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Digital Market Concentration: An Institutional and Social Cost Analysis

An Honors Paper for the Department of Economics

By Jack Shane

Bowdoin College, 2022

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Abstract

In this thesis, I develop an analysis of the industry concentration seen in digital markets today. I begin with a description and argument for the use of institutional economics. This framework allows for the integration of an interdisciplinary approach to economics. My analysis details the socioeconomic and political impacts, as well as the underlying market dynamics that have pushed digital markets towards concentration. I offer novel explanations for the lack of firm behavior that should theoretically increase profit, the existence of barriers to competition, and consumer behavior that focus on the role of social institutions. I also detail many of the social costs of these concentrated markets, such as their impact on democracy, power to influence social institutions, and the impact they have on concentration in other markets. This is done to show that the fears surrounding monopolies do not end with prices. Even in digital markets, where many times prices are very low, if not zero, there are reasons that monopoly is economically inefficient and socially sub-optimal. However, due to the path-dependent nature of the extreme benefits associated with digital markets, policy-makers cannot reasonably propose breaking up these companies. Instead, they must use the power of the government to counteract the conglomerations of social power seen in these private companies in search of an optimal outcome.

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Acknowledgements

Sir Isaac Newton once wrote "if I see further it is because I stand on the shoulders of Giants". A more apt phrase could not be used to describe how I feel at the conclusion of this thesis. Without the love, care, support, and generosity of professors, friends, and family through this project I would not have been able to accomplish this monumental task.

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I would be lying if I said that my family and friends were not major parts of this project as well, especially the task of moral and emotional support. When I tasked myself to do an economics thesis without strict econometric analysis, I certainly was scared. My mom, dad, brother, and grandmother all reminded me that I had interesting and novel points and pushed me to continue working. My friends heard long rants about my project and feigned engagement exceptionally well. Without their steadfast support, this project would have never been completed.

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All remaining errors in this thesis are my own.

1 Introduction

On January 6th, 2021 the world witnessed an action unseen in over 200 years: an assault and invasion of the United States Capitol building. In the aftermath, Facebook (now named Meta), Google, Amazon, and other major digital sites made the controversial move to ban President Donald Trump from their platforms. Some sites deemed that the actions of the President and his supporters had violated the terms and conditions of their sites, while others appear to have followed a social trend rather than stating a specific violation. Other companies, such as Apple, although not taking direct action, staunchly denounced the behavior of those involved in the incursion at the Capitol (Leswing 2021).

In the aftermath of these actions taken by private companies, and the resulting impact on social discourse, many began to worry about the immense power these technology companies wield. Interestingly, the January 6th incident seemed to unite both sides of the political aisle around a common enemy: Big Tech. Conservatives were incensed that these companies held the power to censor dissenting views, especially since they view these companies as overly liberal. Combining this with the high rates of lobbying done by these companies (in particular Meta, Google, and Amazon), one can readily see why conservatives worry that their voices are being censored by government censoring outsourced to private companies. On the other hand, liberals worry that the unifying ability of social media and the internet as a whole, originally viewed as a social benefit, could be used to great social detriment without proper oversight. Moreover, liberals worry, perhaps similarly to conservatives, that private oversight of these platforms would be inadequate, as well as grant too much power to the executives of these platforms.

However, this fear regarding digital markets is not new. At the beginning of the coronavirus pandemic, both sides of the political aisle criticized digital companies, especially social media sites such as Meta and search engines such as Google, either for censoring information regarding alternative treatments (conservatives) or not vetting false results enough

(liberals). Even before 2020, there was a palpable social backlash against the power of these companies. A detailed list of antitrust cases and associated actions is beyond the scope of this thesis, but a brief description of the trend will show the history of social fear on this topic. Although the US before 2020 had taken zero major antitrust cases against the "Big Four",[1] the European Union's antitrust enforcement agency has taken numerous cases. As of this writing, many of these cases are still under investigation, but the EU has already fined Google nearly $10 billion for abusing its market power in search, mobile operating systems, and digital advertising dominance.[2]

One of the main worries that has arisen as digital markets become more socially prevalent is the rise of so-called "fake news" and false information being spread on Google and social media sites such as those owned by Meta. This fear reminds many of the early 20th century and the rise of "yellow journalism". Yellow journalism was false or little researched articles used for the sake of driving up sales of newspapers. These articles often relied on scare tactics as well as sensationalized stories and headlines to entice more purchases of newspapers. Delos Wilcox (1900), a contemporary expert on municipal government and a former newspaper editor, showed empirically that this tactic worked as journals deemed "yellow" had significantly higher sales. However, unlike what we see today, there did not appear to be a major political alignment in the journals deemed "yellow". That is to say, those newspapers engaging in sensational or false reporting and yellow journalism were less likely to discuss politics. Thus, yellow journalism's impact on the political and, by extension, economic, sphere was limited. Even if it did have political impacts, these impacts did not have the partisan flavor seen today. Therefore, yellow journalism did not have the same impact on the greater social fabric. On the other hand, the focus of fake news, purportedly misleading information, and censorship of information, whether misleading or true, on the internet has tended to relate to political topics. Whether it be conspiracies regarding Barack Obama's birthplace, Hillary Clinton's "email" scandal, or the infamous "Pizzagate" scandal, many of the most prevalent

1. The "Big Four" refers to Google/Alphabet, Meta/Facebook, Apple, and Amazon.
2. See this link for more information and updates regarding the ongoing cases

and impactful aspects of alleged fake news have been expressly political. Thus, although understanding the role of market power and industrial organization in newspaper markets that led to yellow journalism is important, it does not suffice to explain the issues associated with digital markets.

Moreover, digital markets have impacts beyond those associated directly with fake news. Although the actions of many digital companies after the January 6^{th} incident were nominally due to the actions of those involved, it illuminated just how powerful these companies had become. They had grown to wield the social power to effectively silence the President of the United States online. Whether or not this action was warranted it raises major social worries, not the least of which is the potential for private companies to surpass states in social power. On the one hand, there is a major economic impact from the concentration seen in some of these markets that warrants a detailed investigation. On the other hand, there are important sociological, ethical, and moral impacts as well that must be investigated. Although there is extensive interest in both of these fields independently, there is limited, if any, scholarship that seeks to combine these impacts into a single cohesive analysis of digital markets' impact on the socio-economic behaviors of individuals. That is the goal of this thesis.

In particular, I argue in this thesis that economists take too narrow a focus when analyzing digital markets for antitrust action. Through a broader analysis, economics can better understand how these markets interact with society. Although it is a theoretically useful project to focus narrowly on the economic impacts (as I detail in Section 4), when theory is applied to the real world it must expand its focus. On the other hand, the extensive sociological and ethical writings on these markets lack the economic theory that can help understand the impacts of policies. By combining these two related, but currently disjoint scholarly communities, an analysis will be more robust and better understand the true welfare implications of these markets.

It may seem on the surface that this approach requires a complete rethinking of what economic analysis entails and therefore a new framework for economics, but it is encapsu-

lated in the uniquely American school of institutional economics, a school including the likes of Thorstein Veblen, John R. Commons, and John Kenneth Galbraith. This school criticized what it viewed as the overly deterministic economic theory of the classical (and later neoclassical) economists. Neoclassical and classical economic theory, according to these economists, had too limited a definition of market power, focusing narrowly on economic power instead of incorporating political and social power that can change economic structures. However, in the predominantly industrial and tangible economy of the first half of the 20$^{\text{th}}$ century, most neoclassical theory was well equipped to analyze the markets as they existed, pushing institutional approaches to the periphery of the economics profession. Eventually, however in the second half of the 20$^{\text{th}}$ century, some economists, such as Douglass North, Oliver Williamson, and Ronald Coase began to incorporate institutionalist thought within the rational actor framework of neoclassical economics, leading to the development of "new" institutional economics.

However, neither "new" institutional economics nor neoclassical economics can fully grasp the societal influence and power that digital markets have today. Unlike the past, where companies had physical size limitations due to location or information transmission, the rise of the digital economy has led to the dissolution of these former limitations. Companies such as Apple, Amazon, Meta, and Alphabet have shown the ability to grow to immense size extremely quickly. This growth has an important secondary impact that a solely economic analysis fails to account for: *in digital markets, economic power can translate to informational power*. Moreover, this informational power redounds to further concentration of economic, social, and political power. When economic power impacts how and what information is shared, neoclassical results can diverge from reality much more than in tangible economies. Neoclassical economic theory is therefore unsuited for the analysis of the effect of market concentration in the modern digital world, where information has become a commodity. Instead an institutionalist approach, which investigates the interactions within a market, is better suited for the analysis of today's digital markets.

This more comprehensive and accurate understanding of the impacts of digital markets is not just a theoretical exercise showing the efficacy and validity of institutional economics as an analytical framework. Without having a detailed — and more importantly, accurate — analysis of digital markets, antitrust agencies cannot be expected to optimally take action. By incorporating non-economic analyses as well as economic ones, antitrust agencies will have a greater understanding regarding the true social impact of any potential actions. Understanding the true social impacts of actions can allow these agencies to no longer remain beholden to the economic orthodoxy of antitrust action such as breaking up big firms. It may very well be that in our new complex digital economy, regulation of major firms is Pareto superior to breaking these firms up.

Apprehensions are growing on both sides of the political aisle about what they see as a common threat: the power of Big Tech. The political right claims they have been unjustly censored since these companies are run mostly by Democrat-supporting CEOs, while the political left argues that the size of these companies allows them to manipulate political outcomes. Mainstream economic theory has a limited approach to this question, typically using market share as a proxy for market power. However, without understanding both the interactions between consumers and firms as well as the interactions between firms and society, an understanding of market power will always be incomplete. For Big Tech, in particular, mainstream economic theory is unable to fully explain the winner-take-all nature of the market and its social implications. These markets are not like natural monopolies, where it is just inefficient to have multiple producers of the same good due to declining average costs. They may still see declining average costs but, more importantly, the network externalities make these goods more valuable the more numerous are the other users of the good. Furthermore, mainstream theory typically focuses its analysis on the direct economic impacts of monopoly, leaving the elaboration of more nuanced social costs to other fields of study. It is true that economists since Coase (1960) have formally discussed social costs in an economic

context,[3] though these have relied heavily on social costs that have an explicitly economic cost. Coase's famous example involved a rancher's cattle harming a farmer's farmland, which can be seen to have direct economic costs as either the farmer saw decreased output of their farmland or the rancher saw lesser cattle production. However, Coase's discussion of social costs overlooks social issues such as free speech, democracy, and unjust power dynamics. Although these are harder to classify and delineate than classical views of social cost, they nonetheless deserve investigation. I argue in this thesis that economists should more closely investigate the social costs of monopolization because ignoring them ignores important indirect economic impacts. Furthermore, these social impacts should influence the policies used to alleviate the threat of monopoly.

2 Institutional Economics as an Analytical Framework

Mainstream economics, often called "neoclassical economics", is the typical approach of economists in our modern times. This approach analyzes markets through the assumptions of firms and consumers which optimize either profits or utility. With these assumptions, mainstream economists mathematically model the behavior of economic actors and solve for variables of interest. There are a myriad of adjustments and updates to the assumptions, utility functions, and interactions across markets, depending on the particular problem under investigation. Through incorporating these adjustments, neoclassical economics has been applied all over the world to all sorts of economic questions, often with much success. However, many of these theories rely heavily on the state of the world that existed at the beginning of the Industrial Revolution. In that world, information was slow-moving, advertising was limited, and decisions were made between needs rather than solely wants. As John Kenneth Galbraith showed in *The New Industrial State* and his earlier work *The Affluent Society*, the world in the middle of the 20$^{\text{th}}$ century was already vastly different than the world from which Adam Smith's theory of the "invisible hand" arose. In this new world, as described

3. There were also many early economists who discussed social costs, such as Arthur Pigou.

by Galbraith, companies had the social power to influence consumer preferences, and individuals in industrialized nations seldom worried about necessities. These differences caused theoretical complications for the ideas of early economists. Just as Galbraith showed that the rise of major corporations was an epochal shift, our current trend towards digital markets and goods, in contrast to physical ones, represents another epochal shift. Although neoclassical economics can adjust its theories, the reliance on the assumption of exogenous social factors in its analysis limits its applicability to the world Galbraith described, which has ever changing social norms. It is possible to develop a model within neoclassical economics which takes economic actions such as savings rates, marginal propensities to consume, and other socially determined behaviors as endogenous, but the major issue that arises for neoclassical economics in modern times is the power of companies to make preferences endogenous. If preferences are endogenous, a determination of a consistent utility function that consumers maximize is fraught with difficulties and perhaps impossible. Thus, mainstream economics is not the ideal analytical framework for market analysis in today's world.

A common criticism of mainstream economics is that it is detached from reality since many of its assumptions (e.g., rationality and optimization of straightforward objective functions) ring false to the average observer. Although it is true that these assumptions greatly simplify the use of mathematical models, they blind economists to important questions that are assumed away.[4] One example is the question: "what are the costs of social media?" An economist using neoclassical assumptions might approach this question by attempting to determine how people view the costs through their behavior in the market. This approach implicitly assumes that behavior in the market is directly reflecting the costs associated with a good. But how does this economist handle the issue of a good with no nominal price? Moreover, how does this economist grapple with the fact that social media is so ubiquitous today that everything from music to news, and even jobs are found through social media? These digital markets pose unique problems for the use of neoclassical assumptions

4. To be fair, recent developments in mainstream economics, especially behavioral economics, have led to a relaxation of these assumptions. However, I believe the general aspect is still true.

required in many mainstream economic analyses. While these problems are hard for neoclassical economics to surmount, other traditions in economic analysis, particularly institutional economics, are more promising. Particularly, institutional economics has approached these questions directly for over a century and has developed a useful set of methods in support of these analyses. I thus argue that an analysis of Big Tech companies, and digital markets more generally, is best done through the framework of institutional economics, particularly "old" institutional economics. This approach not only draws from accepted economic theory, but also leverages the many developments in related subjects (e.g., sociology and philosophy). This approach better explains the economic impacts and trends in a market, which allows for a more detailed and complete economic analysis than most mainstream approaches.

2.1 What is an Institution?

The approach of institutional economics is distinct from that of classical and neoclassical economics, especially concerning its unit of observation. Unlike the classical focus on units of production, institutional economics focuses instead on the base social unit of an "institution". These institutions are the entry point for this analysis because social interactions are determined by individuals interacting with institutions. Thus, by understanding the institutions, we can better understand how individuals behave and, by extension, how the market behaves. However, a common criticism of institutional economics is the ambiguity in the definition of an institution. One of the main founders of institutional thought, John R. Commons, described them as "collective action in control, liberation and expansion of individual action," (Commons 1931, 649) choosing to focus on their interaction with the individual, while more recently Geoffrey Hodgson[5] defined an institution as "systems of established and prevalent social rules that structure social interactions," instead focusing on the general impact on social interactions (Hodgson 2006, 2). Both definitions, however, reflect a consistent aspect: *institutions are society-level rules, customs, or conventions that impact individuals*

5. Hodgson is an editor of the *Journal of Institutional Economics* as of the writing of this thesis.

and mold their social interactions within that society.

To illustrate this definition further, some examples of institutions in society today may be of assistance. One major institution that we have in our society is the profit motive. This is an institution since it is a society-level convention that influences how individuals engage in economic transactions. In particular, it structures individual actions around maximizing profits over other motives (see Polanyi ([1944]2001) and Graeber (2011) for evidence of other motives for individual action). The aforementioned definition also shows that all laws – at least, binding laws – give rise to institutions, because they are manifest in rules and shape customs that impact individuals and structure their social interactions. As a final point on the definitions of institutions, it should be noted that an institution has no inherent moral value. In other words, it is not inherently good or bad to be an institution.

2.2 The History of Institutional Economics

The development of institutional economics in America at the end of the 19th and beginning of the 20th century coincided with major changes in American society. The push west had reached the Pacific, a radical reconstruction of American society had been attempted in the rubble of the Civil War, and America was becoming a major world economic power. At the same time, America was seeing the rise of major concentrations of wealth and power, both individually and in corporations. Moreover, the philosophy of pragmatism, led by John Dewey and William James, was blossoming at this time. One major argument of this school of thought, perhaps best encapsulated in Dewey's theory of instrumentalism, was that scientific theories cannot ever truly mirror reality, but instead scientific progress arises through a development of better prediction and explanation of the world.

Influenced heavily by Dewey, Thorstein Veblen and John R. Commons began to investigate the institutions that influence economic interactions. Veblen was a student of the economist James Laurence Laughlin at Cornell and later, after receiving his doctorate in philosophy from Yale, was a professor at the University of Chicago and Stanford, as well as part

of the founding core of the New School for Social Research. Commons, on the other hand, although he never received his doctorate, did graduate study for two years under Richard T. Ely at Johns Hopkins, and taught first at Syracuse (where he was dismissed for being a radical Georgist) and later at the University of Wisconsin-Madison (which soon became a hub for institutional economists). Veblen famously detailed the theories of "conspicuous consumption" and "conspicuous leisure" where individuals consume goods and services, or substitute leisure for work, largely for the purpose of showing others that they can afford these luxuries, even at the risk of going into debt. In Commons' words, institutional economics is different from the prior European economics because "the classic and hedonic economists, with their communistic and anarchistic offshoots, founded their theories on the relation of man to nature, but institutionalism is a relation of man to man" (Commons 1931, 652). Since these European economists focused on the commodities produced by labor, Commons argues they inevitably concluded that a "materialistic metaphor of the automatic equilibrium" would arise (Commons 1931, 652). Instead, institutionalists investigate the transaction, leading them not to an idealist theory of equilibrium, but rather an understanding of the three basic types of interrelated transactions: bargaining, managerial, and rationing (Commons 1931).[6] Commons further details why institutionalism uses Dewey's ideas on psychology, saying "institutional economics is behavioristic and the behavior in question is none other than the behavior of individuals while participating in transactions". Dewey's psychology was used as "only Dewey's is socialistic," a requisite quality for institutional economics due to the explicitly social character of transactions (Commons 1931, 655).[7]

This social approach to psychology leads to another of the major distinctions for institutional economics when compared to the mainstream: institutionalists argue that preferences

6. Bargaining transactions are those most commonly thought of in markets. They are the transactions that take place between buyer and seller. Managerial transactions are those that are based on individual-level power dynamics, such as employee and employer. Lastly, rationing transactions are those that rely on society-level power dynamics, such as state decrees like taxes.

7. Thus institutional economists, rather than, say, Kahneman and Tversky, may be seen as the first behavioral economists. Nevertheless, it is true that most early institutionalists used psychology that lacked the empirics the Kahneman and Tversky had.

are endogenous. This endogeneity of preferences derives from the institutionalist view that "the individual is both a producer and product of her circumstances" (Hodgson 1998, 177). Since individuals are constantly interacting with institutions, their preferences are constantly molded by prevalent social norms. However, individuals' preferences can, in turn, shape social norms. For this reason, institutionalists, unlike mainstream economists, do not assume that one direction of impact is more prevalent or powerful, instead they seek to understand interactions through a detailed analysis of the omnidirectional causality at play in social relations.

The original school of institutionalism founded by Veblen and his disciples was an expressly interdisciplinary practice of economics, openly taking developments in physical sciences like biology, social sciences like anthropology, psychology, and sociology, and humanities like philosophy to further its understanding of transactions. This interdisciplinary approach derives directly from Dewey's influence on the institutionalists, as it offers a scientific approach to the economic sphere which has greater explanatory power. However, this also means that institutionalism is more an approach to economic analysis, rather than a theory that is expected to describe markets and transactions that have not been directly investigated. Therefore, unlike mainstream economics, whenever a new market is investigated, the institutions involved in that specific market must be investigated. By extension, institutionalists believe no theory can be developed that can explain the entire economy since each market is unique. Therefore, a detailed institutional analysis, such as the one that follows in this thesis, is necessary to expand the understanding of the dynamics of a novel market.

