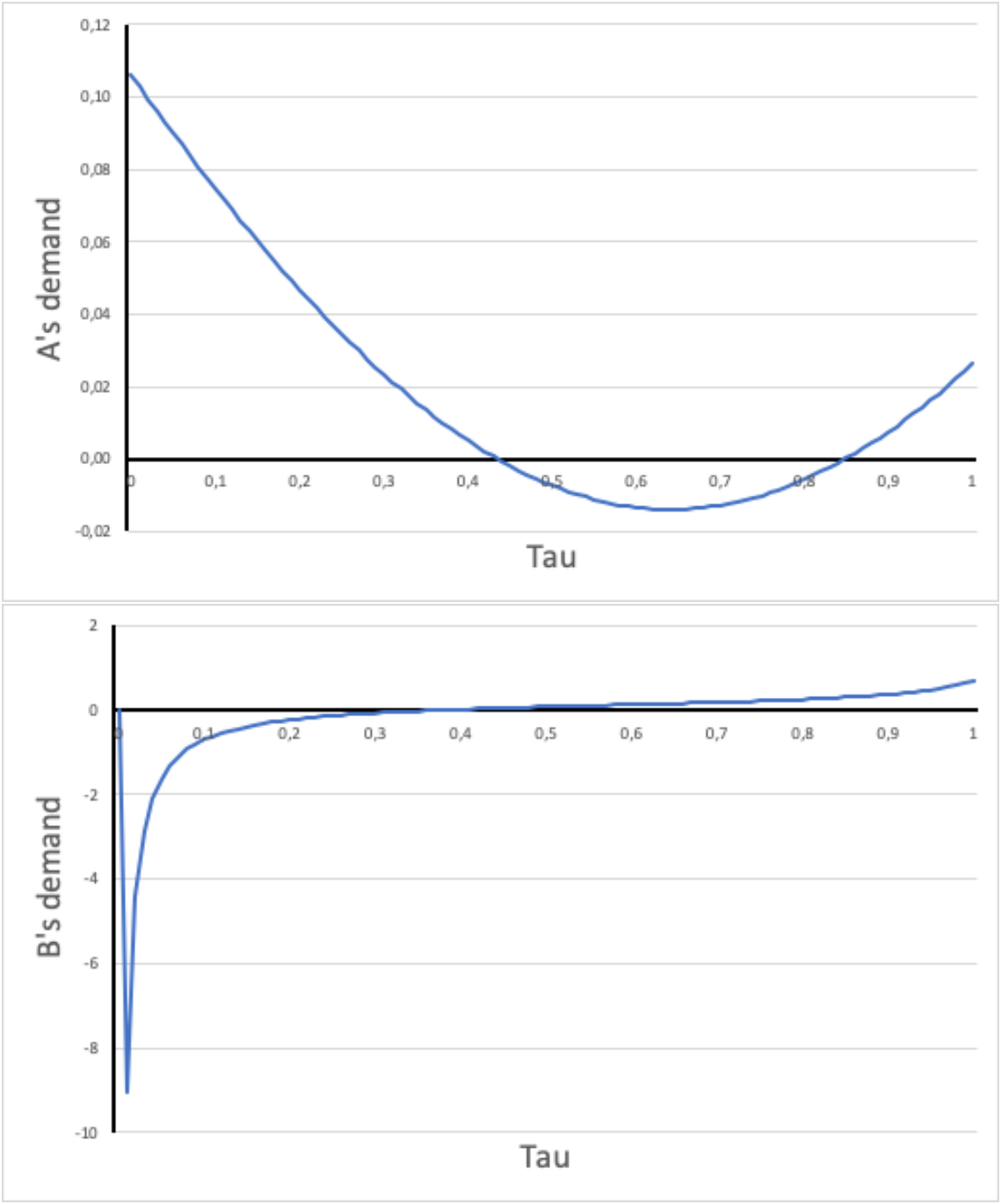


Figure 4.9: How demand changes for the outlets for $\tau \in [0, 1]$. $\phi_A = 0.1, \phi_B = 0.8$, $\alpha = 0.5, \beta = 0.8$.

outlets' reader demand functions vary in τ. i.e. the extent of vertical differentiation, or the differences in compromise cost of accessibility. These results are very sensitive to changes in the other parameters, and have been included mostly to show that the vertical differentiation equilibria will produce wither relatively high or relatively low degree of vertical differentiation. This is because a stable equilibrium might occur at values around $\tau = 0.4$ where t_B is increasing and t_A is decreasing, or at relative similarity of $\tau = 0.8$ where both t_A and t_B are increasing.

4.5 Differentiation in two dimensions

I now allow the news outlets to be differentiated in what to cover, i.e. horizontally in $l \in [0, 1), \delta > 0$, and in readability, i.e.$t_A \neq t_B \implies \tau < 1$. The figures presented in figure 4.3[37] show the possible divisions of the market when the outlets differentiate both in coverage and in journalistic clarity. This scenario provides us with a more tricky demand situation. I note from the figures in 4.3 that B's demand function is always continuous over $[0, 1]$ whereas A's may be disjoint – see figure 4.3d, which could represent competition between a general news outlet and a more specialised magazine. I will thus base my analysis here on outlet B, then define A's demand function as $D_A = 1 - D_B$. Outlet B's demand is dependent on the relative prices:

$$D_B = \begin{cases} 0 & \text{if } \tilde{p_B} \geq \tilde{p_A} + \delta t_A \\ min\{1, y\} - x & \text{if } \tilde{p_A} - \delta t_B \leq \tilde{p_B} \leq \tilde{p_A} + \delta t_A \\ min\{1, y\} - max\{0, z\} & \text{else} \end{cases} \tag{4.27}$$

4.5.1 One outlet is always more expensive than the other

I have assumed that the publishers have access to the same newsroom technology. If an outcome were about to happen where $p_B - j_B > p_A - j_A + \delta t_A$, i.e. one outlet is always more expensive than their competitor to all consumers, the outlet should be able to lower their price – or increase quality – without becoming unprofitable. I have assumed that $t_B \geq t_A$, so this can only happen for outlet B – see figure 4.3c for $p_A - j_A \geq p_B - j_B + \delta p_B$, but then the easier-to-read outlet will capture the readers with specific interests while the harder to read outlet will capture the generalists. I can know that outlet B will be able to, profitably, lower prices or increase quality because their competitor was able to.

This assumption could be restrictive in applications between media platforms, and makes this model not well suited for study between digital and printed newspapers, but this is also not the purpose of this thesis.

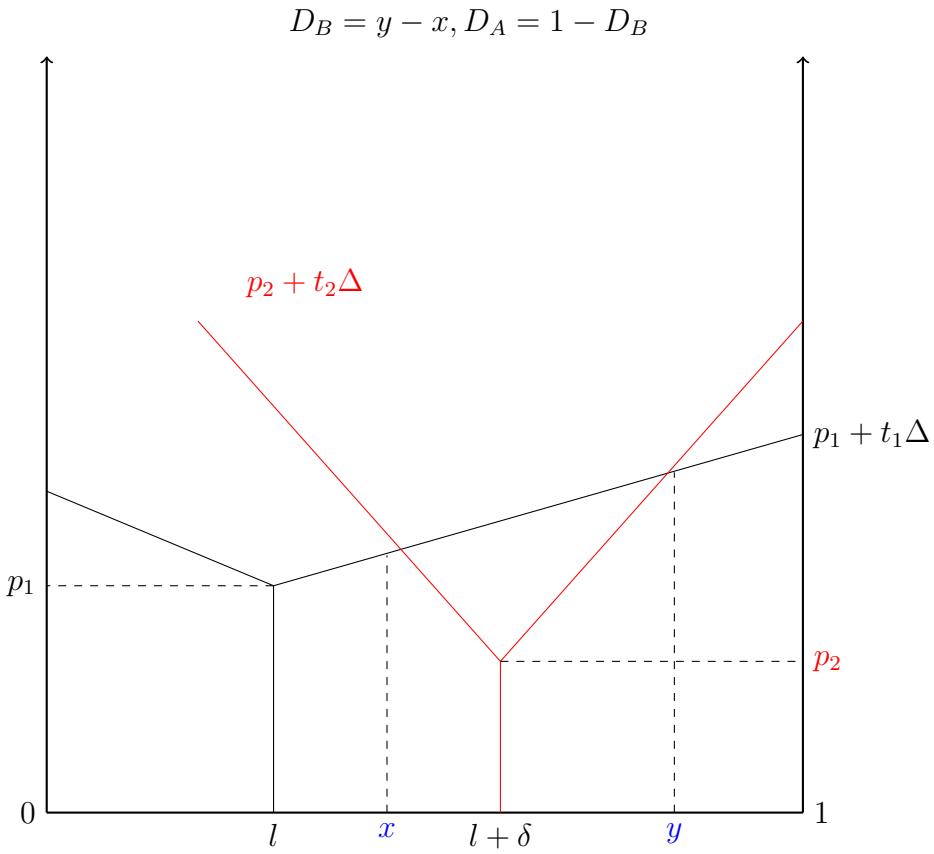


Figure 4.10: Disjoint demand in A

4.5.2 Outlet A capture both extremes

Could be within-sector competition between outlets covering the same general area, say politics, where A is covering the horse race and B is more focused on policy and implications. Then one can reasonably think of B requiring a higher effort cost of reading than A, and I will have a market looking like figure 4.10. Then the demand function will look like:

$$\begin{aligned} D_A =& 1 - \frac{2\delta t_A t_B}{t_B^2 - t_A^2} + \frac{2t_B(p_B - p_A)}{t_B^2 - t_A^2} + \frac{2t_B(j_A - j_B)}{t_B^2 - t_A^2} \\ D_B =& \frac{2\delta t_A t_B}{t_B^2 - t_A^2} + \frac{2t_B(p_A - p_B)}{t_B^2 - t_A^2} + \frac{2t_B(j_B - j_A)}{t_B^2 - t_A^2} \end{aligned} \tag{4.28}$$

From the demand functions I observe that the general properties that the outlet's demand is increasing in their own quality and the competitor's prices, and decreasing the their own prices and the competitor's quality. It is also shown that outlet B demand is

[37] The figure discards the effect of journalistic quality for simplicity.

increasing in horizontal differentiation, δ, and outlet A is decreasing in it[38]. I also note that increasing vertical differentiation, $\tau = \frac{t_A}{t_B} \to 0$ will also increase demand – for A provided $\delta t_A < p_B - p_A + j_A - j_B$, i.e. provided the relative shelf price differential is less than the transport cost between A and B.

4.5.2.1 Stage 3 – setting prices, p_i

Reaction functions are:

$$\begin{aligned} p_A(p_B) =& \frac{t_B^2 - t_A^2}{4t_B} + \frac{p_B - \delta t_A}{2} + \frac{j_A - j_B}{2} - \frac{\Phi_A a_A}{2} \\ p_B(p_A) =& \frac{p_A + \delta t_A}{2} + \frac{j_B - j_A}{2} - \frac{\Phi_B a_B}{2} \end{aligned} \tag{4.29}$$

And Nash equilibria are

$$\begin{aligned} p_A^{NE} =& \frac{t_B^2 - t_A^2}{3t_B} - \frac{\delta t_A}{3} + \frac{j_A - j_B}{3} - \frac{2\Phi_A a_A}{3} - \frac{\Phi_B a_B}{3} \\ p_B^{NE} =& \frac{t_B^2 - t_A^2}{6t_B} + \frac{\delta t_A}{3} + \frac{j_B - j_A}{3} - \frac{\Phi_A a_A}{3} - \frac{2\Phi_B a_B}{3} \end{aligned} \tag{4.30}$$

4.5.2.2 Stage 2 – setting ads-volume, a_i

I maintain the same function here as elsewhere: $a_i = \frac{\phi_i}{2\alpha}$.

4.5.2.3 Stage 3 – investing in quality, j_i and t_i

Reaction functions are

$$\begin{aligned} j_A(j_B) =& \frac{4\left[t_B^2 - t_A^2\right]}{9\beta(t_B^2 - t_A^2) - 4t_B} + \frac{t_B\left[\phi_A^2 - \phi_B^2\right]}{\alpha\left[9\beta(t_B^2 - t_A^2) - 4t_B\right]} - \frac{4t_B\left[\delta t_A + j_B\right]}{9\beta(t_B^2 - t_A^2) - 4t_B} \\ j_B(j_B) =& \frac{2\left[t_B^2 - t_A^2\right]}{9\beta(t_B^2 - t_A^2) - 4t_B} + \frac{t_B\left[\phi_B^2 - \phi_A^2\right]}{\alpha\left[9\beta(t_B^2 - t_A^2) - 4t_B\right]} + \frac{4t_B\left[\delta t_A - j_A\right]}{9\beta(t_B^2 - t_A^2) - 4t_B} \end{aligned} \tag{4.31}$$

and I get SPE

$$\begin{aligned} j_A^{SPE} =& \frac{4}{9\beta}\frac{\left[9\beta(t_B^2 - t_A^2) - 6t_B\right]}{\left[9\beta(t_B^2 - t_A^2) - 8t_B\right]} + \frac{t_B(\phi_A^2 - \phi_B^2)}{\alpha\left[9\beta(t_B^2 - t_A^2) - 8t_B\right]} - \frac{4\delta t_A t_B}{9\beta(t_B^2 - t_A^2) - 8t_B} \\ j_B^{SPE} =& \frac{2}{3\beta}\frac{\left[3\beta(t_B^2 - t_A^2) - 5t_B\right]}{\left[9\beta(t_B^2 - t_A^2) - 8t_B\right]} + \frac{t_B(\phi_B^2 - \phi_A^2)}{\alpha\left[9\beta(t_B^2 - t_A^2) - 8t_B\right]} + \frac{4\delta t_A t_B}{9\beta(t_B^2 - t_A^2) - 8t_B} \end{aligned} \tag{4.32}$$

[38] $\frac{\partial D_B}{\partial \delta} = 1 + \frac{2t_A t_B}{t_B^2 - t_A^2} > 0$, and $\frac{\partial D_A}{\partial \delta} = -\frac{t_A + t_B}{t_B - t_A} < 0$.

The extent of A advantage, or B's disadvantage, is dependent on the exogenous parameters, the firm with the largest advertisement market will be the one most willing to invest in journalism. I do note that the outlets price monopolistically in the advertisement space, which suggest that the hypothesis that the highest-quality outlet will have fewer ads-inserts is not necessarily rejected at this stage. It should also be noted that the advertisement market-size effect is declining in the crowding-out effect on prices, α.

4.5.2.4 Subgame Perfect Equilibrium

The subgame perfect equilibrium is:

$$\begin{aligned}
p_A^* =& \frac{t_B^2 - t_A^2}{3t_B} - \frac{\delta t_A}{3} + \frac{2t_B(\phi_A^2 - \phi_B^2)}{3\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{8\delta t_A t_B}{3\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} \\
&+ \frac{6\beta(t_B^2 - t_A^2) + 2t_B}{9\beta\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{\phi_A^2}{6\alpha} - \frac{\phi_B^2}{12\alpha} \\
p_B^* =& \frac{t_B^2 - t_A^2}{6t_B} + \frac{\delta t_A}{3} + \frac{2t_B(\phi_B^2 - \phi_A^2)}{3\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{8\delta t_A t_B}{3\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} \\
&- \frac{6\beta(t_B^2 - t_A^2) - 2t_B}{9\beta\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{\phi_A^2}{12\alpha} - \frac{\phi_B^2}{6\alpha}
\end{aligned} \tag{4.33}$$

$$a_i^* = \frac{\phi_i}{2\alpha}$$

$$\begin{aligned}
j_A^* =& \frac{4}{9\beta}\frac{\big[9\beta(t_B^2 - t_A^2) - 6t_B\big]}{\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{t_B(\phi_A^2 - \phi_B^2)}{\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{4\delta t_A t_B}{9\beta(t_B^2 - t_A^2) - 8t_B} \\
j_B^* =& \frac{2}{3\beta}\frac{\big[3\beta(t_B^2 - t_A^2) - 5t_B\big]}{\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{t_B(\phi_B^2 - \phi_A^2)}{\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{4\delta t_A t_B}{9\beta(t_B^2 - t_A^2) - 8t_B}
\end{aligned}$$