The lack of a consistent theory of economic behavior in "old" institutional economics has led some "new" institutionalists to deem their earlier intellectual progenitors "anti-theoretical" (Coase 1998; Posner 1993).[8] This is a valid critique as it is true that "old"

8. The modifier "old" is solely to differentiate the foundation dates, as many institutionalists today still identify with the "old" school, such as Geoffrey Hodgson and Ha-Joon Chang. In this thesis, I will use "old institutionalism" to describe the approach to institutionalism used by Commons, Veblen, Hodgson, and other earlier writers, while "new institutionalism" will be used to describe the school of thought started by Ronald Coase and Richard Posner.

institutionalists do not believe that theory should claim to explain the entire economy and its corresponding interactions since the underlying institutions are always changing. Thus, to allow economics to be continuously relevant, old institutionalists seek an explanation of the economy that recognizes it is dynamic and evolving, instead of relying on static assumptions (Hodgson 1998). On the other hand, new institutionalists such as Oliver Williamson argue that their theory does not seek to reformulate economic theory as a whole, but to explain the development of institutions (Williamson 2000). Douglass North explicitly states that "the new institutional economics builds on, modifies, and extends neo-classical theory" in order to accommodate institutional impacts (North 1995, 17). In particular, this is done because institutions become important with positive transaction costs, since "the neo-classical result only obtains when it is costless to transact" (North 1995, 18). This deviation back towards neoclassical theory allowed new institutionalism to gain mainstream acceptance, but removed from it much of the true institutionalist nature, at least in the original sense of the word (Hodgson 1998). This is because institutionalists of the Veblenian school seek not only to explain how institutions arise and develop, but also how these social interactions influence economic outcomes and how they can influence consumer preferences over time. Thus, in an attempt to more broadly analyze and offer an oft ignored economic analysis of digital market concentration, I will be using the approach of old institutionalist economics in this thesis.

Although it is true my use of old institutional economics sets up a criticism of the resulting analysis as "anti-theoretical", I will not only bolster the analysis through institutionalist commentaries, but also by showing how this institutional approach allows for a deeper understanding than mainstream economic theory alone in modern, ever-changing markets. That being said, I will not be excluding new institutionalist analyses from my study, instead using their approach and conclusions as an addendum to the explicitly interdisciplinary approach of old institutionalism.

2.3 The Approach of Institutional Economics

Since a major aspect of this analysis entails the investigation of digital markets and their corresponding institutions, it will be useful to preemptively describe the approach this thesis uses. Following Hodgson (1998) I am chiefly concerned with the "institutions, habits, rules," associated with digital markets and their related development. Specifically, I investigate how the institutions associated with these markets are intimately connected with general societal habits and rules. I then develop an analysis of the social impacts of these institutions. Scattered throughout this analysis are insights from political science, sociology, and other related social sciences, to further the understanding of the transactions taking place in digital markets. I also include a discussion of how the actions of economic actors in these markets can influence the institutions at play.

Furthermore, this thesis analyzes policy implications with the underlying institutions as well as offering potential policy remedies, for which I draw heavily from the approach of Harry Trebing (1987). Trebing dictates two opposing forms of regulation: neoclassical and institutionalist. Since I will be arguing from an institutionalist standpoint, I will use the typical nuanced institutionalist stance: competition is neither fully beneficial nor destructive. Thus, it may be useful to attempt to develop a middle road which allows competition to the extent that society can benefit, while limiting the negative side effects. I do not expect to fully develop this middle road in this thesis, but since any institutionalist regulation requires extensive knowledge of the market to be regulated, I hope to expand the knowledge of the institutions at play in digital markets. With expanded knowledge of these markets, future researchers can develop theories and models which can help to design regulation in these industries that are socially optimal.

Lastly, since much of institutional economics was developed in the Progressive Era through the first decades after World War II (late 19th century to the mid 20th century), it is necessary in this discussion on the approach of the thesis to discuss how institutional economics can be updated to the 21st century. Almeida and Mortari (2021) show how the

rise of technology and vast amounts of information and interactions at people's fingertips requires a rethinking of how decisions are made. This rethinking requires the analyst to both understand the institutions influencing society, as well as use a realistic, in contrast to idealist, approach to the impact of said institutions. A realistic approach necessarily holds that the adjustment of institutions, habits, and social rules do not change immediately, but that "adaptation takes time" (ibid, 342). For example, Almedia and Mortari point out that typical analyses of the negative impacts of smartphones tend to place the blame on the existence of these smartphones. However, they rightly point out "it is not a terrible thing to have a computer called 'smartphone'," but rather the terrible thing is how the institutions we have interact with these new technologies (ibid, 344). Since the institutionalist approach views institutions as impacting individual action as well as impacted by individual action, it can be seen why these institutions are the issue, and thus the object of investigation in this thesis. If our institutions are evolving slower than the technology we use, our interactions are being influenced by institutional structures which developed in a vastly different economic and social world. Thus, these behaviors, which may have been optimal in previous situations, should not be expected to still result in optimal decision making.

A telling example might be the cliché parental rejoinder to their child playing on a computer: "back in my day we used to play outside" or "kids these days only play video games". Although this might be seen as parents attempting to show their children the fault in their ways, an institutionalist might instead say that this response is an institution that has been slow to evolve to the modern world. Our modern world has video games and in many instances children have the ability now to interact over vastly greater distances than they ever could before. This ability allows children to gain a worldly knowledge at a much younger age than ever before. Furthermore, children who engage with technology at a young age may be better able to use these tools in beneficial ways (Gottschalk 2019). At the same time, it is true that digital communication is not easily compared to the in-person communication of "playing outside," though there is some evidence that digital communication can assist in

the development of children's social skills (Winther 2017). All in all, this example shows that institutions develop over time and thus cannot be expected to adjust to changing economic and social dynamics immediately. The inability of institutions to change instantaneously will necessarily lead to frictions and negative outcomes. These frictions are a novel part of this analysis when compared to the mainstream approach, which ignores the influence of past thought on present action.

Another update needed for the 21st century is an understanding of how prevalent and pervasive institutions are in society today. With the expansion of technology, and thus society, into almost every sphere of life, institutions associated with digital markets are influencing more people than ever before. In the past, there were physical spaces, such as a mall, public park, or civic event that reinvigorated and reconstituted institutions. These spaces allowed institutions to have less direct contact with individuals, which thus meant these institutions were more susceptible to change. As mentioned above, institutionalists believe that individuals interact with, are influenced by, and reconstitute the institutions in society. An extension of this is that as institutions have more social prevalence, they become viewed as more powerful social rules, stifling their ability to change. However, the institutionalist approach recognizes that this social prevalence also pits the individuals in society against these institutions. Thus, growth of an institution's social prevalence can also lead to prompt institutional evolution if there is adequate social support.

2.4 Institutional Economics and Antitrust

An institutional analysis of digital market concentration benefits from its nuanced approach to the issue of competition in comparison to mainstream economics. This nuance is critical for the analysis of a market that has brought so many socially beneficial products to consumers including internet search algorithms, smartphones, access to shopping at the touch of a button and social networks that connect us to our friends, both near and far. Monopoly and the study of competition was one of the major intellectual discussions tak-

ing place during the Progressive Era. During that time, America experienced the rise of major railroad monopolies, concentration in the financial sector, and the infamous power of Standard Oil and John D. Rockefeller. Those of the neoclassical school believed that these concentrations of economic power were due to exogenous or transitory factors. Conversely, institutionalists viewed these "market failures" as caused by institutional interactions and scale economies from the organization of the market. Using this approach, institutionalist economists developed economic rationale for antitrust laws in the beginning of the 20th century, as well as developing their own unique competition theory.

The institutionalist approach, in typical fashion, takes a historical approach to the question of competition. More specifically, it seeks to understand how markets change over their lifespan. Typical neoclassical views on monopoly and market power are that they are aberrations, with perfect competition being the normal outcome. Some, like the Chicago School, argued that monopoly and market power were short-term, implying antitrust action would necessarily decrease economic efficiency (Trebing 1987). However, like many aspects of institutionalist economics, institutionalists tend to regard the view of a "normal outcome" as problematic. They see the rise of market power, which Oliver Williamson calls "dominant firm outcomes," as the result of the failure of internal policing mechanisms in markets, on top of the neoclassical explanations of natural monopolies, patents, and scale economies (Williamson 1975, 208). These failures can be the result of first-mover advantages (where the earlier entrants in a market have lower average costs than later entrants thus allowing greater profits for the former group), ineptitude of competitors, or some exogenous shock that impacts only one member. The existence of these dominant firms can cause economic issues that a government might seek to alleviate, such as allocative inefficiency and the potential for economic power to evolve into political or social power (Williamson 1975).

Competition theory and its application to antitrust law must also investigate the question of what constitutes extreme market power of the sort requiring action from the government. The institutionalist approach to this question is to analyze the underlying market trends

and decide whether there was a reasonable case for antitrust action. Through this approach Williamson argued that in static markets it might be necessary to allow mergers so that efficiency can increase. Beyond just efficiency, innovation may be negatively impacted by lack of competition associated with market power (Williamson 1968). As Joseph Schumpeter argued in his book *Capitalism, Socialism, and Democracy*, the fostering of competition might allow for creative destruction in the market for innovation techniques, driving out old techniques thereby opening up space for new innovation. However, with enough market power, a firm could mitigate this, giving greater power to the intrafirm institutions and habits determining research approach and topics. An institutionalist approach must necessarily take these considerations into account when determining the costs of market power and the benefits of enforcement of antitrust laws.

For competition theory to expand beyond solely an academic theory and gain policy-making power, institutionalists must determine a program of goals for antitrust action and help develop actions based on the individual situation at hand (including market structure, law, and other major institutions involved). Trebing (1987) argued that antitrust actions should seek to increase efficiency and choice, as well as understand that to be successful they must have the support of the public. Trebing also argued the form of antitrust was likely to change over time with the changing of institutions and public sentiment. Increasing competition through direct antitrust action may also be a way that governments can enact changes to institutions as compared to blanket laws. Williamson (1975) points out that it is possible a powerful institution will seek to dodge antitrust laws if there is no active power counteracting this incentive. Thus, there exists an argument in support of antitrust which uses the threat of action (which must have substance else it turn into a charade), as a way to disincentivize anti-competitive behavior in markets.

Institutionalists have, like in many instances, a nuanced approach to the question of competition and market power. Regardless of the specific arguments for when antitrust action is necessary, institutionalists agree that the neoclassical approach of assuming competition

will always yield optimal outcomes (unless there was an exogenous reasoning for its failure) is naïve. Understanding that competition in our modern complex economy can lead to market power without specific anti-competitive behavior is an important, yet underdeveloped, avenue of thought in economics. Mainstream economists tend to take a deterministic approach to the world, that is, if a firm succeeds there must be an economic reason why they succeeded over other firms. However, institutional economists and their theories on competition and antitrust argue that luck and timing are just as important to the outcome of economic processes. An understanding of all of these factors allows for both more complete economic understandings of the issues around market power, as well as a delineation of the ethical question of antitrust. Specifically, if luck is the reason one firm (and by extension those working for that firm) succeeded while another failed, do the same ethical questions around disincentivizing "success" remain? Are antitrust actions more reasonable and more economically necessary in these instances to preserve a reality of meritocracy?

The school of new institutionalism, and its approach to the study of law and economics, has developed a vastly different view of the role of antitrust policy. Although it is not an approach I will use, it is nonetheless influential, with the Federal Trade Commission (FTC), Department of Justice Antitrust Division (DOJ), and many mainstream economists using it in analysis of market power and potential remedies. The study of law and economics is not unique to new institutional economics, with John R. Common's 1924 book *Legal Foundations of Capitalism* viewed as the first detailed investigation of the relationship between laws and economic activity. Nonetheless, new institutional economists have become some of the most well-known scholars of law and economics and, by extension, antitrust law.

Law and economics is often described as a school similar to that of the Second Chicago School, with many figures, such as Richard Posner, Ronald Coase, and George Stigler, in this newer Chicago School bringing major developments to law and economics as well. Due to this, the approach of law and economics to antitrust (and law more generally) was that "economic efficiency was the exclusive purpose of...enforcement" (Bougette, Deschamps, and

Marty 2015, 315). The approach of law and economics is in stark contrast to the viewpoint of old institutionalist economists who saw economic stability, fair distribution of wealth, and preservation of future competition, along with its beneficial social and political effects, as other equally important purposes for enforcement (Panhans and Schumacher 2021). In further contrast to the institutionalist school of thought, scholars of law and economics such as Coase and Frank Knight expressly limited the scope of what economics should be about. Institutionalists' main distinguishing factor was their focus on social interactions and how those interactions caused impacts to the economy (which was not solely the market). This necessarily brought institutionalists to ask ethical questions such as "what is fair?", "should the government seek the common good even at the detriment of the private individual?" and more. In contrast, Knight said that although social justice was a useful goal to have, it was a loose category that was nearly impossible to use as a basis for policy (Hackney 1997).

Exploring the development of antitrust law illuminates a social interaction that may be prevalent in the modern discussion of Big Tech and antitrust action against it. One of the most interesting aspects of the development of American antitrust law is that the first lobbying for antitrust action was not from worried consumers, but rather competitors who worried that a large company in their market would cause them to lose profits (Bougette, Deschamps, and Marty 2015). This tendency highlights an intriguing institution: market self-regulation may be a bigger impetus for regulation than consumer advocacy. It is possible this behavior results from consumer purchasing habits which make them functionally blind to threats to their welfare. For instance, it is true that in the case of Standard Oil, like Amazon today, prices decreased while output increased. Thus, in a strictly theoretical nature consumer welfare has gone up. However, this greater market power might make future threats to consumer welfare more worrisome as there will be fewer options if the market becomes monopolized.

The field of "law and economics" developed to integrate economics into the practice of law, in an attempt to make law as scientific as possible, thereby relying on judicial discretion

less. This was the goal of this movement and on that goal, they appear to have succeeded. However, from an institutional perspective, law and economics has veered away from its institutional roots. When understanding the issues at play in a market, ignoring moral and ethical questions can be beneficial to determine a baseline understanding of the theoretical results. However, this omission limits the application to producing new laws, and instead limits law and economics to determining how to act under existing laws. This description of the development of antitrust laws shows that the school of law and economics would not have been able to develop these laws by itself and required these laws for its analysis to exist. That is to say, although law and economics and other developments from new institutionalism are useful, they are only useful for analyzing existing legal structures, but fail to account for the ethical and moral questions that are required when designing new laws.

2.5 Summary of Section

- An institution is a society-level rule, custom, or convention that impacts individuals and molds their social interactions within society.
- Institutional economics focuses on the market transaction, rather than the production of goods as mainstream economics does. In markets, such as digital markets, with anomalous production traits, this focus on transactions allows for broad understanding without theoretical confusion caused by low or zero marginal costs.
- Old institutional economists view the goals of antitrust more broadly than mainstream economists. These goals include social harmony, support of democratic rights, promotion of meritocratic ideals, among others. This is a beneficial trait when investigating a market which has become so socially impactful.

3 Digital Markets Today

Digital markets, just as the technology that has spawned them, are a new phenomenon in the history of economics. For centuries the predominant input in the production of most goods traded in markets was labor, or, as Adam Smith wrote in 1776, "... toil and trouble" (Adam Smith [1776]1994). Alfred Marshall sought to formalize this understanding when he used William Stanley Jevons' utility theory to expand his own supply and demand analysis of market equilibrium. This expansion sparked the marginalist revolution which inaugurated the extensive use of mathematics in economic theory. Paul Sameulson expanded further the marginalists' developments, relying on the assumptions that the chosen position of an economic actor (i.e., the equilibrium) was the maximization of utility and that these equilibria were stable to formulate his general equilibrium theory (Backhouse 2004, 258–259). These theories were helpful even as the industrialized world saw drastic changes during the 20th century, such as the move from a predominantly industrial economy towards a service economy. However, today we have seen yet another change that ultimately threatens the applicability of these theories: the rise of digital markets. These markets are unique as they have low, if not zero marginal costs, and high upfront costs. This has led to concentration levels that have scarcely been seen in modern history. Many view this rising characteristic of concentration with fear. This fear of concentrated markets is further exacerbated due to the personal data held by many of these firms. In order to give a complete understanding of the market under investigation and the current trends, I will detail empirically the development of four of the largest companies associated with digital markets: Facebook (now known as Meta), Google, Amazon, and Apple.

3.1 Facebook/Meta

From a small social network website to rate student attractiveness on Harvard's campus called "thefacebook.com" in 2004, to the largest family of social networking sites in the world

with 3.59 billion unique active monthly users (nearly 46% of the world population),[9] Meta Platforms, formerly known solely as Facebook, has become a globally recognized economic force (Meta Platforms Inc. 2021, 50). Beyond the extreme market share that Meta's portfolio of companies take up in social networking,[10] the vast size of these platforms has led to an economic dependency the likes of which has scarcely been seen in history. As a 2015 *Wall Street Journal* article put it, "anyone building a brand... can't ignore Facebook's highly engaged daily audience of 1 billion" (Clark and McMillan 2015).[11] Moreover, these billions of users are on Meta-owned sites for nearly an hour every day (Statista, n.d.).[12] Thus, it is immediately obvious to any company that without advertising on Facebook — let alone Meta's other major social media platforms such as Instagram — there is a major market left untapped. Thus, demand for advertisements on Facebook is highly inelastic.

This property of the demand for advertisements on Facebook can be best elucidated with the example of the news industry. News agencies heavily depend on readership generated from both Facebook ads and articles. So much so that when Facebook reorganized its "News Feed" to focus on what it described as "meaningful connections," some news sites saw declines in readership of upwards 30% (Andersen 2017). For an industry that has historically had extremely tight margins, this drastic decrease in ad revenue can be deadly. Thus, the dependency on Facebook's platform gives Meta and its subsidiaries immense economic power in markets beyond their own. Moreover, Meta's development of "Facebook News" has caused competitors, such as MeWe's founder Mark Weinstein, to fear "a truly problematic quid pro quo," since Facebook will be paying news agencies for their stories, which can influence the stories these news agencies publish about Facebook (Weinstein 2021). With this power,

9. This is not excluding China's population. However, since Meta has been banned in China since 2009, it has closer to 55% of the population where its product is legal (author's calculations).

10. Estimated at upwards of 95% of the "relevant product market" according to a report by the United States House of Representatives Subcommittee on Antitrust, Commercial, and Administrative Law, with only Twitter and Tumblr (and previously MySpace) as major competitors (United States House of Representatives 2020). An explanation of this relevant product market is given below.

11. As of Dec 31, 2021 the daily engagement on Facebook according to Meta is nearly 2 billion unique users (Meta Platforms Inc. 2021)

12. Assuming these users get around 8 hours of sleep a night, this equates to roughly 6% of their waking lives on Meta owned platforms.

Facebook can influence the stories and information that half the world population view.

The inelastic demand for advertisements has led to Meta generating nearly $115 billion in advertising revenue across its family of apps. This amounts to a staggering 99.5% of Meta's revenue from these apps and 97.5% of its total revenue (Meta Platforms Inc. 2021, 65). These ads become even more powerful with the sheer quantity of user data that Meta gathers from its platforms. With these data, Meta can offer targeted advertisements to businesses. Leaked documents from 2017 detail how Facebook told advertisers it had conducted internal research that showed it could determine the emotions of users, especially young users who may be more easily swayed by advertising (Levin 2017). With this granular level data and the ability to target users with pinpoint accuracy, Meta can offer advertisers the unique ability to directly advertise to their ideal audience. Unlike in the past where advertisers had general demographics about their audience, but could not narrowly reach their preferred audience, with Facebook's extensive user data, these companies can more efficiently spend on advertising through using targeted advertisements.

The ability of Meta to leverage its extensive data is economically impactful not only because it allows companies to spend on advertising more efficiently, but also, due to the impact it may have on consumer preferences. These data can allow companies to generate demand for their goods, rather than solely satisfy existing demand (Kirkpatrick 2010). Although it is true that marketing has always attempted to generate demand for products, the ability to target advertisements to specific consumers further increases this ability. As David Kirkpatrick puts it, "algorithms that orchestrate our ads are starting to orchestrate our lives" leading to a question of whether consumers are truly the ones who prefer products, or if it is companies who prefer that consumers "prefer" these goods (Kirkpatrick 2010, 9–10).

Furthermore, as more and more users join and use Facebook and other Meta platforms, the data that Meta can offer advertisers grows in quality and thus value. This can lock in Meta's position in the market since advertisers will prefer, all else equal, to advertise where

they can generate the greatest impact for the same price. Other market competitors that exist (such as Twitter or TikTok) or other potential competitors would be further hampered by this lock-in effect[13] due to the profit maximizing nature of the firms which are advertising. Increases in user base increase the quality of a platform's data exponentially because increasing the user base not only expands the data set, but also increases the connections and interpolations among existing data, increasing its usefulness in advertising (Li, Nirei, and Yamana 2019). Thus, even if a platform such as TikTok has roughly a quarter of the user base of the combination of all Meta-owned entities (1 billion vs. 3.59 billion), the quality of Meta's data will be much more than four times that of TikTok's (assuming both collect the same amount of data per user). Companies are thus incentivized to advertise the most on the platform with the greatest user base, not only because it has the greatest reach, but also because it is the platform which has the most extensive data, and thus, the greatest ability to offer the company efficient use of its advertising budget.[14]

The exponential increase in quality and power of data incentivizes Meta to attempt to buy out other social media platforms, to capitalize on the growth of user data. This incentive, when coupled with the revenue limitations on smaller platforms, means that larger companies will receive more surplus through buying smaller companies. Since Meta has a much greater user data pool, its valuation of the target company will be greater than the company values itself, since that company has no access to the data Meta controls. Data is therefore being systematically undervalued by smaller companies, a trend which can be capitalized on by larger companies like Meta (Li, Nirei, and Yamana 2019). Meta thus has an opportunity to purchase new revenue streams for less than their true value, growing profits and likely market power as well. As this process continues in the market, it inevitably leads to concentration

13. A lock-in results when certain market characteristics lead to users having difficulty leaving a platform, if not complete inability. Thus lock-in effects are those effects caused by the aspects of the market which limit the switching of consumers. One of the most famous lock-in effects is the QWERTY keyboard. This keyboard was designed to stop typewriters from jamming and so deliberately placed commonly used letters far away. However, with computers this is no longer necessary, yet remains the standard keyboard.

14. This does not account for the fact that Meta's strategy of allowing webpages to integrate Facebook with their site, by allowing users to "like" the webpage, offers Meta even greater access to user data beyond social media (Pariser 2011).

and consolidation.

Although Meta sees significant benefits from the lock-in effects associated with its data quality and breadth, other lock-in effects exist. Namely, the lock-in effects associated with social networks is another major cause of market power, potentially an even bigger one than that associated with data. Network effects are inherent to social media, which means that platforms with greater user bases are more attractive to new users than similar ones with smaller user bases as the main use of social media is connecting with friends and like-minded individuals. All else equal, there is a higher likelihood of finding these groups of people to connect with on a platform with a greater user base than one with smaller. In the wording of network theory, new nodes (i.e., users) connect with higher probability to existing nodes (i.e., platforms) with greater popularity (Barabasi 2014, 70–71). Furthermore, since social media very rarely has been specialized for specific types of connections (beyond maybe LinkedIn) there are limited, if any, alternatives with the same quality and quantity of potential connections. Like the reasons given for the exponential increase in quality of data for advertisers from greater network size, there is likely a large increase in the utility of a greater network for users. Every subsequent user may not only be a direct connection for an existing user, but also allow the existing user to find new connections or reconnect with long lost friends.

Beyond just the lock-in associated with new users, large social media sites have a unique retention quality due to the cohesive nature of their networks. Due to the high switching costs (or in institutional economics parlance, transaction costs) associated with leaving a social media site, when a site develops a large user base, it will be exceedingly difficult for it to lose this user base. High switching costs arise because users leaving a large platform sacrifice the utility of their network on that site. When switching platforms, if users seek to retain their existing network, they must not only convince themselves to leave a platform which may have high utility, but must also convince the rest of their network of individuals, who in turn, must convince their subsequent networks, and so on and so on. Within this

process it can be easily imagined that certain individuals may be unwilling to part with their place on a network such as Facebook or Instagram. Thus, it is highly likely that the users who leave will see a decrease in their utility in any subsequent platform due to a loss of network connections. If these consumers can predict this process, they might end up deciding against this action due to the expected loss in utility.[15]

Additionally, the nature of digital markets is that differences in social media sites, although not often in quality or in preference toward a specific group, do arise and impact the "relevant product market". For example, Facebook is a social media site which allows users to share links, videos, and photos as well as write text updates. Among other social media sites, the only main competitors in this sub-genre of social media site are Twitter and Tumblr (United States House of Representatives 2020). Even a very similar site such as Reddit can be differentiated by the fact that users cannot "follow" other users to see their posts in their feeds, instead only following "subreddits" which focus on certain topics. This functionality is similar in some ways to Facebook's use of "groups," though the lack of direct user connection limits the use of Reddit as a tool for the social connection Facebook fosters. Instagram, on the other hand, offers a platform for sharing photos and videos alone, with no option for text-only posts. These seemingly small differences can heavily influence consumer preferences, especially when deciding whether to leave a social networking site. Beyond just the potential loss in utility from losing access to the extensive network one had on an existing site, users may be limited in their options for similar sites. A lack of reasonable substitutes would further limit the exodus of users from certain social media sites. With the added aspect that competitors are hampered by the lack of revenue from being a smaller site, it is apparent that those sites with major user bases are at an extreme competitive advantage in their respective markets.

A recent development by Meta Platforms also deserves mentioning as it shows the poten-

15. Prospect theory is a helpful tool to understand the potential for users to be unwilling to part with a social network which has become a new "reference point". Furthermore, even if consumers do not predict the future, since actions in this marketplace can be viewed as asynchronous, it seems reasonable to assume that users will observe the utility change for those who leave the platform leading to a similar result.

tial to generate market power the likes of which has rarely, if ever, been seen in history: the so-called "metaverse". Although originally a term from science-fiction and futurism, Meta has begun development of a real-world version of the metaverse, allowing users to interact in a virtual world. In this world, users can conduct meetings, buy "land," and essentially engage in any activity that they could hypothetically do in the real-world. This gives Meta an extreme amount of power over this market, if one can even call this a single market. It may be better to describe this possibility as a completely new form of power altogether. In this situation, Meta has control over the market not just because they are a monopolist (solitary seller), but because they own the market itself. The extremely high upfront costs of creating a competing metaverse also limit, if not completely prevent, competition in metaverse development (Weinstein 2021). If Meta can create the software and hardware that allow people to access a metaverse marketplace, they will have a level of economic power that Adam Smith and David Ricardo would tremble at. The accepted economic theories implicitly assume that markets are decentralized, and any market power comes from economic clout associated with market share. But how can they grapple with a company that not only has major market share, but owns the access to the market and the marketplace itself, thus allowing it to dictate the rules that govern said market?

The development of the metaverse is in stark contrast to the foundation of the internet. Although the internet has developed into an all-encompassing aspect of modern society, similar to what Meta hopes the metaverse will become, it had one major differentiating factor: its development was not monopolized by a private actor. It is arguable that the success of the internet was the open-sourced aspect it held from its very inception. If the internet's development was dependent on one company, such as the metaverse is to Meta, development would likely have proceeded slower. Perhaps more importantly for economists, the monopolized aspect of the metaverse's development could allow Meta to extract all the consumer surplus from the market through discriminatory pricing, a possibility all the more likely with the large swaths of user data collected by Meta.

3.2 Google/Alphabet

Just as Facebook was not the first social media platform, Google was not the first search engine. When Sergey Brin and Larry Page developed Google's base algorithm, PageRank, in 1998, the predominant search engine was Yahoo! which, like many early search engines, allowed users to search a pre-indexed directory of sites. PageRank, on the other hand, allowed web pages to be ranked on relevance based on how often they were cited by other web pages. Those cited more often would be listed as more relevant than those cited less often (Brin and Page 1998). This difference led to Google's search engine becoming the industry standard, especially as the internet grew at rates which made human indexing impossible.

However, if I were to tell an observer in 2000 that Google would become one of the most powerful companies, with advertising revenues over $200 billion and a market valuation over $1 trillion (Alphabet Inc. 2021, 33), they would try to find the best way to tell me I was crazy. That is because Brin and Page actively created Google as an alternative to the search engines being used at the time, which they believed had been corrupted by advertising. In their famous article laying out the basic aspects of the algorithm that would become how Google searches the internet, Brin and Page state "[c]urrently, the predominant business model for commercial search engines is advertising. The goals of the advertising business model do not always correspond to providing quality search to users". They go on to say in their determination, with the help of history, "we expect that advertising funded search engines will be inherently biased towards the advertisers" (Brin and Page 1998).

It is particularly interesting that Google's founders wrote this in 1998 because that same year Google began one of its most profitable endeavors to date: selling search terms (Purcel 2005). Since then, Google (and later its offspring parent company, Alphabet) has become socially ubiquitous with internet search, to the point "google" now means "to search on the internet". This is due in part because Google's search engine is often the first place that any individual goes in their search of the internet. Google is the default browser on Alphabet's Google Chrome and Apple's Safari web browsers, two of the most popular browsers in the

world.[16] It is even more prevalent in mobile search, since Apple and Google produce the two most popular operating systems (OS) for mobile phones, iOS and Android, respectively. Since Google is the default browser for both Safari (Apple's default mobile web browser) and for all Android phones, Google has 95% market share in mobile search (Statcounter, n.d.). This market share gives Google the ability to profit off its position through advertising, but also influence users' view of the world, as even the location of a result can influence whether a user clicks on it. Brin and Page recognized this potential influence as an issue in 1998, saying that although the web had grown extensively, "the user's ability to look at documents has not. People are still only willing to look at the first few tens of results" (Brin and Page 1998). Thus Google, as the main throughway to the internet, can influence what users see not just from explicitly excluding results, but also from subtly deemphasizing them.

Google, like Meta, has characteristics that have generated lock-in tendencies, which can make competition in this market extremely difficult, if not impossible. One of the most obvious ones is Google's aforementioned role as a default search engine for many users. As behavioral economists have showed, most prominently by Richard Thaler and Cass Sunstein in their book *Nudge*, default settings can greatly influence outcomes. Thus, since Google is the default for so many users, competitors must both convince users that their product is better than Google's and that it is so much better to require a transition. Although the impact of default settings is not enough to prove Google's locked in power, when coupled with the network effects Google benefits from, it can be seen why competition in this market is so difficult. Google's algorithm, like any machine learning technique, benefits from more data. When more users search using Google, Google can fine tune the algorithm, gradually improving the product over time. The vast number of users and searches done on Google[17] grants it access to unprecedented levels of data. With this data, Google can make its algorithm more efficient and productive than any others, enticing users to stay on its platform,

16. Together these two browsers hold 80% of the market as of February 2022. No other web browser breaks 5% of the market. (Statcounter, n.d.)

17. Over 8.5 billion daily or 101,649 per second, as of April 25th 2022 (Internet Live Stats, n.d.).

if not due to its default nature, then because it is the best search engine. Furthermore, the associated "foot" traffic that comes with being the default search engine causes Google's advertisers to prefer not to leave, further harming potential competitors' revenue streams. With limited revenue, the profitability of competitors and thus their ability to continue competing with Google is stifled. Finally, Google has a unique lock-in, namely that its name is now synonymous with searching something on the internet, giving it an implicit advantage in the search engine market. This social norm is one that is difficult for any company to compete with.[18]

As Google began to expand beyond solely search, some began to fear that it could use its position in the search market to support its position in other markets. As one *Wall Street Journal* article in early 2017 put it, "Google often pushes its growing list of hardware products...in the top ad spot above its search results" with analyses concluding that nearly 91% of searches had a Google product in the top ad spot (Nicas 2017a). This behavior becomes even more insidious when one recognizes that the "algorithm" Google uses to determine ad placement is secret. With this understanding, cases such as the business software company Bitrix's precipitous fall appear even more worrisome. At the beginning of 2015, Bitrix ads were appearing on roughly a quarter of searches related to its software with Google not advertising on that search term. However, when a year and a half later Google began advertising on Bitrix's search terms, Google quickly shot up to 70% of the results while Bitrix's share of ads fell ten percentage points, while paying 26% more for ads (Nicas 2017a). What makes this especially worrisome is that Google did not suddenly begin producing the good associated with those search terms, instead offering a platform that allowed companies to implement the type of software Bitrix offered.

Google's dominant position in the search market gives them outsized power over the

18. Although other companies have had similar supportive social norms, such as Kleenex and Xerox, and seen competition arise, they did not have the same informational power as Google holds today. This power over information is an important factor that differentiates these digital good markets from physical good markets. Additionally the scale of their potential markets were limited compared to the scale of the internet search market.

information that users see. One example is that of Google's "knowledge panels" and featured results which show up on roughly 40% of searches (Nicas 2017b). According to Google's Help Center, it shows these results to give users "a quick snapshot of information on a topic based on Google's understanding of available content on the web" (Google 2022). However, Google's search algorithm seems to have a confirmation bias, as well as a potential bias towards Google's own products.

As the following images (Figures 1 and 2) from a sample search show, Google's featured results direct users towards pages which reinforce the user's prior belief, while a more accurate result may bold a section for each phone or solely highlight a comparison. Looking closely at the difference of the bolded phrases in the featured results, it appears that the pro-Apple featured result has more qualifiers such as "reportedly" and specifically mentions that this applies to "most" instead of *all* Android phones. When looking at the other results, a snippet from another site describes why Android is better. On the other hand, when one implies they already believe Android is better than Apple, the featured result has no qualifiers and explicitly states in some snippets that Android is better. Here I seek not to do a technological analysis of Apple iPhones compared to Android phones, rather I am attempting to show that since Android phones run on a Google developed operating system, it is worrisome to see Google's power in the search market influencing users' views for its own economic benefit. Beyond being socially worrisome, this action would limit the ability of consumers to truly obtain full information.

This power of Google goes beyond just the economic, as its position as a major accessway to the knowledge of the internet gives it immense power to dictate what "acceptable" information is. The power Google has over information is especially important because it now generates as much revenue from news on its platform as the entirety of the news industry earns in advertising revenue (Tracy 2019). As mentioned before, news agencies have limited profit margins, so they must generate traffic however possible, even if that means submitting to Google's demands. An impact is also seen on how news companies find their audience. In

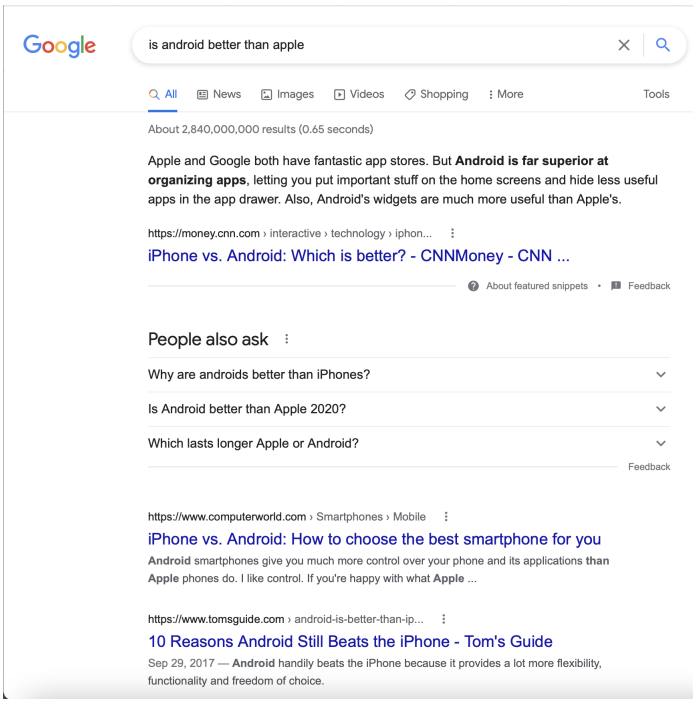


Figure 1: Screenshot of results for query "is Android better than Apple"

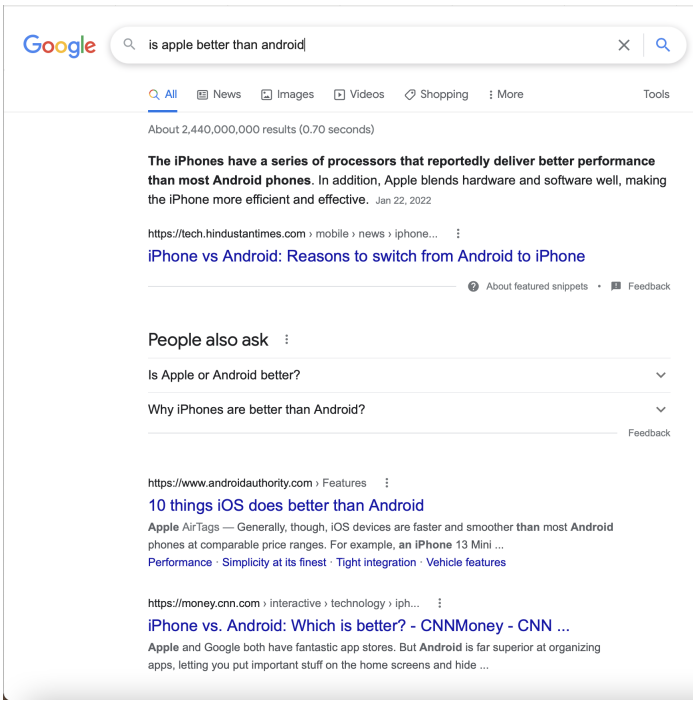


Figure 2: Screenshot of results for query "is Apple better than Android"

the past, it was possible for them to direct advertising to a specific group without a middle-man. However, now with the rise of the digital economy and how prevalent the internet is,

these companies are effectively forced to reach their users through the internet. Therefore, if certain stories threaten to harm their location in Google search results, news agencies have incentives to change them. Furthermore, since Google sells ads on search results, it may be harder for small news agencies to grow a subscriber base. If small news sites have limited access to new subscribers and thus greater funding concentration in news may increase, limiting the democratic ideal of free press. Coupled with PageRank's tendency to push larger sites to the top of results (simply because these sites will be cited by other sites more often, all else equal), a dangerous climate for small news agencies to remain profitable is generated.

Google has also recently attempted to push more "authoritative sources" for news. Backlash against this policy, mainly due to its tendency to narrow the bounds of political discussion, has come from both sides of the political aisle, with former president Donald Trump, as well as many left-wing organizations, warning of the potential downsides of this policy (Wakabayashi 2018). One left-wing organization's analysis showed that when Facebook switched to "more authoritative sources" some of the most well-respected independent and alternative news sites were those that were impacted the most (Andersen 2017). This power of Google and Facebook to narrow the range of public debate and acceptable language is all the more unsettling since governments might wield enough power to influence these censorship decisions. If the government can pressure these companies to adjust socially acceptable discussion, questions arise of expanding the First Amendment's protections (at least in the United States).

Similarly to the influence on public discussion, Google has funded academic research that argues against regulatory challenges of companies in digital markets. Google has gone as far as allegedly having a "wish list" of papers that it wanted written (Mullins and Nicas 2017). This influence over the academic discussions which shape policy debates further shows Google's growing power to shape the world we live in. Furthermore, some authors who were funded by Google failed to acknowledge this obvious conflict of interest. If authors are failing to acknowledge conflicts of interest, societal trust in academic work as scientific,

rather than biased, will be degraded. Even those who try to criticize Google soon see what standing up to one of the largest firms in the world can do to one's life. For example, one critic of Google who worked at a Google-funded think tank was fired after he spoke out in support of the EU's antitrust action against tech companies like Google's parent company Alphabet (Vogel 2017).