from which the outlets will face demand and make profits

$$\begin{aligned}
D_A^* =& \frac{2}{3} - \frac{2\delta t_A t_B}{3(t_B^2 - t_A^2)} + \frac{4t_B^2(\phi_A^2 - \phi_B^2)}{3\alpha(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} + \frac{2t_B(\phi_A^2 - \phi_B^2)}{12\alpha\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} \\
&+ \frac{4t_B^2\big((\phi_A^2 - \phi_B^2) - 4\alpha\delta t_A\big)}{3\alpha(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} + \frac{4t_B\big(3\beta - t_B\big)}{9\beta(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} \\
D_B^* =& \frac{1}{3} + \frac{2\delta t_A t_B}{3(t_B^2 - t_A^2)} + \frac{4t_B^2\big((\phi_B^2 - \phi_A^2) + 3\alpha\delta t_A\big)}{3\alpha(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} + \frac{4t_B\big(5t_B - 3\beta(t_B^2 - t_A^2)\big)}{9\beta(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} \\
&+ \frac{2t_B(\phi_B^2 - \phi_A^2}{12\alpha(t_B^2 - t_A^2)}
\end{aligned} \tag{4.34}$$

where one can see that the demand functions are very similar to those of quality differentiation. Especially noticeable is that the base-split is two-thirds versus one-third for the harder-to-read outlet, then the relative differences between them control for the deviations therefrom. Because of the general instability of the simple simulations I have performed for the other two cases, and the lack of time to engage in a more thorough study, I have not engaged a visual exercise of how demand changes with t_i and ϕ_i. It appears that, by evaluating the first two terms, that outlet B prefers a higher degree of horizontal differentiation, contrary to A. They both appear to prefer the opponent increase their transport cost, ceteris paribus, but I am not able to positively conclude whether or not either outlet positively wish to engage in long-run maximisation or minimisation in τ. For this, the stability values of the parameters should be engaged in, possibly aided by an empirical study – I should wish to some time expand on this myself.

The profit functions are[39]:

$$
\begin{aligned}
\pi_A^* =& \left[\frac{t_B^2 - t_A^2}{3t_B} - \frac{\delta t_A}{3} + \frac{2t_B(\phi_A^2 - \phi_B^2)}{3\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{8\delta t_A t_B}{3\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} \right. \\
& \left. + \frac{6\beta(t_B^2 - t_A^2) + 2t_B}{9\beta\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{\phi_A^2}{6\alpha} - \frac{\phi_B^2}{12\alpha} + \frac{\phi_A^2}{4\alpha} \right] \\
& \times \left(\frac{2}{3} - \frac{2\delta t_A t_B}{3(t_B^2 - t_A^2)} + \frac{4t_B^2(\phi_A^2 - \phi_B^2)}{3\alpha(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} + \frac{2t_B(\phi_A^2 - \phi_B^2)}{12\alpha\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} \right. \\
& \left. + \frac{4t_B^2\big((\phi_A^2 - \phi_B^2) - 4\alpha\delta t_A\big)}{3\alpha(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} + \frac{4t_B\big(3\beta - t_B\big)}{9\beta(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} \right) \\
& - \frac{\beta}{2}\left(\frac{4}{9\beta}\frac{\big[9\beta(t_B^2 - t_A^2) - 6t_B\big]}{\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{t_B(\phi_A^2 - \phi_B^2)}{\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{4\delta t_A t_B}{9\beta(t_B^2 - t_A^2) - 8t_B} \right)^2 \\
\pi_B^* =& \left[\frac{t_B^2 - t_A^2}{6t_B} + \frac{\delta t_A}{3} + \frac{2t_B(\phi_B^2 - \phi_A^2)}{3\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{8\delta t_A t_B}{3\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} \right. \\
& \left. - \frac{6\beta(t_B^2 - t_A^2) - 2t_B}{9\beta\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} - \frac{\phi_A^2}{12\alpha} - \frac{\phi_B^2}{6\alpha} + \frac{\phi_B^2}{4\alpha} \right] \\
& \times \left(\frac{1}{3} + \frac{2\delta t_A t_B}{3(t_B^2 - t_A^2)} + \frac{4t_B^2\big((\phi_B^2 - \phi_A^2) + 3\alpha\delta t_A\big)}{3\alpha(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} + \frac{4t_B\big(5t_B - 3\beta(t_B^2 - t_A^2)\big)}{9\beta(t_B^2 - t_A^2)\Big[9\beta(t_B^2 - t_A^2) - 8t_B\Big]} \right. \\
& \left. + \frac{2t_B(\phi_B^2 - \phi_A^2}{12\alpha(t_B^2 - t_A^2)} \right) \\
& - \frac{\beta}{2}\left(\frac{2}{3\beta}\frac{\big[3\beta(t_B^2 - t_A^2) - 5t_B\big]}{\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{t_B(\phi_B^2 - \phi_A^2)}{\alpha\big[9\beta(t_B^2 - t_A^2) - 8t_B\big]} + \frac{4\delta t_A t_B}{9\beta(t_B^2 - t_A^2) - 8t_B} \right)^2
\end{aligned}
\tag{4.35}
$$

The profit functions summarise the findings I have discussed in regards to the decision variables reaction functions and equilibrium outcomes already, and because of time constraints I have not proceeded further in analysing them as I do not believe it would qualitatively add insights into the current study.

[39]Simplification was, again, a time consuming process which didn't add much to the results, and I was thus (time) constrained by time to engage much further, but most of the insights discussed above should be the same aspects as those which would be provided by the profit function.

5 Discussion

This thesis is meant as an exploitative work, and as such there is no direct research question postulated in the introduction. I did, however, have some expectations on outcomes. I expected outlets which published relatively higher quality journalism to be more reliant on shelf prices for income than lower-quality publications. I also expected to observe an equilibrium path where relatively hard-to-read paper attracts a competitor which is relatively easier to read.

As the model was designed to provide qualitative insights instead of providing immediate quantitative results, the interpretation of the equilibrium outcomes from chapter 4 should rely on relative magnitudes between the outlets (e.g. ϕ_A versus ϕ_B, or t_B versus t_A), and direction of signs. A general insight which holds consistently is the adverse relationship between shelf prices and the number of advertisement inserts. This is generally consistent with reality, where the more expensive of two equal-quality news issues would be expected to contain fewer, or less aggressive, advertisement inserts than the cheaper one – irrespective of the reader's preferences over advertisement.

Of the three cases discussed in the previous chapter, the 'coverage differentiation' one provides little new insights as its setup is comparable to exising litterature on meida economics. The quality differentiation set-up is interesting because it allows me to study competition between outlets which cover fairly similar stories, but with different quality. Examples of this sort of competition could be sectoral magazines, where one outlet tries to appeal to a broad range of readers and an other's readership is devoted to those with core interest in the topic. The third set-up which open for both horizontal and vertical differentiation contains results similar to those found for quality differentiation. Outlets may will still remain in the market if they face differentiation in both dimensions, but further study would have to explore the long-run profitability of this for outlet B. I wish to some day explore this myself, as well as expand on the simulations and stability tests which I briefly explore in this thesis.

In general, my results support a thesis of differentiation similar to the max-min findings of Ansari et al. (1998) and Neven and Thisse (1987) where a large degree of horizontal differentiation suggests costs of reading are likely to be relatively similar. This makes sense, ceteris paribus, $l = 0, \delta = 1$ and $\tau \to 0$ suggests that $t_B \to \infty \implies D_B \to 0$,

whereas in the same situation, if $t_A = t_B \implies D_A = D_B = \frac{1}{2}$[40].

This observation is in-line with the predictions I make from our former analysis, there are gains to maximum differentiation in journalistic quality. It is popularly postulated that American journalism in the era of Trump is "back on top" and world leading. This seems also to be an approach taken by the Washington Post after Jeff Bezos bought the media company in 2013 and invested heavily in journalism and quality. Bezos' entrance at WaPo also allowed reinforced focus on increasing the advertisement market, which they did using insights and business-synergies the Amazon-founder brought.

I find that consumers are willing to pay a higher price for the issue form the outlet with the relatively highest quality. This seems reasonable, the higher the quality, the more nuanced the story. Very often in economic analysis I find equilibrium conditions and assume instant adjustment. However, in the real world, I also know that this adjustment may be prevented in the short run, and that some time is required. The past decade, with the rapid rise of of the internet and the lowering of investment costs to enter the news market this may be seen in light of the shifting strategies most media outlets seems to have initiated. The fist online newspapers were primarily advertisement based, but they were also online versions of already established newsrooms. Then came an outburst of newer media outlets with varying approaches[41], and media market concentration pounded. Now, however, a more common differentiaion in pricing is observed. News outlets of which we associate higher quality – NYTimes, Washington Post, Finanical Times, Aftenposten, or Morgenbladet etc. – usually have a fixed consumer price with some content advertisement, while news outlets with which low, or lower, journalistic quality is associated rely little on consumer pricing and more on advertisement for their revenue – e.g. Breitbart News, New York Post, Washington Times, Resett, or Dagbladet.