Alphabet's power comes not only from the market dominance of Google Search, but also from its ownership of YouTube, a video sharing platform. YouTube has become one of the most popular sites for people of all ages. With over one billion hours of video watched every day, it is quickly becoming as prevalent, if not more so, than television. However, unlike television, which is distributed across many different channels and companies, YouTube is completely owned by Alphabet. Thus, there is no competition in the oversight of the information on this platform. Although users may report videos to YouTube, the sheer quantity of video uploaded each day[19] means that it is impossible for human moderators to ever audit the platform fully.[20] Additionally, confirmation biases in the algorithm can allow individuals to remain in bubbles of their own views fraying the social fabric by limiting productive bipartisan discussions. The use of deep neural networks, a form of computing where the computer can "learn" an individual's preferences from past actions and predict their future preferences, also means that when the algorithm shows individuals conspiracies or illegal material, Alphabet engineers are often in the dark as to why (Nicas 2018). This lack of human agency or oversight in the decision making of these algorithms leads to unintended outcomes where a responsible human party is difficult to locate.

Alphabet, or, as it is better known, Google, has reached a place that no other company can claim to have reached: being the main avenue by which most people find knowledge. This role grants Google an immense power, not only over the digital economy, as users use its search engine to reach other digital companies, but also gives it an immense social power.

19. Estimated at 720,000 hours each day (or nearly 500 hours every minute).

20. Not to mention the ethical questions associated with having individuals watch triggering and traumatic videos daily.

The power to determine what is acceptable information is a power that has never been seen in a private company's hands in the past. Even if Google has yet to obviously abuse its power in this sphere, many social fears have developed from its size alone.

3.3 Amazon

Amazon.com was founded in 1994 primarily as an online bookstore, but in the past 30 years has developed into one of the most prominent companies in the world. Now, Amazon has expanded into being the predominant online marketplace, one of the largest streaming sites, as well as the largest web services supplier. Amazon's immense growth has led its founder, Jeff Bezos, to become one of the richest people in the world, valued at over $150 billion,[21] as well as expanding his political clout with a foray into the newspaper world through his purchase of the *Washington Post*. The online marketplace that Amazon has developed has become so important to every other market that "anyone with goods to sell wants Amazon to carry them" (Clark and McMillan 2015). This captive demand has granted Amazon a position that economics has rarely seen before in history: that of a company owning the marketplace where it competes with other companies.[22] Amazon's ownership of the market, as well as its expansion into many different industries has caused some observers to deem Amazon "something radically new in the history of American business" (Packer 2014). This form of market power[23] is more prodigious than power derived from market share, as incentives exist for Amazon to bend the rules of the market for its benefit.

Amazon has also been accused many times of abusing its market ownership position. In the House of Representatives subcommittee's report on digital markets, members of the

21. According to Forbes, Bezos' net worth of $150.1 billion as of April 30th, 2022. See https://www.forbes.com/profile/jeff-bezos/?sh=1df417e61b23

22. Although there exist examples in history where companies have sold their own brand alongside competitors (e.g., Sears as well as many supermarkets) the digital nature of Amazon, again influences the analysis. As will be mentioned below, the power over information, in the form of search results on its site, grants Amazon the power to influence consumer behavior in its favor. In contrast, physical stores do not have the same ability to influence consumer behavior, limiting the power they can exert.

23. Though it should be noted this is a distinct form of market power from that which companies gain through market share. Thus, one might instead call this market ownership in distinction to the market power gained in a decentralized market.

United States Congress, as well as experts, raise concerns about how trustworthy Amazon's "relevant products" algorithm is (United States House of Representatives 2020). Similar to Google, the report details fears that Amazon may unfairly push its own products over those of competitors. Furthermore, the committee shows evidence of Amazon using data collected from its marketplace to determine goods to sell. By determining popular products and releasing an "Amazon Basics" version for a fraction of the cost to price out the original producers, Amazon sought to push out competitors and exert monopoly power. This behavior not only drives out existing competitors, but the lower prices (and thus profit margins) limit the ability for competition to arise in the future. However, even if competition were to arise, say because Amazon increased prices, it would likely be heavily dependent on using Amazon's platform to grow, restarting the cycle once again.

Even beyond its potential abuses of its unique market ownership position, Amazon has also engaged in more typical monopolistic behaviors. Similar to the actions taken by Standard Oil, Amazon has attempted to vertically integrate through developing its own shipping service, warehouses (called "fulfillment centers"), and growing its web services. In search of vertical integration Amazon has threatened the existence of its competitors and suppliers, in an attempt to lower costs. For example, Amazon has grown its shipping abilities, now competing with UPS and Federal Express.

Pushing out competitors has not only been accomplished through vertical integration. Amazon has also used below cost pricing schemes to drive down profit in markets they enter. Although counter-intuitive that a firm would seek to decrease profits, this action is no accident as Bezos actively tried to limit profit early on to inhibit potential competitors from entering the market before Amazon could grow to a size at which competition was near impossible (Stone 2013, 221). These actions, among others, have led Amazon's net sales to reach nearly $500 billion in 2021 (Amazon.com Inc. 2021, 29).

Amazon's initial role as an online book retailer was also a calculated decision by Bezos to capitalize on the nature of the market. Since the book retail market was heavily dominated

by brick-and-mortar stores at the time, such as Barnes & Noble and Borders, Amazon filled a missing position in the market: a retailer which could use the growing Internet to offer consumers more options. As a former Amazon executive described, the reason Amazon began as a bookstore was because the sheer number of books "in and out of print" made it impossible "to sell even a fraction of them at a physical store" (Packer 2014). Crucially, Bezos did not initially believe that selling books would be a profitable way for Amazon to grow, as it was already an industry with tight profit margins and America was not a country with high demand for books. Instead, Bezos wanted to use the sale of books on Amazon to collect data on its users. With this data, Amazon would then learn how to sell these users everything else they could demand, just as described with Google above. Therefore, Amazon began selling its books at or near cost to increase volume at the expense of profit, as it sought not to profit from the sale of the books, but the data generated.

Another benefit of the online book retail market was Amazon's ability to profit and benefit off the unpaid labor of reviews left by customers for books. Unlike a physical store, Amazon's online bookstore could offer consumers the ability to read other customer reviews of the book, as well as the professional reviews included in a book (Carr 2008). These reviews gave Amazon a unique distinction from other book sellers: its store offered users reviews by others like them. Nicholas Carr argues that this was one of the major aspects that led to Amazon's meteoric rise in the book selling market, as it allowed Amazon to quickly engulf a large portion of the book market, but more importantly, to gain extensive valuable user data.

As mentioned above, Amazon has expanded into many other industries, extending its economic arms into diverse economic, social, and political realms like the antagonist in the classic American novel *The Octopus* by Frank Norris. The industry which Amazon has profited most from is, perhaps surprisingly, web services. Although Amazon's market share (no more than half of the market[24]) is not as extreme as Google or Facebook have in their

24. More so than other markets mentioned so far, web services is a market which analysts have difficulty defining. Some analysts have termed it infrastructure as a service ("IaaS") while others look at "public cloud

respective markets, the dependence of other companies on this service gives Amazon power, nonetheless. The threat of dependence on Amazon Web Services ("AWS") is likely one of the main driving forces pushing Amazon's market share down from 51.8% in 2017 to 40.8% in 2020(Loten 2018; Gartner 2021).[25]

Even while Amazon has seen its overall market share fall, there are still reasons for concern in this market. One source of concern is that Amazon is one of the only companies that has been approved by the United States government to store classified information on the cloud (Mann and Mullins 2018). Due to this fact, there have even been examples of government contracts with no competitors to Amazon due to the lack of required approval. Moreover, the governmental approval signals to other agencies and companies that Amazon might have more secure cloud services than any of its competitors. Governments, therefore, may be growing dependent on AWS similar to companies. However, unlike companies, due to the bureaucratic nature of government contracts and the high upfront costs of approvals and proposals, government agencies may have a harder time switching web service providers. A basic institutional economic understanding can help to elucidate this reasoning. Using the institutionalist idea of "transaction costs," one can see how the long time frames for approval (i.e., opportunity costs) and bureaucratic hoops associated with government projects increase the cost of receiving these contracts. In concert with the economies of scale in cloud computing,[26] these transaction costs make it nearly impossible for smaller companies to compete with Amazon for government contracts (when they are approved to, that is).

Another worrisome aspect of these military and government contracts is the potential for

services" (Canalys 2021; Gartner 2021). Although these seem like seemingly minor distinctions, it can have major impacts on the determination of market size. For example, Canalys (2021) finds a "record of $49.4 billion" spent on cloud services in Q3 2021, while Gartner (2021) found that the IaaS market had $64.3 billion spent in 2020, showing an obvious contradiction if the markets investigated are the same. This also has major impacts on the market share values, with Canalys (2021) finding AWS had 31% of the market in 2020, while Gartner (2021) found that AWS had 40.8%.

25. These values, as mentioned in the previous footnote, are dependent on the definition of the market. Since this definition is difficult and these values come from different sources, it is hard to know if the market definition is similar. Thus it may be that Amazon either lost market share or remained somewhat consistent.

26. These economies of scale come from the fact that expanding cloud services requires expanding data centers. After those data centers are online, expanding user base has minimal to no marginal cost until the data center is at maximum capacity.

monopsony power from the government. For example, the government may tell companies that they are only qualified suppliers if they do not allow certain behaviors on their platforms. With the major amounts of revenue that government contracts can bring in, major conflicts of interest can arise. One example is when Amazon revoked Wikileaks' access to AWS after pressure from the American government (Wasserman 2012). This offers a reverse rendition of George Stigler's idea of "regulatory capture," whereby regulators adopt the priorities of the regulated companies. Now the government can develop a form of "regulatory outsourcing," whereby it uses private companies to enact changes that it cannot make through the official regulatory process.

A final important point is that Amazon's immersion into the smart speaker world has given it intimate access to user data, even that which users did not actively seek to make available to Amazon. Since a major part of the attractiveness of smart speakers is their ability to respond to a certain phrase like "Alexa" or "Ok, Google", these speakers must always be passively listening so that they can respond when acknowledged. Although Amazon has claimed that it does not retain the information that Alexa smart speakers may hear, there have been multiple lawsuits arguing that they are doing just that. These lawsuits have focused especially on the potential that Amazon is generating data on users under the age of thirteen (Morris 2019a).[27] Amazon has been accused of compiling this information without offering parents or users the ability to completely delete it. It has also been accused of allowing third-party app developers to have limited privacy policies, allowing Amazon's smart speakers to be used by third parties to generate information on users without their knowledge.

3.4 Apple

Compared to the other companies mentioned, Apple tends to generate less antitrust discussions, seemingly because Apple has not engaged in the buying out of competitors that

27. This focus is due to the Children's Online Privacy Protection Rule (COPPR) of 1998. This is also the rule that has made most of these companies restrict usage for users under thirteen.

Facebook and Google are well known to do. Moreover, Apple has not engaged in aggressive price cutting to generate market share such as Amazon does. Thus, it may appear that including Apple in this analysis is unnecessary and unwarranted, as it does not have the same obvious anti-competitive actions or extreme market share as other firms mentioned prior. However, since this analysis seeks to show how the typical determinants of market concentration, power, and influence lack the nuance necessary to generate a complete analysis, I will include Apple as a final example to show how these measurements are inadequate to fully comprehend the latent power.

One example of Apple's market power is that of its immense power over its App Store. Due to the "closed" nature of Apple's mobile operating system, all apps that users can download must be downloaded from the App Store, which requires developers to get approval from Apple. The closed nature of its system has allowed Apple to take large commissions on all transactions, reaching up to 30% in recent years (United States House of Representatives 2020). As recent legal battles from developer Epic Games have shown, Apple leverages its market dominance to reap concessions out of vendors who are desperate to reach nearly half of all mobile phone users.

Beyond just being a "closed" operating system, Apple also withholds the ability of any other phone producers to use its iOS mobile environment. This restriction protects Apple's user base by erecting large switching costs associated with leaving the iOS environment. These costs include the time associated with transferring contacts and applications to a new operating system, the time required to learn a new operating system's intricacies, and the financial burden of paying for certain apps again on a new operating system. Google, in contrast, specifically designed the Android operating system to be available to any phone provider and be "unlocked". Although on the surface Android operating systems dominate the iOS environment due to their superior "unlocked" characteristics, vast array of phone producers who use the operating system, and the built-in integration with Google, Apple does have a major factor in its favor: social norms.

Apple has benefited from the social status it generated from being the first major company to produce a "smartphone" when the iPhone was released in 2007. Apple has further protected this status by subtly adding ways to disincentivize users from using other operating systems. One example is the use of green text bubbles for messages to Android phones. This decision was a deliberate one made by Apple marketing executives, as evidenced by Tim Higgins (2022) of the *Wall Street Journal*. Higgins shows that internal documents released in the wake of the Epic Games lawsuit detail how Apple executives actively sought to use this subtle tactic to push users away from Android operating systems. As time has shown, this action has led to young users criticizing others for having "green text bubbles" (Higgins 2022). Since young users engage with their phones a high rates (with 39% admitting they felt addicted), this ability of Apple to generate social norms for young users to stay away from using Android phones can generate lock-in effects that remain for years to come (Morris 2019b). Moreover, the power of this social norm is visible as although Apple has only around 30% of the total market share of phones sold, it has over 90% of the profits (Mickle 2017). To an institutionalist, this is a textbook example of what Veblen described as "conspicuous consumption," that is, where consumers choose a product because of the social status associated with owning it. Since Apple has generated such a powerful brand name around its products, especially the phones, it has powerful lock-in effects under which users will buy these product even if other options are better, due to the associated benefit from social status gained (or rather the forgoing of losing social status).

Apple not only has large amounts of social status and power, it also has extensive economic power. One of the most prominent forms of this power is the extreme levels of cash that Apple has held at times (reaching nearly $250 billion in 2017). In comparison, this cash amount is twice as large as the United States had in foreign reserves at the same time (Mickle 2017).[28] Holding such a large quantity of cash gives Apple an enormous potential to sway both economic and political climates, as this cash can be used to buy out competitors

28. In recent years Apple's cash amounts have decreased to $195.57 billion as of 2020, an amount still more than the US at the same time (Bursztynsky 2021).

or fund lobbying efforts. Moreover, even the seemingly extreme fines levied on Google by the European Union's antitrust enforcement agency ($10 billion total) pale in comparison to this cash pile. Therefore, this cash hoard not only protects Apple from the fear of fines (such as the ones it may have to pay in the lawsuit with Epic Games) having major impacts on its profit capabilities, but also causes regulators to question whether fines are feasible options to influence how Apple behaves in the market.

More recently, Apple has been embroiled in controversy with the major music streaming service Spotify. The EU competition authority ruled in favor of Spotify in 2021, stating that Apple was abusing its market power in the App Store. Similar to the Epic Games case, which revolved around the 30% commissions that Apple takes from in-app purchases and sales of all products approved on its App Store, Spotify argued that Apple abused its power by forcing developers to use its own in-app purchasing methods and preventing those developers from pointing consumers to other options (Reuters and Chee 2021). This action forced companies to submit to Apple's commission scheme, further increasing Apple's power. *Reuters* reports that the potential punishment is a maximum of $27 billion (or 13.8% of Apple's 2020 cash reserves) while the true number is likely to be lower (Chee 2022). Although it is true this is not a negligible portion of Apple's cash reserves, it nonetheless is not an amount that will likely change its behavior. Instead, these fines are now seen as the cost of doing business.

As of May 2022, Apple has also had charges taken against it regarding mobile pay technology. The EU argues that Apple abused its ownership of the App Store and the closed nature of its iOS environment to restrict access to necessary software and hardware in the iPhone and Apple Watch. This action unfairly increased the relative benefit of Apple Pay (Apple's mobile payment system) while forcing competitors like PayPal to have limited functionality on Apple products (Satariano 2022). By limiting the functionality of competitors, Apple pushed users to use its system, and since Apple receives transaction fees from this product, also pushed more revenue and economic power into its hands.

3.5 Summary of Section

- Meta has grown to be a ubiquitous piece of the internet. Much of this growth is due to the large advertising revenue it generates. As advertising on Meta-owned sites such as Facebook offers firms access to a large number of potential customers, Meta has an inelastic demand for its advertising space. Combined with the large switching costs associated with leaving a major social network, Meta's market power may only be threatened by society-wide change in preferences.

- Google has an extreme amount of market share in the search engine market. Since this market is how many access information in today's world, this share translates into large advertising revenues as well as power over what information is deemed acceptable. By influencing information shown to consumers, Google can influence what consumers choose to purchase.

- Amazon has a unique position in the history of markets, as it owns a marketplace which it competes on. This sort of power over a market is one that economics has never had to understand in the past. Furthermore, through the growth of AWS, Amazon has increased the dependence of other companies, and even countries, on its products. This creates a captive market for consistent revenue.

- Although Apple has the least antitrust discourse in the literature, it nonetheless has potential reasons for action. Beyond being the largest company by market capitalization in the world, Apple abuses its position as the owner of the App Store to extract additional revenue from developers. Moreover, the extreme levels of cash held by Apple raises questions as to the efficacy of antitrust agencies using fines to punish anti-competitive behavior.

4 Review of Mainstream Analyses

The advent of the internet caused many economists at the end of the 20th century to begin investigating how this new technology would impact economies. One of the main arguments that first arose was that the vast amounts of information available on the internet would make economic assumptions that may have previously rested on shaky ground, sturdier. It was argued the expansion of information at the fingertips of consumers would make the assumption of perfect information more reasonable. Moreover, the lowered transaction costs and search costs would make markets behave as they were theoretically expected to, without deviations caused by transaction costs (Wiseman 2000). Among industrial organizational theorists there arose those who focused on network economics, which sought to understand how the rise of the internet would impact market dynamics.

4.1 Network Externalities

As Shy (2011) puts it, network economics studies the impact of so-called "network effects" on markets, in particular, how consumer utility and/or firm profits can be impacted by the size of the user base using a certain technology. Network effects on the demand side exist when greater user base size increases or decreases utility for an individual user (e.g., social media sites see positive network effects because greater user base means greater probability of finding friends, news, stores to interact with, etc.). On the other hand, they can also exist on the supply side, such as when the number of firms using a certain technology impacts the profits of each firm (e.g., firms deciding whether to make their software compatible with a competitor's).[29] It is important to recognize that network effects are not unique to digital markets, but they have grown to new levels in these markets. For example, a brick-and-mortar store has network effects from having more individuals in the store. At first it is a positive network effect as the crowd can signal to other potential consumers that the store is

29. This example will be explained in depth later in this section.

popular, but as the size of the "user base" grows a negative network effect develops due to overall congestion in the store. However, online stores do not have this same issue of network effects inflecting after a certain point.

4.2 Zero Prices

A major issue that arose early in the economic analysis of the impact of the internet was how to handle miniscule (or potentially zero) marginal costs associated with products in these markets. As a study that initially focused on material products, which require time, energy, and effort to produce, economics was not initially well suited for understanding these issues. For example, as Shy (2001) shows, it may be that the profit maximization condition (i.e., marginal cost equal to marginal revenue) results in negative profits in markets with high upfront costs and low marginal costs. Furthermore, these low marginal costs are not associated with any loss of information or value.[30] Beyond the potential issues associated with low (or zero) marginal costs, zero prices lead to difficulties for economic analysis. In standard economic analysis, prices are seen as encapsulating all the relevant information and consumers determine consumption based on prices (an objective measure) and quality (a subjective measure). However, when prices are zero, consumers are unable to compare products through an objective measure like prices and must rely on subjective measures such as quality. If consumers are unable to compare products easily they will be less likely to switch from the incumbent firm in a market to a potential competitor (Lancieri and Sakowski 2021).