This model is the first, as far as I am aware, which allows for specialist media outlets set up against a generalist one by having the generalist have readers on either side of the spectrum preferring their paper. Whereas this complicates the analysis, it allows for more representative predictions about the real-world competitive environment.

From the predictions of advertisement, I see that advertisers prefer the high-quality

[40]The steeper is B's cost of reading the further towards $l + \delta = 1$ will the indifferent consumer move, and the fewer readers will be willing to read their publication.

[41]Many of the papers now clusteded in the Vox Media network were part of this wave of news outlets started online with a much narrower target audience. FiveThirtyEight.com became among the premier empirical journalism outlets.

outlets. However, this is also an expected result, given my assumptions that advertisers prefer to reach as many as possible, they prefer exclusivity, and they prefer quality-association. However, it gives credence to the idea that high quality newspapers can get away with less advertisement because advertisers are willing to pay more to advertise in their papers, and

5.1 Criticism

One major drawback of this model is the implicit assumption underlying the use age of the Subgame Perfect Equiulibrium concept, namely that of perfect information. I assume that the editors can perfectly observe the actions of the competitor. This may be reasonable for large and developed news outlets where the editors can use their knowledge of the market to make reasonable conjectures about the nature of the competition, but this is less likely to hold in other contexts.

Because I work in a model with exogenous placement, which I have for intuitive ease simplified to suggest "pre-placement", I can defend the complete information assumption by suggesting that pricing and advertisement volume are inherently observable (there is nothing preventing an editor to preview their competitors' newspapers). Additionally, I can consider editors the ultimate news market insiders, it is their jobs to understand what works how who works how. The quality of a newsroom is dependent on the quality of the journalists which inhabit it, I can also refer to websites such as journalisten.no etc which announce when journalists change newsroom as a way for editors to track quality changes in their competitors' journalistic quality.

I assume that advertisement is independent between the news outlets, which would be representative of when newspapers were paper-based and the publishers themselves sold space, but in the age of social media and online 'tracking', this could be thought to fail.

The demand functions may, when the parameters take certain values, become negative. I have been unsuccessful by time constraints in finding the set of reasonable parameter ranges required to maintain positive demand. My conjecture is that the higher the investment cost in quality, the more sensitive the demand becomes, but I would wish to explore this further. Additionally, time constrains meant I was not able to study the long-run decision making, when the outlet will find it more preferable to move between the cases to maximise their profits.

The equilibrium as presented here seem to be unstable and change drastically for small changes in the parameters. A further robustness study would have been beneficial to conclude whether the equilibria are stable, and also to conclude on which values of the exogenous parameters the model should be expected to behave nicely in.

I should also have compared the demand functions for when the upper limit is 0 or 1, or if outlet placement outside the segment would affect the outcomes – outside placement is often allowed in Hotelling settings. Additionally would it be beneficial to understand the differences in the outlets' profits under the different cases, and how this changes if the competitive relationship changes. My conjecture is that this would, even in this setting, verify the results of, for instance, Ansari et al. (1998); Cremer and Thisse (1991) that stabile equilibria occur with max-min or min-max differentiation.

5.2 Extensions and further research

This framework provides a general introduction to how one can evaluate newspaper, and other media, markets characterised by competition in shelf prices and journalistic quality in multiple dimensions. I have provided a general overview of predictions I make in various contexts, but there are possibilities for extensions. I here provide some examples.

5.2.1 Endogenous placement and analysis of entry

The most obvious extension would be to open for endogenous placement on coverage; allow the newspapers to choose what to cover. The internet has decreased the costs of entry into the news business, 'everyone can start a blog-site – for *free*'. I would thus expect there to be a storm of new news sites, but the figures discussed in chapter 1 seems to suggest this has not happened. Could a study where I allow for a Stackleberg-approach to a second outlet entering the market provide an explanation for why? Alternatively could the demand functions to adopted for a circular coverage line and use an approach similar to that introduced by Salop (1979) to study entry?

5.2.2 Public news media

Many countries have, in addition to a privately run media market, a public media outlet. This is often a relatively dominant news service. The objective of the public media outlet

is often to maximise social welfare instead of profits, and how would this affect the decision making of the other outlets?

5.2.3 Global advertisement market

Whereas most newspapers used to run their own advertisement network they could make money from selling space. A shortcoming of the current thesis is that I still assume this. In the real world, however, online advertisement services such as Google Ads and Facebook are widely used, where they provide readers with personalised ads. This would addended by either having advertisers also located on a continuum similar to the consumers and news outlets, or by having advertisement prices being decreasing in both outlets's advertisement volume.

5.2.4 Other

Endogenise ϕ in δ. This would suggest that the advertisers willingness to pay is increasing in differentiation. In particular, I wouldn't expect there to be much of an advertisment price differential between VG and Dagbladet og WaPo and NYT, they are very similar papers, whereas I would expect VG and Aftenposten to have larger differentials because they reach different audiences. And maybe while VG has a large audicence, Samfunnsøkonomen could charge a relatively higher price because it has exclusivity over its readers. The reason advertisers are willing to pay more for this advertisement could be because they have a target audience size with specific preferences they wish to reach. If there is an outlet through which they know they reach a considerable share of these, they will be more willing to pay for placing ads there than in a general newspaper where they have to pay for reaching a lot of readers for whom their service is of little to no interest. This could be an expensive affair, and as such it is still cheaper to pay more for a specialised readership.

6 Conclusion

From primal tribal being to the interconnected world of 2020, communication between people are essential to social cohesion. News represent the most efficient means of sharing information between large swats of people – efficient because media markets are (generally) competitive. I have in this thesis shown that the broad-stroke business model of the newspaper has not changed since, at least, the first printed newspapers were printed in what is today the United States in 1690.

Newspapers may differentiate themselves in what they cover, but an important aspect is also who they assume their readers are. A political insider magazine is going to be a more challenging read (for most) than the political coverage fro a daily newspaper. Going to any newsstand will convince you that there exist numerous magazines for most, if not all, topics. Why is there room for numerous aviation magazines? Even with varying focus, they are generally located closely in the coverage topics space – I here refer to all as 'aviation magazines'. A plausible explanation is that the generalist might prefer to read the one which is relatively low effort to read, while others care more deeply about the neuanced, analysis, and details which will confuse the average person.

The model I have developed in this model differ from the traditional literature in media economics in two particular aspects. First, whereas I deploy a location based model of differentiation I allow for disjoint demand curves which is a move away from the standard Hotelling model. Secondly, I deviate in my measure of vertical differentiation. Whereas multi-dimensional differentiation is already explored in the literature, the most common method of allowing for this is to simply expand a Hotelling location and pricing two-stage game to be an $n-$touple attribution decision vectors. Whereas this is an appealing approach for product feature differentiation, the purpose of quality in regards to media quality is harder to define explicitly, but separating easy-to-read from hard-to-read is an easier task.

Hotelling-expansion in differentiation is appealing in cases where product appeal and quality is measurable as an $n-$dimensional feature-metric. Transport-cost differentiation, on the other hand, captures the degree to which the consumer's compromise between features and quality affect their decision making. An intuitive example of this would occur, for instance, if my favourite study break hiking trip was the Ulriken mountain in

Bergen, and the second favourite was Fløyen, then I might still hike Fløyen – because it requires less effort – over Ulriken, even if I'd lived close to Ulriken[42]. The primary appeal of this approach is that I do not have to make any presumption as to the nature of my preference of Ulriken over Fløyen, I simply have to acknowledge that a taller and steeper hike is more effort-full.

I find that, in general, a larger advertisement market will increase the outlet's incentives to maximise demand in the short run. This could explain the media concentration observed in the media industry over the past decade. This demand-seeking behaviour is manifested though a negative influence on prices. I also find that the outlets' reaction function provide a premium in the journalistic quality space.

The introduction of the paper-pressed newspaper significantly lowered transport costs of the media from the postmen who proceeded it. The postman might be able to provide you with better personalised news than the newspapers were, but the necessity to converse the postman lessened with the newspaper. Similarly, the internet has reduced the costs of news transmission. Whereas I will still read my local newspaper, their narrative is more easily challenged.