Although I have not found many explicit descriptions of the impact of zero prices in relation to digital markets, behavioral economics has developed nuanced ideas of how individuals interact with zero prices in other markets. The interesting behaviors seen with zero prices

30. Shy (2001) gives the example of photocopies compared to digital copy creation. Photocopies, although low marginal cost, are associated with quality loss (and eventually lose all value after successive photocopies are photocopied). On the other hand, digital copies can be copied an infinite number of times without seeing any data loss (assuming no corruption in file transfer, no software which blocks copying, etc.).

has caused some to term them "special" (Shampanier, Mazar, and Ariely 2007).[31] Shampanier, Mazar, and Ariely (2007) argue that zero price likely has a special property because consumers that see a zero-price correlate it with no cost, and thus might have a positive affective response to that price (i.e., they feel an emotional gain from this "free" good). If consumers use this response in their determination of consumption behavior, this could help to describe why zero prices see such a large increase in consumption. A similar description could describe the seemingly "sticky" nature of zero prices.[32] Although Shampanier et al. focus on the decrease of prices, their data imply that inverting the direction of price change (i.e., increasing prices from free to small positive) would have the effect of greatly decreasing consumption. This increase in price above zero would lead to users decreasing consumption much more than would be expected if zero was non-special. Thus, the specialness of zero can explain why there are few examples of digital platforms that charge even small positive prices in markets with consistently zero prices (e.g., social media and search results). Even if a platform did charge a small positive price, the above argument shows why this platform will likely have difficulty competing with zero price platforms.

Zero prices also raise questions as to what market power entails in these markets. Usually, market power is seen as the ability for a firm to charge higher than optimal prices, but when prices are zero (and remain zero as we see even in highly concentrated markets such as search engines) this causes issues for mainstream economic theory. Zero prices cause issues in the application of econometric methods to determine relevant markets, especially the two main econometric methods for determining relevant markets: the hypothetical monopolist test (HMT) and small significant non-transitory increase in price (SSNIP) test. The SSNIP test assesses the substitutability of certain products, while the HMT is a thought experiment to determine whether a market is defined too broadly, which is then operationalized through the SSNIP test.[33]

31. At the other extreme end, some have argued that a lack of a price necessitates a lack of a market, since there must be no commercial relationship at play (see Calvano and Polo 2021).

32. That is to say that once prices have reached zero, it is difficult to return to a positive price.

33. For the HMT, if a hypothetical perfect monopolist could not exert market power on the market under

Recently Gans (2022) has developed a model that explains the use of zero prices. Gans argues that since a large of portion of consumers in any market will derive zero utility from a good, zero acts as an anchor for the resulting prices. Through assuming consumers have "free disposal," that is, they can freely stop using a product, he shows that zero price can be a welfare maximizing outcome. Gans admits that he uses the assumption of rational agents in his paper, while also contrasting his work with that of Shampanier, Mazar, and Ariely (2007), saying that their study focused on physical goods and thus might not be generalizable. Gans's model also finds that negative prices may be welfare reducing due to the associated overproduction of goods. Gans thus comes to a conclusion that goes against accepted antitrust economics: with zero prices "competition (and lower pricing) may not improve welfare" (Gans 2022, 175).

4.3 Two-Sided Markets

Before delving deeper into the approaches of mainstream economists, it will be helpful to detail what definition of digital markets mainstream economists use.[34] As Lancieri and Sakowski (2021) define them in their review of economic approaches to digital market competition, these markets are ones where the "[digital] companies can be generally understood as intermediaries that connect two or more groups of users and, in doing so, benefit from *direct and indirect network effects* [italics in original]." This intermediary position leads to the creation of multi-sided markets (Lancieri and Sakowski 2021; Krämer and Wohlfarth 2018; Calvano and Polo 2021; Shy 2011). Multi-sided markets can thus help to explain why production of digital products continue, even when the profit maximization condition could yield net losses. Although firms may be losing money on one side of the market, they may be more than making up for it on the other side.

question, then the market is defined too broadly. One can see that this implicitly assumes a price setting power, which causes issues when prices are zero. It is true that this test could be performed where market power includes the power to set quantity or quality (which would still be a subjective measure making econometric analysis difficult), but since the operationalization relies on prices, I focus on this issue.

34. For the sake of simplicity, I will use the same definition, so my critique of these approaches focuses more so on the approach itself rather than pedantic market definitions.

The most prevalent form of these multi-sided markets in this analysis is where one side is users of the service, and the other side is firms seeking to advertise to those users. A main distinction between multi-sided markets[35] and unidimensional markets is that while unidimensional markets only have a price level (assuming no price discrimination), multi-sided markets have both a total price level (across all sides) as well as a price structure (i.e., how that price level is distributed over the sides). Thus, even though some digital products (e.g., search and (most) social media) are provided free of charge to the user, that does not imply that the provider did not profit from the relationship. Indeed, one can easily imagine how companies which supply two-sided markets with advertising could end up supplying one side's product free of charge or even with a subsidy attached (i.e., a negative price) while seeing the same overall price level. A telling example is the testimony Mark Zuckerberg (Meta's CEO) gave to the United States Senate in 2018, in which Senator Orrin Hatch asks how Facebook could make money if it was a free service, to which Zuckerberg responded "Senator, we sell ads".

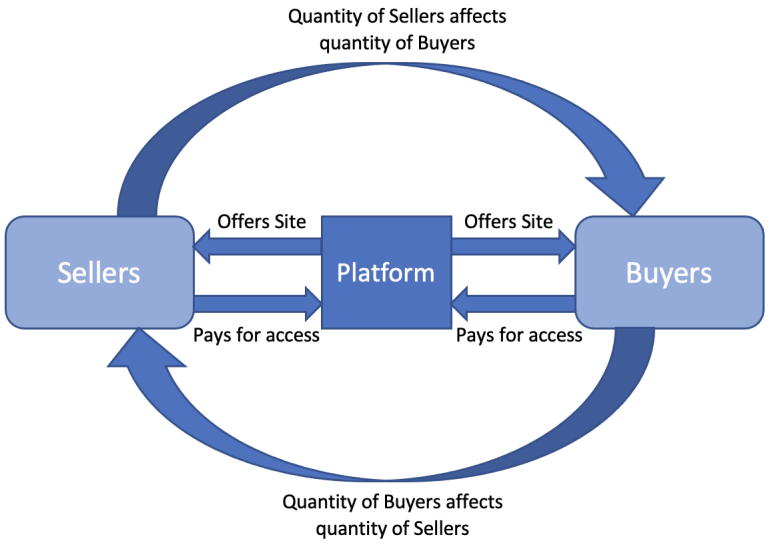


Figure 3: Depiction of a Simple Two-Sided Market

Jean-Charles Rochet and Jean Tirole (2003) argue that monopolistic firms interacting

35. For the remainder of the thesis, many analyses will entail two-sided markets, but it is hypothetically possible to expand these to higher dimensional markets, though mathematically difficult.

with a two-sided market will seek to "get both sides on board." A brief example of a previous two-sided market will help to illuminate the nature of these markets (see Figure 3 for a depiction of a simple two-sided market). Such an example is credit cards. Credit card companies (e.g., Visa and Mastercard) cannot focus too heavily on one side of the market compared to the other. They see that the greater the user base using the credit card, the more attractive it is to sellers to accept it as payment, while simultaneously, the more sellers that accept the card as payment, the more attractive it is to potential users. This interconnected aspect of the market means that actions that may appear to have limited impact on consumer welfare (such as credit card company charging firms fees) can indirectly impact consumers.

Taking Google and Meta as examples, both seek to make their product (search results and social media, respectively) as attractive to their users as possible to maximize the valuation of their site to advertisers. Incorporating the data that these platforms generate would make many of the users what Rochet and Tirole term "marquee buyers" of the advertising product. Rochet and Tirole describe a marquee buyer as a buyer which gives a seller a large surplus. Put another way, these marquee buyers are those which increase sellers demand for the platform, allowing platforms to increase seller price. One could argue that "buyers" in these markets (i.e., users of the platform) are not only marquee buyers, but also what Rochet and Tirole describe as "captive buyers" due to the lock-in effects mentioned above. Although true that they are captive in some sense, Rochet and Tirole were focused on the demand impact, and the advertising benefit to firms increases their demand. Thus, even though these users may in some sense be "captive," they nonetheless are generating large surpluses for the sellers unlike the captive buyers Rochet and Tirole describe, which would result in lower prices for sellers. As they show, when a monopolist in control of a two-sided market has marquee buyers, the sellers will see an increased price and in turn the buyers will see a decreased price (in our example, zero price).[36]

36. An interesting result that arises here with respect to zero prices is what happens when buyers become progressively more "marquee," even after prices have reached zero. This theory would imply that an optimal

However, unlike credit cards, which have complimentary demands on both sides, digital markets may see conflicting consumption preferences across sides. As shown above, advertisers value the potential advertisements on a platform more when that platform has more users, like how sellers value accepting a certain credit card more when more buyers use that card, all else equal. However, users of digital markets (such as social media or search engines) gain negative utility with greater permeation of advertisers.[37] This leads to these platforms having conflicting demands. As more users join the platform, more advertisers want to advertise on the platform. Then, as more advertisers are on the platform, this leads to some users leaving the platform, causing less advertisers to want to advertise. With less advertisers on the platform, this might incentivize users to rejoin the platform, repeating the process, ad infinitum.[38]

More recent expansions in the industrial organization literature regarding two-sided markets have led to some interesting results. Bolt and Tieman (2008) expand on work by Armstrong (2006) to show that under constant elasticities of demand on both sides of the market, highly skewed pricing is profit maximizing. In particular, the highly elastic nature of buyer demand (in our earlier example the demand of users of the platform) is used to generate demand from sellers by offering buyers extremely low prices.[39] Behavioral economists have recently sought to incorporate ideas such as the reference effect to argue that the reference price on one side can influence the price charged on the other (Li and Zhang 2020). Through this process, Li and Zhang add nuance to the results of Rochet and Tirole (2003). Arm-

policy for a profit-maximizing monopolist with a large network effect is to offer a subsidy to the buyers, while increasing the price on the sellers. An analysis of this will be taken up in the next section.

37. Calvano and Polo (2021) argue that advertising should be seen as the shadow price of the use of the platform. Others argue that the advertising is informative and thus gives users more information. This seems to rest on the unreasonable assumption that all advertising is truthful, or at least users can always glean the truth of advertising.

38. For the sake of this example, let us ignore the potential that users have switching costs. As described above, switching costs could lock-in users to these platforms so that even the rise in advertisers would not decrease user base.

39. Importantly, Bolt and Tieman specifically report that their model does not support a zero price, but Armstrong's model allows for zero and negative prices. However, Armstrong does not mathematically prove the profit maximizing nature can be found from highly skewed prices (though it can be implied from his work).

strong's (2006) work also points out how the equilibrium price structure and level depend on the size of the externalities that interact across the sides of the market and whether individuals use many sites, or only one.

The impact of individuals using many different sites has been extensively researched, often under the term "multihoming". Many experts view multihoming[40] as a potential constraint on the anti-competitive nature of network effects, as it can limit the complete monopolization of a consumer base (Lancieri and Sakowski 2021). With respect to benefits, early authors often argued that users who could multi-home (due to "compatibility") would have lower welfare, due to incentives to charge lower prices facing firms which produce incompatible products (Shy 2001, 2011). Oz Shy argues this incentive arises because of the switching costs associated with incompatible products. If firms are to incentivize users to abandon a competitor's product and accrue the associated switching costs, they must lower their prices, in a sense subsidizing the costs that users face in switching.[41] Thus there will exist higher prices for the side which can multihome in comparison. Armstrong (2006) develops a model where multihoming exists on one side of the market, while the other side singlehomes.[42] In this situation, he shows that the side that multi-homes will have its interests ignored, with the single-home side and producer's surplus being maximized. However, recent research has raised criticisms regarding the universality of Armstrong's claim. Belleflamme and Peitz (2019) argue that in certain situations it may not be the case that the side that engages in multihoming will necessarily see a lower welfare. Generally, they argue that there exist situations where platforms can achieve their desire to have the seller side single home universally, partially, or never.[43] Moreover, they show that there exist

40. In the earlier credit card example, "multihoming" would be comparable to using more than one credit card.

41. It can be seen how this theoretical understanding ignores the potential for social status associated with certain brands.

42. A representative example is how consumers typically single home into computer operating systems (i.e., Apple OS or Windows), while app developers instead multi-home to access the maximum number of users.

43. Some authors have called this "Schumpeterian competition" or "competition for the market", in contrast to "competition in the market" (Calvano and Polo 2021; Katz 2021). This process could also be seen as a version of product differentiation, since if products are differentiated enough it may be nearly impossible to truly multi-home due to vastly different functionalities. This differentiation can be seen in social media, as

cases where both sides and the platform see gains in surplus when sellers multihome. They also develop two related propositions that relate closely to an antitrust authority seeking to maximize consumer welfare: i) forcing singlehoming on sellers who would prefer to multihome leads to an ambiguous impact on seller surplus, but certainly a decrease in surplus to the buyers and ii) if buyers see lower welfare through seller multihoming, then sellers and the platform certainly see benefits.

4.4 How Do Network Effects Impact Digital Markets?

With the expansion of the internet to ever more markets, economists began to see that networks effects were having major impacts on these new digital marketplaces. The seminal paper that introduced the ideas of network externalities to economics was Katz and Shapiro (1985). Although before the rise of the digital markets investigated in this thesis, Katz and Shapiro detail how there can be positive consumption externalities in certain markets. These externalities are especially prevalent when the quality of a good, service, or platform is dependent on how large the network is already.[44] As digital markets have proved to be especially prone to network effects, economists have begun to expand on Katz and Shapiro's early work. Alan Wiseman (2000) argues that this updating of economic theory was needed because, unlike before, digital markets do not experience the same constraint on network effects that congestion effects had on earlier networks like telecommunications. He also explains that for networks to be "viable" they must have large enough initial population. In Katz and Shapiro's original formulation, this would be a signal influencing the consumer's rational expectation of the future market size. Wiseman argues this necessity of initial population can help to explain two aspects of digital markets with network effects: i) that entrants into these markets tend to enter with low prices that may be increased over time,[45]

each site has its own functionalities, with limited comparable features across sites. This means that it may be nearly impossible to truly multihome in social media.

44. This includes maintenance of a good, such as service on a car. The quality and options for car service professionals depends on how prevalent a make and model of car is.

45. Wiseman ignores the zero prices under investigation here likely because the prevalence of these was limited at the time of his writing

and ii) that the success of a firm is highly dependent on the expectations around its success that its potential users have.

Katz and Shapiro (1985) also introduced a formal explanation of the incentives regarding compatibility of products, which has been further developed since their initial paper. Consumers prefer compatibility of products so that they can lower their costs and still receive the same utility. On the other hand, producers prefer to produce only incompatible products since this would allow them to have greater product differentiation and thus less competition, as well as lower production costs (Shy 2001).[46] Although seemingly inconsequential, Shy (2001) argues that consumers are actually worse off when firms sell compatible machines, even though the consumers prefer compatibility because the impact of network size is mitigated[47] when firms universally sell compatible products. Since firms no longer need to offer lower prices to accommodate the switching costs associated with transferring between incompatible systems, the equilibrium prices will be higher in compatibility than in incompatibility.[48] Although firms will charge higher prices when they produce compatible products and thus lower the welfare of consumers, theoretical formulations have shown that total social surplus will still increase due to the much greater welfare increase for suppliers (Shy 2001, 2011).

The relationship between social surplus and consumer surplus in these markets, as well as the competitive impacts of network effects, cause issues for antitrust agencies acting to maximize consumer welfare and preserve competition.[49] According to the theoretical developments in Shy (2001), preserving competition and maximizing consumer welfare may be

46. This explanation by Shy may be one of the weaker he offers, as for contemporary firms it may be that incompatibility involves greater costs, since they must develop an associated operating system, like in the case of computers or smart phones, or the like. A further analysis will be done in the next section.

47. This is because the network effects impact all firms equally in this example. Thus, there is no impact on pricing that includes this factor.

48. Shy (2001, 18–31) gives a detailed proof of this result. In short, if α is a parameter that determines the added utility to users from compatibility and η is the number of users of a platform, then prices in compatibility are $2\alpha\eta$ greater than they are in incompatibility. This value becomes significant as η increases even for limited impacts of compatibility on user utility.

49. Note in many instances preserving competition will maximize aggregate social welfare, through either innovation, lower prices, higher quality, or many other potential benefits. Nonetheless, it is not necessarily true that the action which maximizes aggregate social welfare, simultaneously maximizes consumer welfare.

mutually exclusive in some situations. Since he shows that large market shares incentivize incompatibility (which increases consumer surplus, but lowers social surplus), in some instances, antitrust authorities must determine what directive is more important. Evidence seems to show most authorities determine that consumer welfare is the more important of these two, or at least behave that way (Neven and Röller 2005).[50] Thus, antitrust agencies may maximize consumer welfare by allowing monopolization, or at least having a lax merger policy. This could lead to more innovation in these markets if the probability of profit is low for entrants (thus leading to low expected profits) or increase competition if potential mergers incentivize entrepreneurs to innovate (Motta and Peitz 2020; Katz 2021). Thus, some economists have argued in favor of lax merger policy to increase innovation in these markets, which may then lead to future competition since network effects have pro-competitive effects (Calvano and Polo 2021).[51]

On the other hand, other economists argue that merger policy in digital markets has been too lax. One of the major theoretical developments on the anti-competitive impacts of network effects in digital markets is the idea of a "kill zone" in the development of companies. As Kamepalli, Rajan, and Zingales (2021, 2) describe it, a kill zone arises because "platforms might acquire any potential competitors, dissuading others from entering, and thus preventing innovation from serving as the competitive threat that is traditionally believed to keep monopoly incumbents on their toes". These kill zones can also arise through the switching costs that users face. Users who face switching costs may wait for new technology to become broadly integrated (i.e., have a large network). This consumer hesitation can, in turn, make new entrants undervalued by the market and allow incumbents to cheaply buy out this potential competition. Moreover, these buyouts by incumbents disincentivize future

50. Crandall and Winston (2003), however, argue there is no empirical evidence that antitrust actions have increased consumer welfare.

51. These pro-competitive effects arise from a similar process as the anti-competitive ones. Just as network effects mean that when network size increases utility increases, if an entrant can incentivize some users to defect to their platform, they can simultaneously increase the value of their network and decrease the value of the incumbent's. This exodus can then cause a chain reaction if users have heterogeneous utility functions where the entrant now produces greater utility than the incumbent for some of the incumbent's users, allowing for quick growth of the entrant and a loss of user base for the incumbent.

investment in entrants in that market by venture capitalists, as the evidence of market deals show (Kamepalli, Rajan, and Zingales 2021). Thus, decreasing mergers (or buyouts[52]) can be a way to incentivize investment by venture capitalists to generate innovations and grow competition in the market.

Some economists have raised concerns about how the extremely rapid rates of innovation and technological change may cause mergers that seem benign to have major anti-competitive effects. In a response to Crandall and Jackson (2011), Timothy Brennan (2011) argues that technology change in digital markets may necessitate strict merger policy to limit the potential anti-competitive nature of early acquisition. With more resources, incumbents can more easily enact mergers with new entrants who have promising (or put another way, threatening) technology. These mergers can be anti-competitive if much of the innovation in the market will be engulfed by the incumbent. Calvano and Polo (2021) show that the incumbent would take over these new developments as it has a greater incentive to invest in innovation due to the "efficiency effect."[53] It is important to note that for this process to be truly pro-innovation, incumbent firms must be incentivized to bring these innovations to market, otherwise this innovation will not impact consumers at all.

Beyond the lower incentive to innovate for monopolists described by Kenneth Arrow (1962), these monopolists may also have an incentive to not bring new developments to market. If these developments are brought to market by a monopolist, they may "cannibalize" the demand for the monopolist's other products. Especially in markets with network effects, the monopolist's profits may fall if they allow for this innovation (Calvano and Polo 2021). Thus, Calvano and Polo conclude that incumbent firms in digital markets will have both a greater incentive to invest in innovation and a greater incentive to not allow this innovation

52. This example shows an important issue in the antitrust literature: there is limited clarity as to what denotes a "merger" and what denotes a "buyout". For example, the FTC has "Merger Guidelines" that denote how to determine whether to allow a merger, but has no similar document for buyouts. To my knowledge, mergers tend to be seen as two relatively similarly sized firms merging, while buyouts tend to be seen more as one large firm "buying out" a smaller firm. For the sake of consistency, I will only use the term "merger" from now on, regardless of the size of the individual firms.