All cases allow for competition, and whereas the model only looks at two outlets at a time, it allows us to evaluate the strategic component of the editor's deicison making for stories where they may, for instance, face competitiors who differ in nature. It is easy to imagine an Aftenposten or NYT editor thinking about VG or WaPo's coverage for general interst main stories, but differently against DN or Financial Times for more business or economy news – in this example, I assume the business newspapers have higher transport costs as their segment tends to be more limited.

The relative size of a newspaper's advertisement market affect how they behave because it affects the optimal revenue stream from the advertisement side of their platform model. Because I have assumed the outlet have monopoly power in the advertisement space, this model does not capture the role og Google or Facebook in this space, but the qualitative insight that VG's advertisement market is independent of 'Budstikka' or a specialised sectoral magazine may very well still provide useful.

The media economics literature still has room to develop, and I hope the general ideas presented in this thesis could suggest a path for future research which better account

[42]This is clearly an example, I would never make any such hike.

for the differences in accessibility to journslism the journalist's presumptions about their readers impose.

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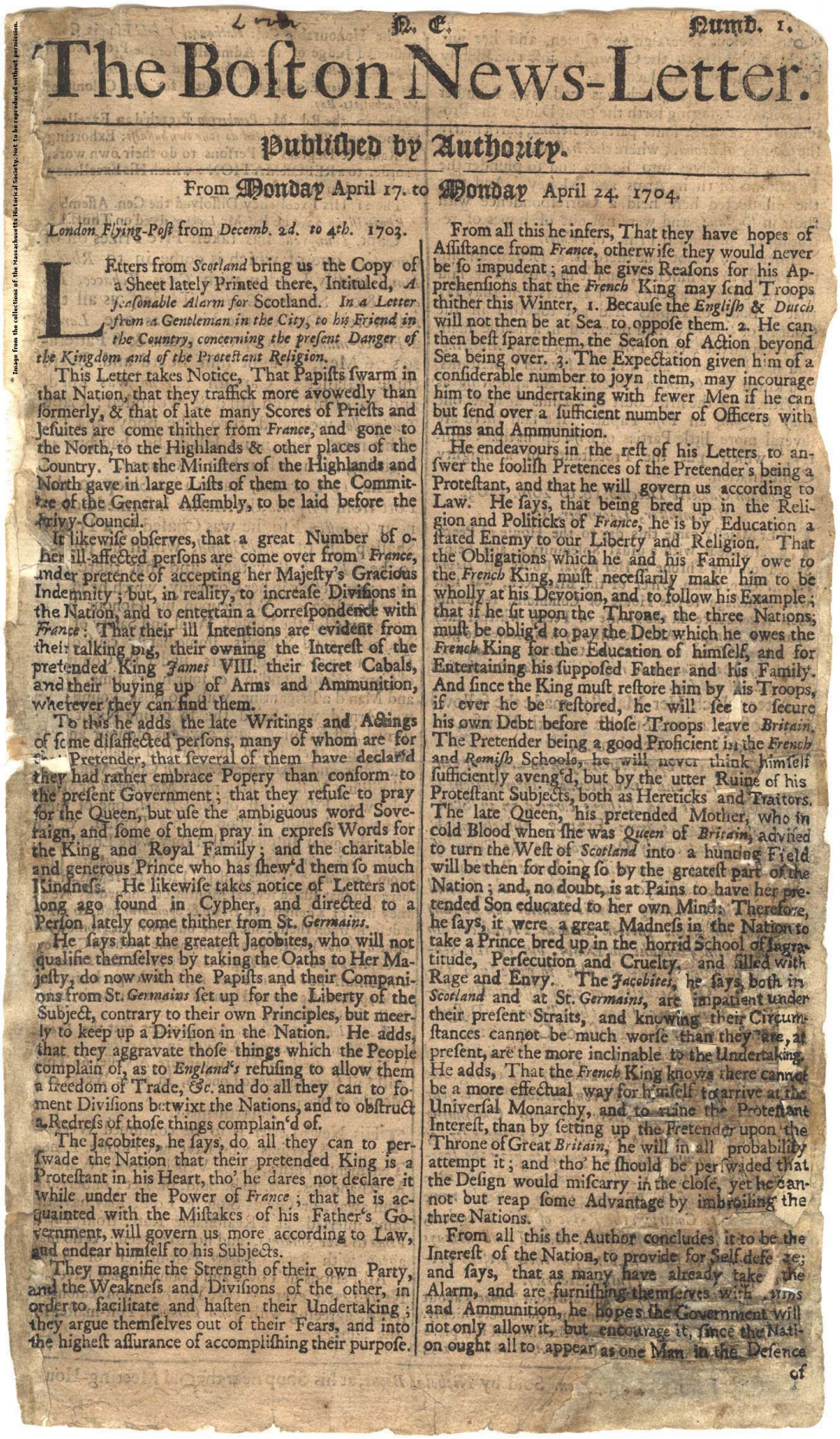
Appendix

A1 The first edition of *The Boston News-Letter.*

This copy has been acquired from the 'Massachusetts Historical Society's' online archive on 26 Mai 2020, and is available at https://www.masshist.org/database/186. Its print consisted of two pages, and was largely based on the 2 December edition of *the London Flying-Post*.



N. E. Numb. 1.

The Boston News-Letter.

Published by Authority.

From Monday April 17. to Monday April 24. 1704.

London Flying-Post from *Decemb.* 2*d.* to 4*th.* 1703.

LEtters from *Scotland* bring us the Copy of a Sheet lately Printed there, Intituled, *A Seasonable Alarm for* Scotland. *In a Letter from a Gentleman in the City, to his Friend in the Country, concerning the present Danger of the Kingdom and of the Protestant Religion.*

This Letter takes Notice, That Papists swarm in that Nation, that they traffick more avowedly than formerly, & that of late many Scores of Priests and Jesuites are come thither from *France*, and gone to the North, to the Highlands & other places of the Country. That the Ministers of the Highlands and North gave in large Lists of them to the Committee of the General Assembly, to be laid before the Privy-Council.

It likewise observes, that a great Number of other ill-affected persons are come over from *France*, under pretence of accepting her Majesty's Gracious Indemnity; but, in reality, to increase Divisions in the Nation, and to entertain a Correspondence with *France*: That their ill Intentions are evident from their talking big, their owning the Interest of the pretended King *James* VIII. their secret Cabals, and their buying up of Arms and Ammunition, wherever they can find them.

To this he adds the late Writings and Actings of some disaffected persons, many of whom are for the Pretender, that several of them have declar'd they had rather embrace Popery than conform to the present Government; that they refuse to pray for the Queen, but use the ambiguous word Sovereign, and some of them pray in express Words for the King and Royal Family; and the charitable and generous Prince who has shew'd them so much Kindness. He likewise takes notice of Letters not long ago found in Cypher, and directed to a Person lately come thither from St. *Germains*.

He says that the greatest Jacobites, who will not qualifie themselves by taking the Oaths to Her Majesty, do now with the Papists and their Companions from St. *Germains* set up for the Liberty of the Subject, contrary to their own Principles, but meerly to keep up a Division in the Nation. He adds, that they aggravate those things which the People complain of, as to *England's* refusing to allow them a freedom of Trade, &c. and do all they can to foment Divisions betwixt the Nations, and to obstruct a Redress of those things complain'd of.

The Jacobites, he says, do all they can to perswade the Nation that their pretended King is a Protestant in his Heart, tho' he dares not declare it while under the Power of *France*; that he is acquainted with the Mistakes of his Father's Government, will govern us more according to Law, and endear himself to his Subjects.

They magnifie the Strength of their own Party, and the Weakness and Divisions of the other, in order to facilitate and hasten their Undertaking; they argue themselves out of their Fears, and into the highest assurance of accomplishing their purpose.

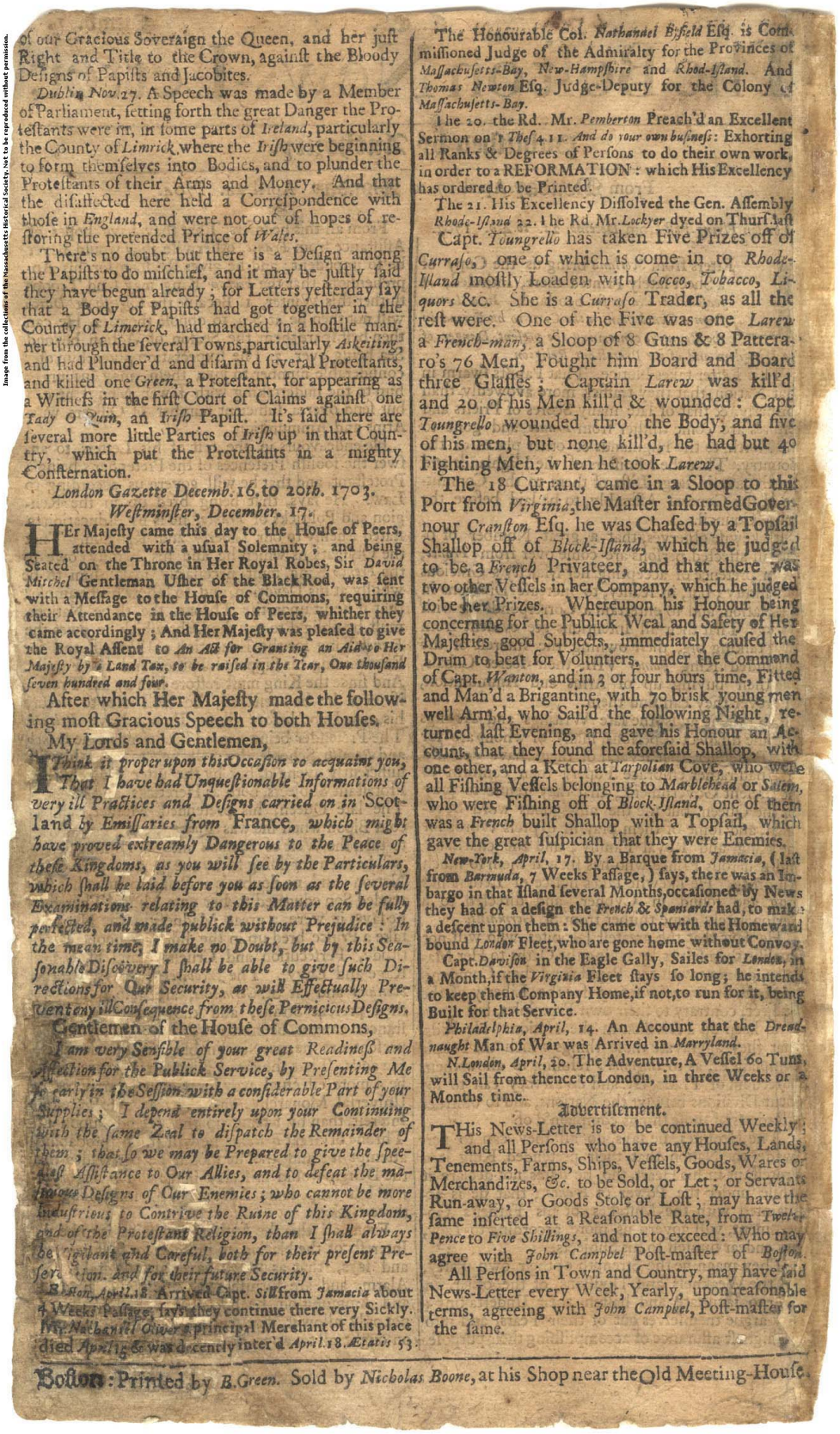
From all this he infers, That they have hopes of Assistance from *France*, otherwise they would never be so impudent; and he gives Reasons for his Apprehensions that the *French* King may send Troops thither this Winter, 1. Because the *English* & *Dutch* will not then be at Sea to oppose them. 2. He can then best spare them, the Season of Action beyond Sea being over. 3. The Expectation given him of a considerable number to joyn them, may incourage him to the undertaking with fewer Men if he can but send over a sufficient number of Officers with Arms and Ammunition.

He endeavours in the rest of his Letters to answer the foolish Pretences of the Pretender's being a Protestant, and that he will govern us according to Law. He says, that being bred up in the Religion and Politicks of *France*, he is by Education a stated Enemy to our Liberty and Religion. That the Obligations which he and his Family owe to the *French* King, must necessarily make him to be wholly at his Devotion, and to follow his Example; that if he sit upon the Throne, the three Nations must be oblig'd to pay the Debt which he owes the *French* King for the Education of himself, and for Entertaining his supposed Father and his Family. And since the King must restore him by his Troops, if ever he be restored, he will see to secure his own Debt before those Troops leave *Britain*. The Pretender being a good Proficient in the *French* and *Romish* Schools, he will never think himself sufficiently aveng'd, but by the utter Ruine of his Protestant Subjects, both as Hereticks and Traitors. The late Queen, his pretended Mother, who in cold Blood when she was *Queen* of *Britain*, advised to turn the West of *Scotland* into a hunting Field will be then for doing so by the greatest part of the Nation; and, no doubt, is at Pains to have her pretended Son educated to her own Mind. Therefore, he says, it were a great Madness in the Nation to take a Prince bred up in the horrid School of Ingratitude, Persecution and Cruelty, and filled with Rage and Envy. The *Jacobites*, he says both in *Scotland* and at St. *Germains*, are impatient under their present Straits, and knowing their Circumstances cannot be much worse than they are, at present, are the more inclinable to the Undertaking. He adds, That the *French* King knows there cannot be a more effectual way for himself to arrive at the Universal Monarchy, and to ruine the Protestant Interest, than by setting up the Pretender upon the Throne of Great *Britain*, he will in all probability attempt it; and tho' he should be perswaded that the Design would miscarry in the close, yet he cannot but reap some Advantage by imbroiling the three Nations.

From all this the Author concludes it to be the Interest of the Nation, to provide for Self defence; and says, that as many have already take the Alarm, and are furnishing themselves with Arms and Ammunition, he hopes the Government will not only allow it, but encourage it, since the Nation ought all to appear as one Man in the Defence

of

Figure A1.1: Page one of the 17 April 1704 edition *the Boston News-Letter.*



of our Gracious Soveraign the Queen, and her juſt Right and Title to the Crown, againſt the Bloody Deſigns of Papiſts and Jacobites.

Dublin Nov. 27. A Speech was made by a Member of Parliament, ſetting forth the great Danger the Proteſtants were in, in ſome parts of *Ireland*, particularly the County of *Limrick*, where the *Iriſh* were beginning to form themſelves into Bodies, and to plunder the Proteſtants of their Arms and Money. And that the diſaffected here held a Correſpondence with thoſe in *England*, and were not out of hopes of reſtoring the pretended Prince of *Wales*.

There's no doubt but there is a Deſign among the Papiſts to do miſchief, and it may be juſtly ſaid they have begun already; for Letters yeſterday ſay that a Body of Papiſts had got together in the County of *Limerick*, had marched in a hoſtile manner through the ſeveral Towns, particularly *Askeiting*, and had Plunder'd and diſarm'd ſeveral Proteſtants, and killed one *Green*, a Proteſtant, for appearing as a Witneſs in the firſt Court of Claims againſt one *Tady O Quin*, an *Iriſh* Papiſt. It's ſaid there are ſeveral more little Parties of *Iriſh* up in that Country, which put the Proteſtants in a mighty Conſternation.

London Gazette Decemb. 16. to 20*th.* 1703.

Weſtminſter, December. 17.

HEr Majeſty came this day to the Houſe of Peers, attended with a uſual Solemnity; and being Seated on the Throne in Her Royal Robes, Sir *David Mitchel* Gentleman Uſher of the Black Rod, was ſent with a Meſſage to the Houſe of Commons, requiring their Attendance in the Houſe of Peers, whither they came accordingly; And Her Majeſty was pleaſed to give the Royal Aſſent to *An Act for Granting an Aid to Her Majeſty by a Land Tax, to be raiſed in the Year, One thouſand ſeven hundred and four.*

After which Her Majeſty made the following moſt Gracious Speech to both Houſes.