53. This is even more prevalent in the case of large economies of scale, such as those seen in digital markets.

to enter the market, thus lowering efficiency. This unproductive innovation can be accomplished by either merging with potential competitors or by investing heavily in R&D and using patents to increase barriers to entry in the market. Importantly, this has been shown empirically with Google, Apple, Meta, and Amazon's mergers over the past two decades (Gautier and Lamesch 2021).

However, some argue this process might be necessary. Fishman, Gandal, and Shy (1993) argue that constant innovation in a market with durable goods (such as digital markets[54]), may mean no equilibrium can be reached. This is because the benefit of switching to non-durable production is increased profits and revenue from more sales, while the costs are typically in the form of harder to measure status and reputation costs. Thus, it may be optimal for a producer to have planned obsolesce or some other constraint on the durability of the goods offered in order to guarantee innovation (Shy 2001). By extension, if the society seeks continual innovation, and production of durable goods can stifle innovation due to limited potential profits, there would be reason for social support of planned obsolescence.

Katz (2021) also details a potential threat that this preference for merging can have on the innovation of the market, which is shown in the following example. Let us assume there is a subset of users of a platform that would prefer to use another platform due to some perceived negative aspect of the incumbent (such as Facebook's potential censorship or Google's data collection). These users are the ones most likely to leave the incumbent platform for a new entrant. As detailed above, this initial transfer of users from one platform to another will increase the expected utility of the new entrant, while decreasing the utility of the incumbent. However, if mergers are extremely common (as we see in digital markets today) or if much innovation is done for the sake of merging into a bigger company later, these activist users may be discouraged from transferring. Put another way, if these users expect

54. I believe it is fair to label most digital products as durable goods. Google and Facebook offer durable products since users gain utility over time from these products rather than in one use. If one focuses on the fact that Amazon mainly offers the marketplace for sales and the cloud computing platforms it has with AWS, it too offers durable goods. Lastly, Apple offers durable goods both in hardware (iPhone, iPad, Mac, etc.) and software (MacOS and iOS).

that a new platform will eventually be merged with the incumbent, they may see much less utility in this potential move. If the expected utility gain is lower than the switching costs associated with leaving the incumbent, they may decide to remain with the incumbent, even if they would prefer otherwise.

As companies in digital markets have grown more powerful, they have also begun to bundle their products. One such example is Google's behavior with its OEMs (original equipment manufacturer). Google supplies its Android mobile OS for free to OEMs under some strict conditions: Google Search must be the default search engine and a suite of Google apps must be preloaded (Etro and Caffarra 2017). This behavior has been viewed as both pro-competitive as well as anti-competitive, depending on the economist. As Economides (1996) shows, if the network effect is sufficiently large in a Cournot quantity game, incumbents will invite entry and license their product at little to no cost,[55] thus increasing competition. However, this does not consider the nature of firms competing *for* the market. Namely, if firms are competing for the market, it may be in the firm's best interest to initially actively incentivize competition to expand the market, only to later abuse their incumbent power.[56] It is also possible that Google recognized the large network effects of their Android OS and instead of taking the risk of competing with entrants in smartphone production, opted to use this product to further entrench its market power in another market (i.e., search). This decision may also protect Google from antitrust action (or at least extensively delay it) through the market complexities (Etro and Caffarra 2017).

The above examples illuminate an important complexity for antitrust action in digital markets: cutting edge economic theory can support vastly different antitrust policies. It can support active merger control to limit the impact of a "kill zone" and support innovation by increasing the likelihood that new technologies are brought to market by entrants. At the

55. He argues that it is even possible the incumbent will pay a subsidy to entrants!

56. If there is limited production capabilities initially, firms may license their product out to increase production and permeation, only to later abuse their power to extract surplus from other suppliers. By increasing production and permeation, these firms can develop norms around use of their product that can support future profit.

same time, economic theory can support the use of lax merger policy to increase innovation and competition if network effects are large enough. These dichotomous, yet theoretically supported, arguments further show why a detailed analysis of digital markets is necessary to understand how to properly apply the advancements of mainstream economic theory. Another layer of complexity is added by the fact that the FTC determines antitrust action based on a consumer welfare standard. As Fishman, Gandal, and Shy (1993) argue, it may be that supporting consumer welfare (say by outlawing planned obsolescence) could threaten the incentives for innovation. Thus, a law that would theoretically increase innovation, could actually *decrease* it.

4.5 How Does Commodified Data Impact Antitrust?

Just as network effects and zero prices cause issues for antitrust action, so does the data that companies in digital markets collect on their users. These data is often used to offer advertisers the ability to target specific demographic groups in their campaigns, but can also be used to generate economies of scope. Using data to allow easier entry into new markets is particularly difficult for antitrust authorities to grapple with. On the one hand, allowing firms to have this data to enter new markets could be efficient, as firms could be expanding to market segments that are underdeveloped. On the other hand, due to the nature of digital markets, firms with dominant market positions in one market can generate more data than those who lack a dominant position. With these data, dominant firms can more easily enter, and restructure their whole business model to, a new market.[57] This complicates the antitrust agency's role since they have self-imposed rules that require determinations of "relevant markets." However, with economies of scope these "relevant markets" can be constantly changing, complicating, if not eliminating, the ability to define them, a particularly pressing issue when one considers the length of antitrust action(Krämer

57. As mentioned above, Amazon began as an online bookstore, but Jeff Bezos specifically chose this market to capitalize on the economies of scope it could offer. With these economies of scope in place, Amazon has now expanded to be a more general online marketplace, as well as a cloud computing supplier, smart home electronics producer, and more.

and Wohlfarth 2018).

For example, the FTC took around 12 years (1998-2010) to act on Intel regarding anti-competitive behavior in the market for microprocessors.[58] In that same 12-year period, Amazon went from being solely an online bookstore in 1998,[59] to, by 2010, being the predominant cloud computing supplier,[60] ebook hardware (i.e., the Kindle) and software supplier, and the main internet marketplace. If the FTC were attempting to act on Amazon in 1998 and took a similar length of time as its process on Intel, any analysis of the market in 1998 would be useless by 2010. Even if the FTC could prove anti-competitive actions by Amazon in online bookselling, this market would be a minor portion of Amazon's current product sphere. Thus, any action on Amazon's online bookselling would be overly specific. On the other hand, if the FTC tried to use the evidence from 1998's focus on online bookselling to argue for action against Amazon's entire online marketplace, Amazon would likely rebut by criticizing the action as too broadly defining the market. Instead, they could say, the FTC should only act on the online bookselling as that was the "relevant market." Thus, it can be seen that the use of relevant markets with the existence of economies of scope causes major complexities, and limits the extent of antitrust policy.

The economies of scope associated with the data generated in digital markets, as well as the increased ability to extract consumer surplus, have also been termed anti-competitive by some economists. Some economists argue that companies with superior data, often gained from market share, can gain a "non-transient competitive advantage" (Krämer and Wohlfarth 2018, 166). This advantage arises from superior data, especially on platforms where algorithms can increase user demand and interaction. This increased interaction increases the quantity of data, and by extension, the quality of said data. This, in turn, starts a feedback loop, whereby the initial winner gains an advantage over its competitors with respect to data. Unlike in other markets, product innovation in quality may not be as productive

58. This length is calculated from the initial FTC complaint in 1998 and the eventual settlement made in 2010.

59. Amazon purchased a book publisher in 1998: its first entrance into a market outside of book selling.

60. By this time cloud computing was also their most profitable sector.

in these markets at threatening dominant firms due to the large lock-in and network effects. However, one option does exist for potential competitors: innovate in the ability to extract more data from users.

This option for competitors arises for two reasons. First, it is obvious that if competitive advantage is dependent on the quality of data a firm has, then entrants (which have limited breadth of data) would seek to increase the depth of the data they collect per user. This increase in data per user would increase the quality of the data, by the same process described above. However, the second reason this arises shows why many firms that have attempted to compete with Google, Meta, Amazon, and Apple by being focused on privacy have failed: advertisers lose heavily if they can't target ads while their competitors can (Lancieri and Sakowski 2021). Alternatively, it may be that advertisers do not materially lose, but that there is a socially accepted idea that targeted advertising has benefits. This would then mean that even though advertisers may not lose from a lack of targeted ads, they believe they are losing, which nonetheless influences their behaviors.[61] These advertisers will have less efficient advertising campaigns, or at least believe they will, if they do not use targeted advertising.[62] Thus, a profit-maximizing firm seeking to maximize expected utility for the lowest cost will choose the platforms which have the most data on their users, allowing for the most targeting of advertisements. This not only increases the market power of these platforms, but can also lead to a trend towards greater data collection, barring any change to institutions.

This market trend toward more extensive data extraction raises antitrust concerns. Krämer and Wohlfarth (2018) argue that since many digital markets might be considered contestable and a robust definition for relevant markets is near impossible, market power should not be understood through market share, but rather, through quality of data. How-

61. See Liu-Thompkins (2019) for a review of the effectiveness of digital advertising. In short, there appears to be a positive effect from targeted digital advertising, but the magnitude is unknown.

62. Exceptions may exist for this. For example, a VPN (Virtual Private Network) or encryption software company, which can assume that users privacy focused platform will value its product, may advertise more on these platforms than others. Nonetheless, this is a minor sub-group of companies advertising online.

ever, two problems arise for the antitrust agency here: how do they access the proprietary data that these firms have in a fair way and how do they determine the quality of this data? These questions are currently not only unanswered in the literature, but rarely, if ever, posed even in rhetorical form. Furthermore, antitrust agencies must determine whether this data collection is a threat to consumer welfare. They must determine whether users view privacy as a beneficial aspect of a platform (and, by extension, lack of privacy a threat to their welfare). This gives rise to what Krämer and Wohlfarth (2018) term the "privacy paradox", where many users claim to greatly prefer privacy and view lack of privacy as a major threat to their welfare, yet their actions directly contradict this. The privacy paradox heavily relies on the mainstream assumption that users have full information and ignores the potential for the impact of lock-in effects and/or switching costs. When this assumption is relaxed, it is no longer necessarily a paradox since users could be unaware of the privacy risk, or unable to change for other structural issues. Interestingly, Lancieri and Sakowski (2021) show that there exists limited evidence of competition in digital markets around privacy concerns, raising concerns about whether increasing competition would support innovation of privacy policies.

Another important aspect of consumer preferences regarding privacy is that unlike most products, an individual's privacy is dependent on the privacy decisions of those around them. As Acquisti, Brandimarte, and Loewenstein (2015) point out, "sharing personal information with others makes them 'co-owners' of that information and, as such, responsible for its protection." Beyond the moral role of individuals to protect the information they have received, the extensive datasets controlled by major platforms allow for exceptionally accurate interpolations regarding members of a demographic group. As digital rights lawyer Lizzie O'Shea puts it "we all end up bound by decisions made by others to consent to invasive data collection practices" (O'Shea 2019, 15). Therefore, antitrust agencies are not only put in the difficult position of determining whether to follow consumers stated or shown preferences, but if they choose to protect privacy, there is no middle ground. To truly protect

privacy, an antitrust agency must make sweeping changes, the sort of which are extremely difficult and time-consuming actions.

This detailing of contemporary industrial organization theory shows how complex digital markets are. This complexity makes it difficult to use prior antitrust standards on these rapidly changing markets. Moreover, with the speed that some digital market players have grown to large sizes,[63] if antitrust agencies take years of litigation to reach a decision, these companies can continue their anti-competitive actions unchecked for years. Moreover, assuming these companies have knowledge that the agency is acting, they may actively seek to rearrange their business model using the economies of scope inherent in digital markets to further complicate any actions. Antitrust agencies have been integral parts of competition policy in major economies for nearly a century. However, they were developed well before the rise of digital markets. By relying on outdated standards, they are limiting their ability to achieve their goals in the modern economy, or worse, acting in ways that contradict their standard.

4.6 Summary of Section

- Most mainstream analyses of market power require an understanding of relevant markets. The empirical tests that are currently used for this task are unable to handle the intricacies of digital markets. They also ignore the interconnected aspects of these markets.

- Digital markets tend to be multi-sided. Multi-sided markets have theoretical outcomes that seemingly diverge from typical economic theory, such as divergent pricing structures across sides due to network effects. These pricing schemes include zero and negative prices.

- Modern economic theory does not have a consensus regarding the impact of network

63. Roughly 10 years for Google, Meta, and Amazon. Apple had a much longer growth period with peaks and valleys.

externalities on competition. Some argue that they may increase competition, while others argue that they decrease competition. This disagreement has led to vastly different proposed policy remedies.

- The commodification of data has led to economies of scope for digital companies. These economies of scope cause issues for antitrust agencies that depend on relevant markets, as a company's relevant market can be constantly changing.

5 Towards an Institutional Analysis

As has been shown, mainstream industrial organization theorists have done extensive research on the topic of digital markets. This research has led to a number of advancements in economic theory. However, as mentioned in Section 2, mainstream economic theory arbitrarily constrains its analysis by the assumptions it makes to allow for mathematical modeling. Although this simplification is necessary (and I believe an important scientific process), it nonetheless limits the questions that can be investigated. In some markets the impact of deviations from baseline assumptions may be minor and thus their exclusion may be warranted. However, digital markets have potential social impacts well beyond those that can be validly assumed away. By ignoring these impacts, mainstream analyses fail to truly analyze digital markets, instead analyzing some theoretical market in a vacuum, diminishing the applicability of the resulting analysis.

One major threat that has arisen with the rise of digital markets is the ability of major companies to influence the preferences and actions of individuals, and even other companies. As the scandal with Cambridge Analytica showed, Facebook's collection of user data can be used to influence users' political beliefs.[64] As detailed above, Google's proprietary and secret algorithm for search results can be adjusted at any time, giving it immense power to influence

64. I take no stand here about whether Cambridge Analytica's work influenced the 2016 election in substantial ways. Nonetheless, it would seem irrational for Cambridge Analytica to engage in this risky behavior without expecting it have an impact on the election's outcome.

what information is deemed acceptable, or what websites can be easily reached. Amazon's control of a major online marketplace, as well as its influence over many other companies through AWS, is yet another threat that has arisen.[65] Lastly, Apple, with a market valuation larger than the GDP of all but four countries (United States, China, Japan, and Germany), has been accused of using planned obsolescence to force users to buy newer phones when they are released,[66] as well as forcing developers to pay a 30% commission on all sales on their platform.

If economic theory can only offer policy makers options that are politically impossible to implement, economic analysis may be relegated to the academy in favor of more populist policies, with dire consequences. Thus, the following institutional analysis is my attempt to further the analysis beyond the theoretical and investigate the potential outcomes of different policy measures. Moreover, I will compare the theoretical predictions to the empirical evidence and detail potential causes for deviation. Furthermore, I will follow in the footsteps of institutional greats such as John Maurice Clark, John R. Commons, John Kenneth Galbraith, and Thorstein Veblen by offering some non-standard policy recommendations that can maximize the benefit to society at lowest cost. In general, this will be a positive analysis, investigating these markets as they are instead of as we assume they should be. This approach will allow for antitrust authorities to develop policies that can better reach the outcomes that normative economic theory advocates. However, at times this analysis will question the normative theories used by the mainstream, mainly due to their ambivalence or exemption of social aspects when determining the "best" outcome.

65. Not to mention Jeff Bezos' ownership of the *Washington Post*, one of the foremost newspapers in the world.

66. In particular, claims have been made that Apple built code into its iOS updates that would cause older generation phones to run slower and use more battery when a new generation was released. The immediate response in 2017 from Apple was to offer battery replacements at lower prices. However, as of 2021, Apple argues that it slows down old phones to protect the hardware of older phones from the newer software which is designed for the newest hardware. See https://www.techradar.com/news/apple-might-be-slowing-down-your-old-iphone-on-purpose.

5.1 Institutional Response to Mainstream Analysis

One of the first complications that arises when attempting a mainstream analysis of digital markets is the inability of mainstream theory to explain some empirical regularities in these markets. The most obvious example may be the case of the drastic price differences between Apple iPhones and Android phones.[67] On average, Android phones are cheaper than iPhones. It is not an insignificant difference either, as in 2015 the difference was $433 (Chowdhry 2015).[68] However, this directly contradicts the theory described above from Shy (2001). In that theory, Shy shows that, using mainstream assumptions, it should be the case that the compatible product is priced higher than the incompatible product. Applying Shy's theory to this example[69] would predict that Android phones would be priced higher. As mentioned before, switching costs are lower between these phones and thus producers do not need to subsidize these costs through lower prices. Yet as anyone who has researched buying a smartphone knows, Android phones have a reputation for being lower priced and affordable, while Apple iPhones are higher priced.

An institutionalist understanding can illuminate a few major aspects of this market that Shy ignores, which can help explain this anomaly. One of them is that Apple has developed a reputation for having high quality and valuable products, which implicitly biases users towards Apple. Therefore, due to the large option set consumers face for mobile phones, an impatient consumer will tend towards Apple. Furthermore, this reputational value can have social benefits for consumers of the product. Those who purchase Apple products might gain social capital through their purchase, causing these users to value Apple products more than another product which gives them the same (or more) non-social utility. There is also evidence that users, especially young ones, have large losses in quality of social interactions

67. A similar distinction in prices arises in computers as well.

68. For context that is roughly the same as a Samsung Galaxy A42 5G phone costs today. Thus, an average iPhone could be bought for the same amount that at least two average Androids could be bought.

69. We can say Apple is incompatible as its software is only available on Apple produced phones. In contrast, Android phones are produced by many different manufacturers, which should lower the switching costs of these more compatible phones.

if they do not use Apple products. As one University of Michigan student recounted to the *Wall Street Journal*, "there definitely was some kind of social pressure to get back to [Apple]" (Higgins 2022). Apple has attempted to capitalize on this social pressure by making SMS messages to Android phones green, instead of the blue used by iOS to indicate messages to another iPhone.[70] Although text bubble color is a small detail, the social norm that develops in a group of iPhone users for blue bubbles can be very strong. Thus, seeing an unexpected green bubble can cause social backlash, and even decrease the net utility users get from engaging with that individual. The Android user will then be incentivized to transfer to the Apple environment if they feel there are enough social costs that can be eliminated by moving.

This institution developed around Apple helps to explain the high prices that Apple can charge for its product. Not only has it succeeded in developing a prevailing social view that its products are high-quality (and thus worthy of a high price), but it has also fostered the development of major social costs associated with not using its products. Thus, even though Android may nominally have lower prices than Apple, Android products may have a greater perceived cost when adjusting for the social stigma associated with their use. With this institution supporting it, Apple has been able to consistently post gross profit margins (revenue less costs as a percentage of revenue) of around 40% since the iPhone's release in Q3 2007 (see Figure 4).

Another aspect of this institution is its focus on the younger population. Apple's focus on locking in young individuals to its platform has a two-fold impact. First, it will increase the likelihood of Apple holding major market share in the future, as the younger generations become more prevalent in the population. Secondly, the increased prevalence of these generations over time will increase the prevalence of the associated institution. This increased

70. Apple's official position is that iMessage (i.e., Apple product to Apple product messaging) is preferred due to its superior encryption. Although there is no evidence that younger users are preferring iMessage for that reason, this still does not explain Apple's use of a different color. Moreover, as recently released documents show, Apple had an extensive internal debate regarding whether iMessage should be offered to Android products. Eventually, it was decided it would remain only for Apple products to erect a barrier locking users in (Higgins 2022).