My Lords and Gentlemen,

I Think it proper upon this Occaſion to acquaint you, That I have had Unqueſtionable Informations of very ill Practices and Deſigns carried on in Scotland *by Emiſſaries from* France, *which might have proved extreamly Dangerous to the Peace of theſe Kingdoms, as you will ſee by the Particulars, which ſhall be laid before you as ſoon as the ſeveral Examinations relating to this Matter can be fully perfected, and made publick without Prejudice: In the mean time, I make no Doubt, but by this Seaſonable Diſcovery I ſhall be able to give ſuch Directions for Our Security, as will Effectually Prevent any ill Conſequence from theſe Pernicious Deſigns.*

Gentlemen of the Houſe of Commons,

I am very Senſible of your great Readineſs and Affection for the Publick Service, by Preſenting Me ſo early in the Seſſion with a conſiderable Part of your Supplies; I depend entirely upon your Continuing with the ſame Zeal to diſpatch the Remainder of them; that ſo we may be Prepared to give the ſpeedieſt Aſſiſtance to Our Allies, and to defeat the malicious Deſigns of Our Enemies; who cannot be more induſtrious to Contrive the Ruine of this Kingdom, and of the Proteſtant Religion, than I ſhall always be Vigilant and Careful, both for their preſent Preſervation, and for their future Security.

Boſton, April. 18. Arrived Capt. *Sill* from *Jamacia* about 4 Weeks Paſſage, ſays they continue there very Sickly. Mr. *Nathaniel Oliver* a principal Merchant of this place died *April.* 15. & was decently inter'd *April.* 18. *Ætatis* 53.

The Honourable Col. *Nathaniel Byfield* Eſq. is Commiſſioned Judge of the Admiralty for the Provinces of *Maſſachuſetts-Bay*, *New-Hampſhire* and *Rhod-Iſland*. And *Thomas Newton* Eſq. Judge-Deputy for the Colony of *Maſſachuſetts-Bay*.

The 20. the Rd. Mr. *Pemberton* Preach'd an Excellent Sermon on 1 *Theſ.* 4. 11. *And do your own buſineſs*: Exhorting all Ranks & Degrees of Perſons to do their own work, in order to a REFORMATION: which His Excellency has ordered to be Printed.

The 21. His Excellency Diſſolved the Gen. Aſſembly *Rhode-Iſland* 22. The Rd. Mr. *Lockyer* dyed on Thurſ. laſt

Capt. *Toungrello* has taken Five Prizes off of *Curraſo*, one of which is come in to *Rhode-Iſland* moſtly Loaden with *Cocco*, *Tobacco*, *Liquors* &c. She is a *Curraſo* Trader, as all the reſt were. One of the Five was one *Larew* a *French-man*, a Sloop of 8 Guns & 8 Patteraro's 76 Men, Fought him Board and Board three Glaſſes; Captain *Larew* was kill'd and 20 of his Men kill'd & wounded: Capt. *Toungrello* wounded thro' the Body, and five of his men, but none kill'd, he had but 40 Fighting Men, when he took *Larew*.

The 18 Currant, came in a Sloop to this Port from *Virginia*, the Maſter informed Governour *Cranſton* Eſq. he was Chaſed by a Topſail Shallop off of *Block-Iſland*, which he judged to be a *French* Privateer, and that there was two other Veſſels in her Company, which he judged to be her Prizes. Whereupon his Honour being concerning for the Publick Weal and Safety of Her Majeſties good Subjects, immediately cauſed the Drum to beat for Volunteers, under the Command of Capt. *Wanton*, and in 3 or four hours time, Fitted and Man'd a Brigantine, with 70 brisk young men well Arm'd, who Sail'd the following Night, returned laſt Evening, and gave his Honour an Account, that they found the aforeſaid Shallop, with one other, and a Ketch at *Tarpolian* Cove, who were all Fiſhing Veſſels belonging to *Marblehead* or *Salem*, who were Fiſhing off of *Block-Iſland*, one of them was a *French* built Shallop with a Topſail, which gave the great ſuſpician that they were Enemies.

New-York, April. 17. By a Barque from *Jamacia*, (laſt from *Bermuda*, 7 Weeks Paſſage,) ſays, there was an Imbargo in that Iſland ſeveral Months, occaſioned by News they had of a deſign the *French* & *Spaniards* had, to make a deſcent upon them: She came out with the Homeward bound *London* Fleet, who are gone home without Convoy.

Capt. *Daviſon* in the Eagle Gally, Sailes for *London*, in a Month, if the *Virginia* Fleet ſtays ſo long; he intends to keep them Company Home, if not, to run for it, being Built for that Service.

Philadelphia, April, 14. An Account that the *Dreadnaught* Man of War was Arrived in *Marryland*.

N. London, April, 20. The Adventure, A Veſſel 60 Tuns, will Sail from thence to London, in three Weeks or a Months time.

Advertiſement.

THis News-Letter is to be continued Weekly; and all Perſons who have any Houſes, Lands, Tenements, Farms, Ships, Veſſels, Goods, Wares or Merchandizes, &c. to be Sold, or Let; or Servants Run-away, or Goods Stole or Loſt; may have the ſame inſerted at a Reaſonable Rate, from *Twelve Pence* to *Five Shillings*, and not to exceed: Who may agree with *John Campbel* Poſt-maſter of *Boſton*.

All Perſons in Town and Country, may have ſaid News-Letter every Week, Yearly, upon reaſonable terms, agreeing with *John Campbel*, Poſt-maſter for the ſame.

Boſton: Printed by *B. Green.* Sold by *Nicholas Boone*, at his Shop near the Old Meeting-Houſe.

Figure A1.2: Page two of the 17 April 1704 edition *the Boston News-Letter.*

A2 New York Times, 9 May 2020

This figure is also available at the New York Times's web page at: https://www.nytimes.com/issue/todayspaper/2020/05/09/todays-new-york-times.

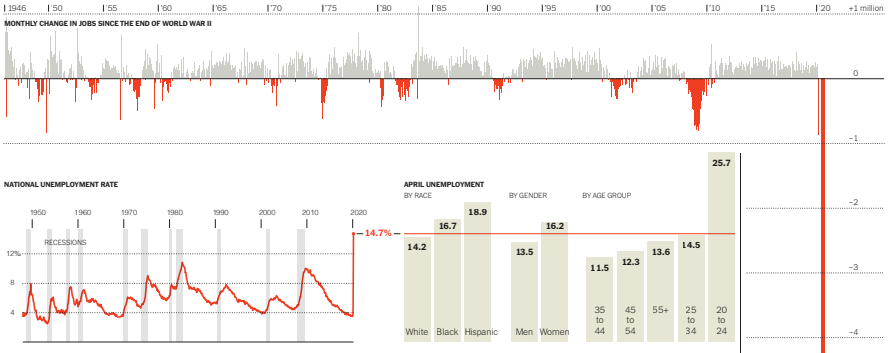
"All the News That's Fit to Print"

The New York Times

Late Edition
Today, clouds and sunshine, stray showers, windy, chilly, high 49. **Tonight,** mostly clear, brisk, cold, low 39.**Tomorrow,** clouds and sunshine, high 62. Weather map is on Page C8.

VOL. CLXIX . . . No. 58,688 © 2020 The New York Times Company NEW YORK, SATURDAY, MAY 9, 2020 $3.00

U.S. UNEMPLOYMENT IS WORST SINCE DEPRESSION



Georgia Killing Puts Spotlight on a Police Force's Troubled History

This article is by ***Rick Rojas, Richard Fausset*** *and* ***Serge F. Kovaleski.***

BRUNSWICK, Ga. — When the Glynn County Police Department arrived at the scene of a fatal shooting in February in southeastern Georgia, officers encountered a former colleague with the victim's blood on his hands.

They took down his version of events and let him and his adult son, who had fired the shots, go home.

Later that day, Wanda Cooper, the mother of the 25-year-old victim, Ahmaud Arbery, received a call from a police investigator. She recounted later that the investigator said her son had been involved in a burglary and was killed by "the homeowner," an inaccurate version of what had happened.

More than two months after that fatal confrontation, the Georgia Bureau of Investigation, which took over the case this week, arrested the former officer, Gregory McMichael, and his son, Travis McMichael, on charges of murder and aggravated assault.

The charges — which came after the release of a graphic video showing the killing as the two white men confront Mr. Arbery, who was African-American — made clear the depths of the local department's bungling of the case, which was just the latest in a series of troubling episodes involving its officers.

Long Path to Arrests of Ex-Officer and Son in Black Man's Death

And it was one element of the broader potential breakdown of the justice system in South Georgia. Attorney General Chris Carr, through a spokeswoman, said on Friday that he planned to start a review of all of the relevant players in that system.