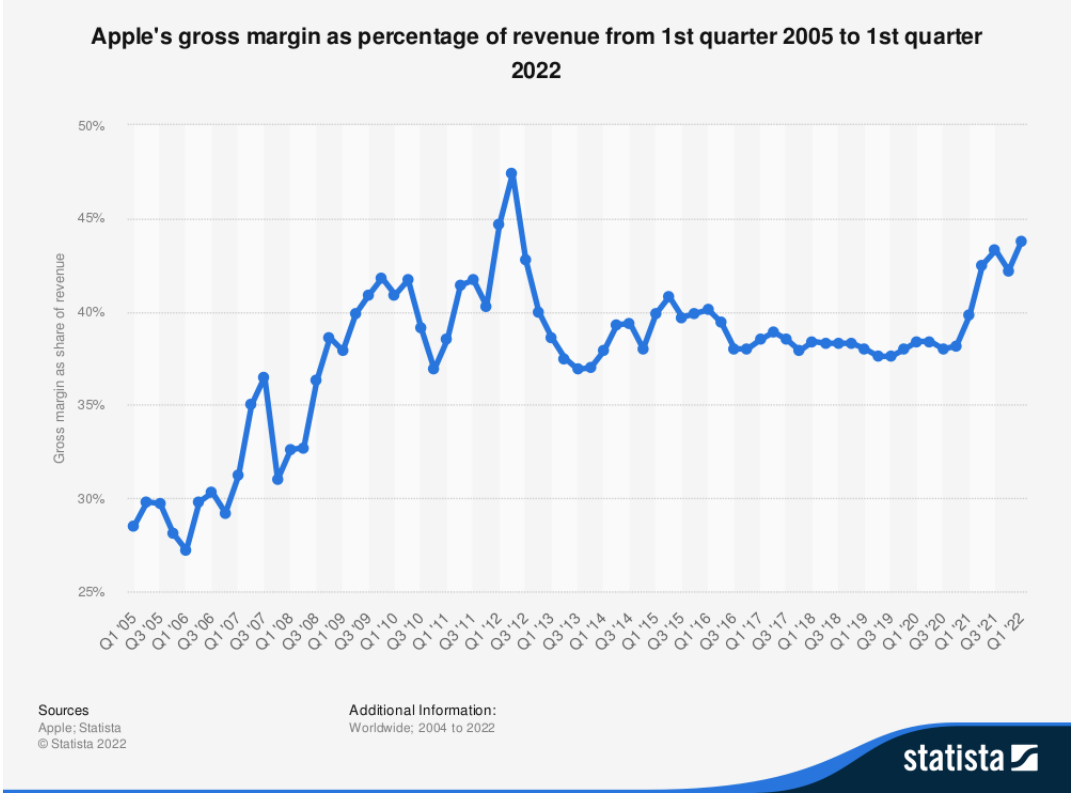


Figure 4: Apple Gross Profit Margins 2005-2022 (Statista, n.d.)

institutional presence will, in turn, increase the reconstitution of the institutions through social conditioning of subsequent generations. With greater prevalence and stability, change to this institution will be more difficult and, therefore, Apple may continue to hold a hegemonic position, not only in the market for smartphones, but in society. Since mainstream analyses fail to recognize this role of social influence, they fail to recognize that waiting until indisputable consumer welfare harm occurs may mean that the underlying institution has developed to a level at which action may be extremely difficult if not impractical.

For example, if Apple had no antitrust policy for 20 years until it finally caused obvious social harm, it may be the case that the institution would have developed to a point where punishing Apple may become politically infeasible or even hurt consumers. Imagine in these 20 years Apple products became more prevalent, along with the social view that Apple was a uniquely innovative firm. It may be the case that by the time Apple damaged consumer welfare, consumers were able to convince themselves that Apple was harming their immediate

welfare to increase their future welfare through a new innovative technology funded through the extra profits, causing major issues for antitrust authorities. Should they act in the best interest of the current consumer and potentially threaten the welfare of the future consumer, or stand idly by and potentially allow the consumers they are supposed to protect be harmed by Apple's policies? If the institution was strong enough, it may be that consumers would prefer no action to action. Although mainstream normative analyses would say that action that increased consumer welfare is the action that should be done, this ignores the fact that consumers may see welfare loss from politically unpopular antitrust action even if the theory would say this increased competition would increase consumer welfare.

5.2 Two-Sided Markets and Negative Prices

Apple, Amazon, Google, and Meta, all have aspects of their business that rely on two-sided markets. Apple must convince software and application developers to develop on its platform so that it is attractive to consumers, while simultaneously convincing users to use the platform so it is attractive to developers. Amazon must convince users that there are enough vendors and products available on its marketplace to warrant its use, while also needing to convince vendors there are enough users to validate selling on the platform. Lastly, Google and Meta must convince advertisers that their audiences constitute a valuable consumer base, while trying to restrict ads enough to prevent users from abandoning the platform altogether.

As shown above, mainstream industrial organization theory has developed many theories that help to explain some of the behavior seen in two-sided markets. However, these theories often hold that if network effects are large enough, profit-maximizing platforms should subsidize users (i.e., have negative prices). A representative example here would be Google. Since Google's PageRank algorithm[71] uses the rate of citation from other web pages to determine

71. Although this example will rely mostly on the PageRank algorithm, the actual Google search algorithm is proprietary and secret. It is known that PageRank has at least some impact in the method, but there are likely other factors that Google uses that are unable to be audited.

a certain web page's ranking, general usage of the internet greatly impacts the algorithm's efficacy. Namely, if more users (and consequently more web pages) join the internet, this algorithm will have greater efficacy. Google thus sees an increase in the value of its search results when more users use not only Google Search, but the internet as a whole. That is it sees a large network effect associated with its product. Since Google holds a monopoly on this two-sided market (with search users on one side and advertisers on the other) and is profit seeking, it must seek revenue from at least one of the sides. The nearly universal scope of the user-side network effect means that Google's product can draw in users relatively passively. Since the advertisers will value advertising on Google's platform more as more users join, and advertising can be seen as a cost to search users, Google will likely (and does) seek revenue from the advertisers rather than the search users. The extreme nature of the network effect on search users means, theoretically, Google may maximize profit by offering a slight subsidy to users for using its platform. However, we see limited evidence of Google (or any other major site for that matter) using this business model.[72]

Since we do not see the predicted outcome of the theory in this case, we must investigate to determine what might be causing these deviations. Since the network effect impacting Google's search results is all-encompassing, it is unlikely that this effect is too small for the theory to support negative prices. Calvano and Polo (2021) show that if the network effect is positive and strong (as Google's is) below cost pricing, including negative prices, may occur.[73] Others, such as Gans (2022) have argued that below cost pricing is welfare maximizing, but that negative pricing is welfare reducing. Instead, I argue that there is an institution that influences both consumers and producers in this situation that arbitrarily

72. A perceptive reader may point out here that influencers on social media may be a form of negative prices. I argue instead that this is just a modern form of advertising. The closest example to a user subsidy is social media companies such as Meta, TikTok, YouTube, and Twitch paying creators to create on and use their platform. I think this could still be seen as advertising on one's own platform, however. A true user subsidy would likely mean a periodic dividend based on the usage level each users had, rather than influencers who get paid to create content.

73. If Google's network effect is not large enough to exhibit the behavior described in the theory presented by Calvano and Polo, it begs the question: why were hypothetical negative prices not mentioned as the result of an implausible network effect?

sets zero as a lower bound on price.[74] I believe that this arises from three main avenues: i) price as a signal of quality; ii) the "specialness" of zero prices; and iii) firms being influenced by outdated institutions regarding business practices.

The lack of profit-increasing negative prices in the Google example is, in part, due to a social norm of using the price of a good as a signal of its quality.[75] In the modern economy, no consumer has universal knowledge about the product they buy or consume, so many rely on heuristics (such as those famously described by Daniel Kahneman and Amos Tversky) to make decisions, one of which is price. If a good is priced highly, it may signal that the cost and quality of production are higher, and vice versa for low priced goods. With respect to digital markets, many of the products consumed by users are free (i.e., zero price), so negative (i.e., lower) prices may be perceived as signaling a lower quality product. Users may see a subsidy for using Google's product as a sign that Google does not offer a high-quality product and must generate demand for a lesser quality product through this tactic. Moreover, the impact of price signaling is complicated when prices approach zero. Due to the aforementioned "specialness" of zero prices, users vastly overvalue free goods when compared to goods with small positive prices. Thus, this would seem to imply that negative prices should further increase the demand for a product beyond what a decrease to zero would.

Yet, a simple example can show that this may not be the case. Let us add an additional hypothetical test to the Shampanier, Mazar, and Ariely (2007) candy test. In their original paper, they offer two candies, originally at 1 cent and 15 cents and subsequently for free and 14 cents, respectively. Now let us assume we decreased prices by 1 cent again, so that prices

74. This differs vastly from Gans (2022) since he argues that zero prices are a anchor price due to "free disposal". Through incorporating transaction costs, I show that free disposal does not exist in these markets. Thus the existence of zero prices must be explained in another way.

75. It is true that credit card rewards are an example of negative prices in other markets. However, this example does not negate the fact that Google is not behaving in a profit-maximizing way. Although one could argue that Google might take up negative prices if threatened, and currently just sees no reason to, there is a major issue, namely that Google, as any firm, is thought to be profit-maximizing. Moreover, the use of negative prices could hamper future competition even more, as smaller firms would have to offer negative prices of greater magnitude to convince users to leave Google. Therefore, Google could potentially increase its profit, while limiting future competition, two actions that are beneficial to a profit-maximizing firm.

were -1 cent (i.e., an individual would receive a penny from the researcher) and 13 cents. Although one may argue that any rational person would be more likely to take the candy in this final case compared to the second case (of free and 14 cents) because the subsidy covers some of the potential cost associated with the candy, I doubt this would happen. In particular, I believe the interplay between price signaling quality and the specialness of zero prices here is important. The sign switching causes a mental inflection in utility determination. This causes consumers to actively hypothesize potential costs beyond the price, while with positive prices they only do this passively. The associated mental cost associated with thinking about these potential costs decreases the utility that users gain from the good. This, in turn, decreases their demand for the product. In the candy example, this would be demonstrated through less candy being taken when individuals would be paid than when the candy was free. For Google, this means it may not be subsidizing use of its search product because this lower price could paradoxically *decrease* demand for its good.[76]

Another potential reason for the lack of negative prices is that businesses are using pricing heuristics that have not adjusted to new dynamics apparent in modern markets. As described in Section 2, institutions take time to develop and adjust to economic and structural changes and, just as mainstream economic theory is currently in the process of adjusting its theories to understand the novelty of digital markets, business institutions are adjusting. Basic microeconomic theory has long argued that the optimal (i.e., profit-maximizing) production for a firm is where marginal cost equals marginal revenue. Using this heuristic, most businesses have been able to successfully achieve nearly maximum profits. However, with the complexity introduced with digital markets, this rule is no longer universally true. Instead, companies that are influenced by this out-of-date institution may see the low (or zero) marginal costs of their digital products and determine that similar levels for price would profit maximize.[77]

76. This could alternatively described as the reverse of a Veblen good, where demand increases as prices increase (i.e., upwards sloping demand curve).

77. Thus, in a sense, the societal overconfidence in some simplistic economic theories may be a cause of the lack of optimal pricing in digital markets. This is especially true when they gain broad societal implementation as this allows for greater reconstitution of the social norm to align actions with these economic theories.

Therefore we are not at a Pareto optimal point, as consumers could receive additional utility in the form of negative prices, which would, in turn, increase the profits of firms. Gans (2022) argues that zero prices may be welfare maximizing, while negative prices would result in overproduction. Although I agree with his theoretical analysis (especially regarding the potential failure of competition in these markets), he assumes that consumers have "free disposal" of products. As I have shown, consumers do not have cost-free disposal of digital goods, evidenced by the existence of switching costs and interpersonal costs, among others. This means that consumer utility curves are not bounded at zero as Gans assumes.[78]

5.3 Market Power as Power Over Institutions

Market power for firms in digital markets is not as closely correlated with market share as in other markets. Data's ability to offer economies of scope and associated network effects interact to generate large market power even when market share remains seemingly low. One major example of this is Amazon. According to eMarketer (2021), Amazon has a market share of nearly 40% in e-commerce, well below Department of Justice's de facto threshold for dominance in a market (i.e., 70%) (Krämer and Wohlfarth 2018). However, since in digital markets it is harder to determine the quality of a product, Amazon's power over the information shown to users grants it more power than a simple retailer would have. In physical retail stores, such as Walmart, consumers can investigate physical properties of the product to determine the quality. However, even this limited ability does not exist in digital markets (Wiseman 2000). The power over information is an underappreciated aspect of market power that mainstream economic theory ignores in its focus on market share.

78. In particular, Gans argues that consumers "can simply choose not to consume" a good, which would bound utility at zero (Gans 2022, 160). Although this may be true in many other markets investigated by economics, with the social prevalence and importance of digital products, this is not the case in digital markets, such as the evidence regarding social norms around Apple products shows. In this case, consumers are not able to simply not consume Apple products, since they must also weigh the potential loss of social connections and other interpersonal losses. They may still decide to not consume, but the utility need not be bounded by zero. For example, utility from remaining may be -10 utils, while leaving has utility of -8 utils. Thus, even for a rational agent, who would choose to leave, the resulting utility would be below Gans' proposed lower bound of zero.

Furthermore, Amazon's power over information is even more important because it competes with third parties on a marketplace that it owns, meaning it can dictate how and what information is given to consumers. Since individuals have less ability to investigate the quality of a product before purchase, they have greater dependence on brand names to act as a proxy for quality, making brand names in these markets more powerful.[79] For example, a consumer on Amazon may see two equally priced products, one which is Amazon Basics and the other a small brand. Since Amazon has developed a brand name and the associated trust of its products, there is an implicit impact on consumer behavior. That is, when consumers face this decision with limited ability to compare the quality of the products, they will likely see the name brand as the safer option (i.e., the one with a higher expected quality or utility).

Amazon's ownership of the marketplace also grants it power to impact the institution influencing consumers on its site. Since consumers depend heavily on the information that Amazon offers through recommended products and official lists, Amazon can use this captive aspect of its users to its advantage. For example, there are active allegations that Amazon uses the data from third party sales to determine products it should sell. When these products are determined, Amazon leverages its economies of scale to undercut these third-party providers. Since Amazon is a more well-known brand and its products are often cheaper than competitors, it quickly captures major shares of the market, a trend directly shown through the below graph (Figure 5) from the House of Representatives investigation of digital markets. Here it is shown that although Amazon consistently has less than 50% of the total postings in a good's market, it has an outsized number of total sales of that good. Consequently, smaller producers are disincentivized from competing, causing further concentration in the production of goods. Thus, it can be seen that market ownership, in contrast to solely market share, allows for large economies of scope. These economies of scope

79. It is true that consumers can read many reviews to help determine the quality of a good. However, these reviews can be flooded with fake reviews by sellers in an attempt to make their product appear higher quality. Consumers may respond to this behavior by decreasing their trust in these online reviews, leading to aforementioned result.

raise antitrust questions, as ownership of one market can cause major threats to competition in other markets, especially in digital markets, where extensive user data can lower barriers to entry into new markets. At the same time, however, these economies of scope can be used to enter underdeveloped markets. This process can expand and increase the efficiency of these markets and illuminates a major dilemma: the ownership of markets can both increase innovation and efficiency, while also threatening competition in other markets.

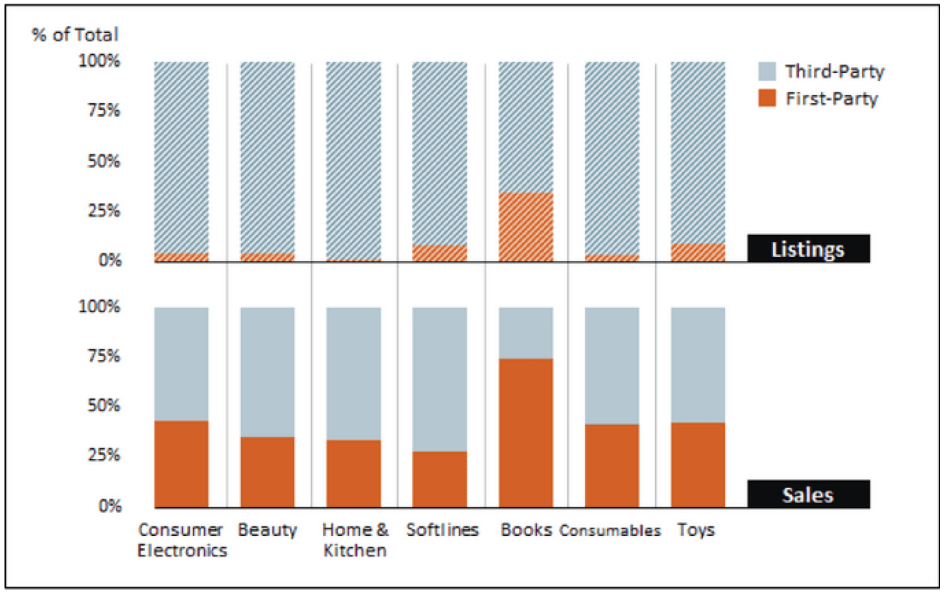


Figure 5: First Party vs. Third Party Listings and Sales on Amazon (United States House of Representatives 2020, 276)

5.4 Data as a Business Model

Data has been an important aspect of economies for as long as humanity has sought to trade goods with one another. Understanding what a customer wants and how much they are willing to pay for it is an important task for any producer. Companies used to conduct market surveys to understand how they should design production so as to maximize their profits. These surveys were nonetheless imperfect for many reasons, not the least of which was the fact that they often did not have representative groups of their multifaceted consumers. However, with the recent rise of technological innovation and the growth of "Big Data," determining market demand has become less onerous, while simultaneously growing

in accuracy. Some companies, such as Facebook and Google, have commodified information and designed their business models around it. A major factor that has shaped the market structure of digital markets is the interplay between network effects and revenue derived from consumer data. Furthermore, there are major social welfare costs that are ignored in this market which, when properly valued, justify government market intervention.

Facebook and Google are two of the most prevalent companies that have grown to prominence with a revenue stream heavily dependent on data. One of the major benefits of this business model, in terms of profitability, is that data (in contrast to R&D or physical capital) does not easily depreciate (Li, Nirei, and Yamana 2019).[80] Furthermore, since data is non-rival, there is limited need for upfront capital costs or major upkeep costs. This further creates a beneficial climate for these data-driven business models as there is limited labor required to create extensive value. Even just merging two previous datasets can generate extensive value due to the increased accuracy of the data interpolation. Although there are numerous examples of companies which have grown extensively using this business model, it is important to note this is not a model that is easily replicable. Data's value grows exponentially with its extent, thus companies that already have market power can further entrench that power through exploiting the highly profitable move to data revenue streams. As I demonstrated in Section 4, one common way that companies in digital markets increase profits is by aggressively merging with other companies. This merging of companies allows for an expansion and extension of data, further increasing its value, while simultaneously protecting the firm from competition. This benefit helps to explain why mergers are extremely prevalent in digital markets.

These business models also pose a risk of creating adverse incentive structures in the economy. John Torpey (2020, 752) describes the economy that companies such as Meta and Google face as the "attention economy," as these companies benefit when more consumers

80. It is true that data may depreciate in the sense that data on an individual may become out of date. However, unlike most depreciated goods, depreciated data can lower the cost of analyzing new data. That is, old data can give a point of reference for more updated data, lowering analysis costs.

remain on their platform. Within the attention economy, there are incentives for companies to engage in anti-competitive actions to keep as much of the market for themselves, securing higher revenues and profits. This is especially prevalent for companies like Meta and Google which rely heavily on the network effects that are gained the more users their platforms have. Meta and Google are then incentivized to engulf any competitor under their umbrellas, so they can expand their profits more. Moreover, since data is likely to be undervalued, it follows that these mergers benefit the buyer more than the seller (Li, Nirei, and Yamana 2019).[81] Thought of another way, this means that Meta and Google can buy a revenue stream for less than its true value to them, further expanding their profits and likely their market power as well.