Mr. Carr's office has already determined that George E. Barnhill, a district attorney who was assigned the case in February but recused himself late last month, should have never taken it on. Among his many conflicts: His son once worked alongside one of the suspects at the local prosecutor's office.

S. Lee Merritt, a lawyer representing Mr. Arbery's family, has called for a federal civil rights investigation focused not only on the men who pursued Mr. Arbery, but the broader justice system.

"It's small-town America," Mr. Merritt said in an interview on

Continued on Page A21

April's Rate of 14.7% Touches All Parts of Economy

By NELSON D. SCHWARTZ and BEN CASSELMAN

The American economy plunged deeper into crisis last month, losing 20.5 million jobs as the unemployment rate jumped to 14.7 percent, the worst devastation since the Great Depression.

The Labor Department's monthly report on Friday provided the clearest picture yet of the breadth and depth of the economic damage — and how swiftly it spread — as the coronavirus pandemic swept the country.

Job losses have encompassed the entire economy, affecting every major industry. Areas like leisure and hospitality had the biggest losses in April, but even health care shed more than a million jobs. Low-wage workers, including many women and members of racial and ethnic minorities, have been hit especially hard.

"It's literally off the charts," said Michelle Meyer, head of U.S. economics at Bank of America. "What would typically take months or quarters to play out in a recession happened in a matter of weeks this time."

From almost any vantage point, it was a bleak report. The share of the adult population with a job, at 51.3 percent, was the lowest on record. Nearly 11 million people reported working part time because they couldn't find full-time work, up from about four million before the pandemic.

If anything, the numbers probably understate the economic distress.

Millions more Americans have filed unemployment claims since the data was collected in mid-April. What's more, because of issues with the way workers are classified, the Labor Department said the actual unemployment rate last month might have been closer to 20 percent.

It remains possible that the recovery, too, will be swift, and that as the pandemic retreats, businesses that were fundamentally healthy before the virus will reopen, rehire and return more or less to normal. The one bright spot in Friday's report was that nearly 80 percent of the unemployed said they had been temporarily laid off and expected to return to their jobs in the coming months.

President Trump endorsed this view in an interview Friday morning on Fox News. "Those jobs will all be back, and they'll be back

Continued on Page A13

THE FACES A look at 21 people in various fields who have lost their jobs during the pandemic. PAGE B5

NEWS ANALYSIS

In Flynn Case, Russia Inquiry Is Barr's Target

By MARK MAZZETTI

WASHINGTON — Shortly after admitting guilt to a federal judge in December 2017 for lying to the F.B.I., Michael T. Flynn issued a statement saying what he did was wrong, and "through my faith in God, I am working to set things right."

It turns out that the only higher power that Mr. Flynn needed was Attorney General William P. Barr.

Mr. Barr's extraordinary decision to drop the criminal case against Mr. Flynn shocked legal experts, won President Trump's praise and prompted a career prosecutor to quit the case. It was the latest in Mr. Barr's steady effort to undo the results of the investigation by Robert S. Mueller III, the special counsel. Mr. Barr has portrayed his effort as rectifying injustice, and the president more bluntly as an exercise in political payback.

In his decisions and public comments over the past year, Mr. Barr has built an alternate narrative to the one that Mr. Mueller laid out in his voluminous report. Where the special counsel focused on Russia's expansive effort to interfere in the 2016 election, the Trump campaign's openness to it and the president's determination to impede the inquiry, Mr. Barr has focused instead on the investigators. He has suggested that they were unleashed by law enforcement and intelligence officials bent on bringing political harm to Mr. Trump.

Continued on Page A20

WHITE HOUSE MEMO

If West Wing Still Isn't Safe, Is Any Office?

By PETER BAKER and MICHAEL CROWLEY

WASHINGTON — In his eagerness to reopen the country, President Trump faces the challenge of convincing Americans that it would be safe to go back to the workplace. But the past few days have demonstrated that even his own workplace may not be safe from the coronavirus.

Vice President Mike Pence's press secretary tested positive for the virus on Friday, forcing a delay in the departure of Air Force Two while a half-dozen other members of his staff were taken off the plane for further testing. That came only a day after word that one of the president's own military valets had been infected.

All of which raised an obvious question: If it is so hard to maintain a healthy environment at 1600 Pennsylvania Avenue, the most famous office address in the world, where staff members are tested regularly, some every day, then how can businesses across the country without anywhere near as much access to the same resources establish a safe space for their workers?

"The virus is in the White House, any way you look at it," said Juliette Kayyem, a former assistant secretary of homeland security under President Barack Obama. "Whether it's contained or not, we will know soon enough. But the fact that a place — secured, with access to the best resources to mitigate harm — is not able to stop the virus has

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DANIEL BEREHULAK FOR THE NEW YORK TIMES

A Mexico City crematory. Regional virus deaths are officially low.

As Official Toll Ignores Reality, Mexico's Hospitals Are Overrun

By AZAM AHMED

MEXICO CITY — The Mexican government is not reporting hundreds, possibly thousands, of deaths from the coronavirus in Mexico City, dismissing anxious officials who have tallied more than three times as many fatalities in the capital than the government publicly acknowledges, according to officials and confidential data reviewed by The New York Times.

The tensions have come to a head in recent weeks, with Mexico City alerting the government to the deaths repeatedly, hoping it will come clean to the public about the true toll of the virus on the nation's biggest city and, by extension, the country at large.

But that has not happened. Doctors in overwhelmed hospitals in Mexico City say the reality of the epidemic is being hidden from the country. In some hospitals, patients lie on the floor, splayed on mattresses. Elderly people are propped up on metal chairs because there are not enough beds, while patients are turned away to search for space in less-prepared hospitals. Many die while searching, several doctors said.

"It's like we doctors are living in two different worlds," said Dr. Giovanna Avila, who works at Hospital de Especialidades Belisario Domínguez. "One is inside of the hospital with patients dying all the time. And the other is when we walk out onto the streets and see people walking around, clueless of what is going on and how bad the situation really is."

Mexico City officials have tabulated more than 2,500 deaths from the virus and serious respiratory illnesses that doctors suspect are related to Covid-19, the data re-

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Source: Dept. of Labor

GUILBERT GATES, ELLA KOEZE AND BILL MARSH/ THE NEW YORK TIMES

Figure A2.1: The *New York Times* frontpage on 9 May, 2020. Notice the figure for unemployement

A3 Calculations for Launhardt's Indifferent consumers in a utility framework

A3.1 Between the firms: x

$$\begin{aligned} U_1 &= v + j_1 - p_1 - t_1(x - l) \\ U_2 &= v + j_2 - p_2 - t_2(l + \delta - x) \end{aligned} \tag{A3.1}$$

$$\begin{aligned} v + j_1 - p_1 - t_1(x - l) &= v + j_2 - p_2 - t_2(l + \delta - x) \\ x &= l + \frac{p_2 + t_2\delta - p_1}{t_1 + t_2} + \frac{j_1 - j_2}{t_1 + t_2} \end{aligned} \tag{A3.2}$$

A3.2 Above firm 2: y

$$\begin{aligned} U_1 &= v + j_1 - p_1 - t_1(y - l) \\ U_2 &= v + j_2 - p_2 - t_2(y - l - \delta) \end{aligned} \tag{A3.3}$$

$$\begin{aligned} v + j_1 - p_1 - t_1(y - l) &= v + j_2 - p_2 - t_2(y - l - \delta) \\ y &= l + \frac{j_2 - j_1}{t_2 - t_1} + \frac{p_1 - p_2}{t_2 - t_1} + \frac{t_2\delta}{t_2 - t_1}\big(+ \frac{t_1\delta - t_1\delta}{t_2 - t_1}\big) \\ y &= l + \delta + \frac{p_1 + t_1\delta - p_2}{t_2 - t_1} + \frac{j_2 - j_1}{t_2 - t_1} \end{aligned} \tag{A3.4}$$

A3.3 Below firm 1: z

$$\begin{aligned} U_1 &= v + j_1 - p_1 - t_1(l - z) \\ U_2 &= v + j_2 - p_2 - t_2(l + \delta - z) \end{aligned} \tag{A3.5}$$

$$\begin{aligned} v + j_1 - p_1 - t_1(l - z) &= v + j_2 - p_2 - t_2(l + \delta - z) \\ z &= l + \frac{p_2 + t_2\delta - p_1}{t_2 - t_1} + \frac{j_1 - j_2}{t_2 - t_1} \end{aligned} \tag{A3.6}$$