The dependence on data as a business model also means that network effects interact uniquely in digital markets. Since data's value increases exponentially with the size of the dataset, many companies seek to expand their markets as much as possible to gain valuable data from their consumers. The network effects that are associated with industries such as search engines and social media websites relate to the size of the user base. With these industries, the more users there are the more likely users will enjoy their experiences and return. Meta and Alphabet have these network effects most prominently, but so do Amazon (e.g., more users imply more informative reviews) and Apple (e.g., more users of Apple products increase the benefit that users would receive from buying Apple products in their next purchase decision). Thus, these companies must try to expand their user base continuously to expand their revenue. For Google and Meta, this has been done through "voluntary giveaways," such as Google not charging consumers for their search algorithm, or Meta not charging users for posting on their sites. According to Jonathan Barnett (2018), expansion is done to capitalize on network effects in a market or to move revenue streams to

81. This undervaluation of data is due to a similar process to the one that leads to the exponential increase in data quality and value. When small companies or individuals are viewing their data, the marginal benefit of a single new datum is relatively less than the marginal benefit that a larger company can gain from that datum. Thus, one further complication of digital markets is that marginal benefit may not be diminishing in these markets. When this potential lack of diminishing marginal benefits interacts with the economies of scale described above, there exist reasons for larger companies to engage in a large number of mergers.

areas where a company has an advantage over its competitors.[82] This push for more network effects can also be done by continuously seeking to "innovate" in some way. However, unlike typical markets, the innovation in digital markets is more often related to aggregation and breadth of information than quality or production (Li, Nirei, and Yamana 2019).[83] Unlike the innovation of other industries, this innovation has much less cost in terms of both R&D and time. All these aspects can generate a perfect storm for extreme market shares.

Economic theory is typically worried about the higher prices due to monopolies (either through price setting behavior or production below socially optimal levels), so for companies such as Google and Facebook, whose market share has been derived from goods with little to no price to consumers, understanding the social welfare costs is more complicated. As Li, Nirei, and Yamana (2019, 2) rightly point out, "consumers exchange their personal data for 'free' goods and services," implying that the notion that these goods are "free" is not necessarily true. However, this idea expands beyond just those consumers who decide to "exchange their personal data," since a company with enough data can make exceptionally accurate interpolations regarding members of a group who are not even among their data. Furthermore, although there is no monetary price for using Facebook or Google, there is an associated opportunity cost: the income one could gain if they owned their data and companies had to pay the individual consumer for it.[84] Another potential social cost is the fact that algorithms for many of the largest social media sites tend to reward content that reinforces previously held beliefs.[85] This has led the sociologist John Torpey to proclaim, "whereas the original vision of the Internet foresaw a 'democratization' of information. . . social media such

82. The latter point here can be understood well through the aforementioned theory of two-sided markets. If these firms have power over their clients on one side of a market (such as from inelastic demand), these firms may move revenue generation into the side of the market they have more power over. This would decrease the risk associated with the revenue stream, while also increasing total profit.

83. This definition of innovation is one that is often overlooked in mainstream analyses. It is true that innovation here is not necessarily consumer beneficial technology, but it nonetheless allows for increasing profitability.

84. However, due to the network effects associated with data, this opportunity cost is lower when it is an individual compared to a group. This may support consumers joining together to collectively own data, thereby increasing its value.

85. This is another way to entice users to remain on a platform, allowing these sites to collect more commodifiable data as it limits the cognitive dissonance that users must deal with.

as Facebook tend to promote tribalism and extremism" (Torpey 2020, 759). Also, the rents associated with data-based business models, coupled with the non-rival aspect of data, may lead to overproduction of advertising and data collection, causing inefficiencies and potential welfare losses (Li, Nirei, and Yamana 2019; Barnett 2018).

If one believes that the welfare costs associated with these companies outweighs the associated welfare gains, there exists justification for a market intervention in defense of social welfare. However, as Torpey points out, our current situation may be "path dependent" (Torpey 2020, 751). This path dependence, according to Antonelli (1997) means that the state at present is dependent on both the state in the past and how that state has changed over time. Thus, our current state of data commodification and market concentration is due to how these companies came about, but more importantly for this analysis, how the structure of interactions changed over time. The large benefits derived from these products further mean that any action must determine a way to change society while keeping digital markets or goods to some extent, potentially supporting actions such as those taken by the State of California and the European Union in which they have allowed individuals to opt out of having their data collected (in California's case) or guaranteed the right of individuals to their personal information and the ability to demand it be deleted (in the case of the EU).[86] In general, this understanding highlights the complexities associated with regulating an industry which has created the first companies to reach trillion-dollar market valuations. Although it may no longer be possible to effectively enact antitrust actions against Big Tech companies due to their extreme sizes, this does not mean that regulators are out of options. It does, however, show that, just as companies must innovate to stay ahead of their competition, antitrust regulators must also innovate to create plans that will generate their desired outcomes.

The rise of data-based business models and the rise of market power associated with

86. These laws are the California Consumer Privacy Act (CCPA) and the EU's General Data Protection Regulation (GDPR). The GDPR contains the so-called "right to be forgotten" which allows any user to demand their data be deleted.

them has led many to fall back to the familiar response to market power: break it up through antitrust legislation. However, as detailed above, this recourse may be untenable due to path dependency of the situation. These modern problems will likely require modern solutions. Digital technology has undoubtedly brought immense welfare gains to society. Individuals can now communicate with anyone around the world at the touch of a button, order food from any local restaurant from their couch, or find information related to almost any topic imaginable in mere seconds. However, as often happens, these benefits come with associated costs. By using a social media site such as Facebook or WhatsApp to communicate with others, consumers give these companies free access to their valuable data. This transfer of valuable data happens with almost all actions based on the internet. Thus, understanding the market dynamics at play and the potential social costs associated in an institutionalist framework necessarily requires economists to understand the reasons why consumers give companies free access to their valuable information. Furthermore, economists should also seek to develop ways to protect consumers, and society, from the potential negative consequences of this market which, to many, may seem solely positive. To be able to properly engage in this project, economists must first describe in detail the social costs associated with digital markets.

5.5 Social Costs of Commodified Data

In recent years our society has had to grapple with major questions around how we seek to exist in a world of commodified data. In this world, companies have such expansive knowledge about subgroups of people that they can predict behavior even for people who are excluded from their original dataset. The rise of Big Data and the subsequent market power associated with it not only causes economic concerns, but also raises many ethical and social questions. These seemingly non-economic questions must be properly understood to examine the market dynamics associated with Big Data and their impacts on modern society. As institutionalists have constantly pointed out, no interaction happens in a vacuum and the

economic and non-economic factors involved play an integral part in properly understanding how policy changes can bring the desired outcome. Through investigating these seemingly non-economic questions, the economic nature of their answers becomes apparent.

To be of any real value, the policy that is offered must be implementable. If economic theory can only offer theoretical policies that work when individuals are in a vacuum, the relevance of economic analysis is lessened. If major ethical questions arise in a situation (such as centralized private caches of personal data), a portion of the population may decide to ignore their personal utility to support the moral position they believe in.[87] Furthermore, this group's action may cause other economic actors to rethink their personal classification of welfare.[88] Here, we then see an economic impact from a moral background. Hence, the focus in this section on understanding those social costs that are not generally viewed as economic.

Before expanding on the social and ethical issues associated with commodified data and the companies that capitalize off it the most, it is necessary to understand the ways that rentiership develops within digital markets. Rentiership is an important aspect to investigate for these markets, as economics for centuries has focused on how and why certain goods receive more income than they cost to bring to market. Thus, rentiership could be seen as a social cost, as it gives firms in digital markets undue social power through the undue economic power gained through rents. One major differentiating factor for these digital markets is that the economic rents associated are no longer of the sort investigated by David Ricardo and early classical economists (such as land or resource rents), but rather are inherent aspects of

87. I recognize that many mainstream economists would likely argue this behavior could be incorporated into a utility function, as the individual may be gaining utility from the seemingly altruistic action they are taking (e.g., an individual may be an impure altruist). I grant this valid point, but I believe that the benefit of the institutionalist focus on transactions illuminates the potential for these non-economic impacts to influence social institutions. Through this process, they can not only cause tangible impacts to the utility of the individual in the moment, but over time, change their preferences and, thus, the entire economic structure of society. Mainstream economics, on the other hand, takes the economic structure as given and stagnant.

88. Here one can think about how prior to Edward Snowden's release of information regarding the NSA's surveillance of citizens, relatively few citizens worried about their privacy on the internet. Since then, concerns about privacy have become a major moral and social question regarding digital markets.

the market (Birch and Cochrane 2022). According to Kean Birch and D.T. Cochrane (2022), there are four distinct ways that Big Tech companies extract economic rent in their market: enclave rents, engagement rents, expected monopoly rents, and reflexivity rents. Some of these, such as enclave rents (which are derived from ownership of an ecosystem of use, such as a platform or market, thus directing all revenues through the company) and engagement rents (where algorithms allow for discrimination of consumers) have already been explained above, so I will focus on the latter two. Expected monopoly rents arise when investors believe that the high market share of a company will lead to higher future revenues and profits. This feedback loop allows for these companies to access capital more cheaply, allowing for easier merging with smaller competitors (Birch and Cochrane 2022, 7). The access to cheap capital has a related impact on the market: a decrease in investment in potential competitors, since investors see little chance of generating a return on investment. Reflexivity rents, on the other hand, arise when companies leverage their control over algorithms to exploit either consumers or other companies seeking to exist within the algorithm's sphere of influence (Birch and Cochrane 2022, 9–10). This control can generate rents by warping information dissemination in favor of the algorithm's owner, pushing disproportionate levels of revenue to this firm.

These reflexivity rents are particularly emblematic of the market structure, as they show that in these markets, even if a monopoly is not formally a price-setter, it has the potential to distort, and even eliminate, effective competition.[89] This power over information incentivizes firms to pay for high placement in secretive algorithms, leading to a self-selection of highly capitalized firms, causing concentration in digital markets to develop tendencies towards concentration in every other market. Concentration has given rise to another worrisome aspect: the privatization of previously publicly funded research and innovation (Apostolicas 2019). At first glance, calling privatization of research worrisome may appear contradictory

89. Take for example, Amazon Basics. Since Amazon owns the marketplace it competes on, and thus has control over the search algorithm for the site, it can push users towards Amazon Basics products. When this is combined with Amazon gleaning information about what products to produce from the information gained from the marketplace ownership, the potential for anti-competitive behavior is obvious.

to much of economic theory,[90] but understanding the history of the technology market puts this in proper perspective. Many of these companies developed from technologies initially funded by government money, such as Google's search algorithm (funded by the National Science Foundation), Apple's SIRI, touch-screen technology, and the Internet as a whole (all funded, at least in part, by the Advanced Research Projects Agency (ARPA) or its successor the Defense Advanced Research Projects Agency (DARPA)).[91] Since technology innovation requires such large upfront spending to develop working prototypes (not including the cost of bringing a good to market, if possible), the government has historically played a major role as an entity that is able to invest without requiring profitability. Instead, the government could invest with a focus on technology it deemed beneficial, such as military projects (as many of these innovations began). However, with private companies such as Google and Microsoft innovating independently of government funding (take, for example, quantum computing), there is a risk that government-funded innovation may stall as politicians prioritizing spending in other areas (or reducing it on the whole) might argue that private companies have picked up enough of the slack to allow the government's role to shrink. Without government-funded innovation to lower the barriers to entry for competitors, these markets may see innovation steadily engulfed by massive corporations. By having greater government funding of innovation, there is less profit-incentivized innovation (which may have above optimal levels of risk aversion) and greater overall social benefit.

Beyond just the concerns regarding economic competition, the rise of private innovation in areas formerly driven by government research has led some to worry about the threats this has on national security. Although some tech executives (typically Americans) tend to argue that their market power counters that of belligerent nations such as China,[92] there

90. As economic theory typically hypothesizes that private markets more efficiently distribute investment.

91. For more information on this and the history of government funded innovation, see Mariana Mazzucato's book *The Entrepreneurial State*.

92. This is in reference to major Chinese competitors in similar markets, such as Alibaba (similar to Amazon), Baidu (similar to Google), Tencent (similar to Meta), and Huawei (similar to Apple). As mentioned above in Section 3, China has banned Google and Meta, while Amazon and Apple have limited market penetration. Thus, these executives seem to be arguing if they were not the ones with market power in Western countries, Chinese state-owned businesses would be. This situation raises many geopolitical

is a parallel argument that their market power stifles innovation, potentially harming the US more than the associated benefit from protection (Sitaraman 2020). Furthermore, in a geopolitical sense, the domicile of a company does not necessarily give any information about their political leanings (take, for example, Google's use of an Irish domicile to dodge corporate taxes in the US, while most associate Google with Silicon Valley in Northern California). In our current economic framework, it is more likely that these major companies are beholden more to the profit motive and growth prospects than the countries they are physically located.

Furthermore, the rising concentration in digital markets causes national security issues since many of the modern tools for national information security are privately produced, causing governments to become beholden to private interests guided by the profit motive (Sitaraman 2020). Like the military-industrial complex President Eisenhower warned of, one could term this the "military-technological complex" of the 21st century. Some have argued this dynamic situates these Big Tech companies (or so called "silicon states") as modern-day mercenaries, especially when it comes to their development of quantum computing, which has the potential to be used as a cyberweapon in the future. Also, the attempts by tech companies to introduce new, potentially viable cryptocurrencies (such as Meta's Libra) threaten the hegemony of Western central banks and the use of monetary policy (Apostolicas 2019, 20–21).

There are also extensive social concerns associated with the rise of Big Data, technology monopolies, and social media as a major organ of political expression, especially regarding its effects on democracy. As the 2016 election and the fallout of the Cambridge Analytica scandal showed, data can be used to manipulate democratic institutions, when in the hand of opportunists. One of the major issues seen in the 2016 election cycle was the rise of extensive fake news[93] and how the Facebook algorithm allowed these stories to gain levels

concerns for Western nations.

93. Here I use the definition from Allcott and Gentzkow (2017) which classifies "fake news" as news that is blatantly false, such as a misquotation of a real speech, satire articles pushed as fact, and the like.

of viewership on par with mainstream news agencies (Allcott and Gentzkow 2017, 211–212). It should be noted that it is likely, due to the extreme levels of information many in today's world must grapple with daily, that individuals hold habits which subconsciously give more value to stories that are highly shared to lessen the cognitive load associated with engaging with news, causing these fake news stories (regardless of how obviously fake they may be) to be perceived as real to some. Furthermore, Allcott and Gentzkow (2017) show that, on average, each person in their study remembered roughly one fake news story, which potentially influenced the outcome of the election. Even if it did not impact the election itself, the spreading of fake news has eroded the trust of many in news agencies, a trend that can be exacerbated by the lower barriers to entry associated with digital media compared to print media. With easier entrance into the news market, already tight margins are decreasing and the total number of sites with limited trustworthiness is increasing.[94] This trend is a distinct issue from that of "yellow journalism" at the end of the 19th century, since the push for sensationalism is not necessarily just to entice individuals to purchase their magazine (as it predominantly was in "yellow journalism"), but is now also influenced by the catered nature of what individuals see on the internet. That is to say that algorithms in digital markets have become an influential factor in the proliferation of misleading or false information.

Many commentators have also pointed out how algorithms that give users the "best" user experience rely on boosting the posts that others share, leading to these same stories being pushed by these companies.[95] Since the inherently political sphere of social media has been commodified by seemingly apolitical companies,[96] some have argued that the way to fix this

94. This is solely a mathematical statement, since assuming the same ratio of trustworthy to non-trustworthy sites with a total increase in sites would say both types increased. I think it is more likely that less trustworthy sites are more prevalent in the new sites, due to the push for traffic over accuracy described prior. Regardless, sites which lack trustworthiness are increasing in number.

95. For one such example of an algorithm that does this, see the description of PageRank in Section 3.

96. This is different than news agencies which have opinion sections because the political nature of these agencies are typically well known. There are also many editors that must approve an opinion piece being published in a newspaper. This social position as a platform for political discussion makes these agencies necessarily political, as they often accept. However, social media companies have engaged in similar editing practices (if one classifies removing "misinformation" as editing) yet seek to appear apolitical. If these companies are engaging in the inherently political action of censoring and labelling false information (however reasonable it may be), it is unreasonable to view them as still apolitical bodies.

issue involves changing the factors that allow views to be manipulated in the first place. For example, instead of breaking up these companies or forcing them to operate more like news agencies in terms of journalistic integrity, some have argued that we should foster visibly political "middleware" which allows consumers to tailor the news they receive to their own tastes, whether they be truth, support of certain causes, or others (Fukuyama, Richman, and Goel 2021).

Beyond social and geopolitical concerns of concentration in digital markets, there exist more general philosophical and ethical questions. One of the first ethical questions is one that capitalism has constantly faced: is it morally acceptable to have five companies with market capitalizations over the $1 trillion (most having only 100,000 employees), while only 16 countries (each with tens of millions of citizens) have GDPs over the same benchmark? Although it is true that GDP and market capitalization are not the same, this dichotomy depicts the issue of major economic and social power consolidated in relatively small companies with no democratic oversight. There have also been many questions regarding the role of Big Data with respect to privacy. As mentioned above, there is no way for an individual to gain true privacy from companies that have enough data. This fact has led some philosophers to argue that privacy should be viewed not as an individual right but a collective right.

A related ethical question, and one that relates directly to economic theory, is whether informed consent is taking place in these markets (Richterich 2018). It is important to know whether individuals are fully understanding the costs associated with commodfied data, that is, whether there is informed consent in these interactions. There is evidence that users of these sites are either unaware of the costs or have no alternative. As mentioned above, there are extensive social costs and privacy concerns in digital markets, but many did not know about them before Edward Snowden showed the world. Furthermore, in some instances, users may have to accept major costs because there is no way to avoid them. One example of this is internet "cookies". When a user goes on a website, many sites download small software packets, called "cookies", on the user's computer. These cookies allow the

site to track the user across other sites and optimize performance of the site, among other tasks. However, when websites offer users the ability to change their cookies preferences, they often have "required" cookies, which a user cannot disable if they seek to use the site. Although this is typically viewed as a right of private businesses, when major social platforms such as job boards and news sites, engage in these behaviors, it begins to have a broader social impact. Namely, this practice may discriminate against users with different privacy preferences, which, in turn, could force these users to sacrifice their welfare to remain a part of the broader society.

However, it would be wrong to claim that these markets and products have only caused costs to society. It is clear that Amazon's extensive marketplace has made it easier to buy any product one could imagine. Meta's platforms, such as Instagram and Facebook, have allowed people around the world stay in touch with the push of a button. Google's search engine, YouTube, and other products have put the world's knowledge at the fingertips of anyone with an internet connection. Apple's innovation and marketing of the smartphone has connected the world in ways nobody could imagine even 30 years ago.[97] The size of these companies has also given immense benefits to society, such as Amazon lowering the search costs for consumers or Meta's immense size lowering the costs to users from multihoming in social media, while keeping network size constant. Algorithms that show individuals their preferred viewpoints and information, although socially harmful in some ways, can also foster digital communities of like-minded individuals. These algorithms can show users ads for products they would enjoy but might not know about.[98] Moreover, data's use in elections can offer greater understanding of the true political views of the citizenry, making for a stronger and more truly representative democracy.[99] Even issues such as data collection have major potential benefits, from offering the ability to track close contacts with infected

97. For example, the project that sent man to the Moon had less computing power than a modern day iPhone has.

98. This assumes that preferences of consumers are not influenced by the advertisements that they see.

99. I admit this assumes that politicians at least partially seek to advocate the policies their constituents support. Since this is the world we wish to live in and these are hypothetical benefits, I believe it is fair.

individuals during the COVID-19 outbreak to allowing doctors and physicians to collect large amounts of data to better understand side effects of drugs.

This description of the social costs associated with digital markets was done to show the reader the costs that are overlooked when benefiting from the products of these companies. Nonetheless, any analysis of digital markets would be incomplete if it did not at least acknowledge the extensive benefits these markets and products have brought society. These benefits must be weighed with the costs, and any actions taken must be understood both with respect to their ability to mitigate costs, but also in their impact on the extensive benefits associated with these markets.

5.6 Summary of Section

- An understanding of the social institutions influencing digital markets can help to explain the divergence from theoretical outcomes seen in these markets.
- A complex interaction of social norms and behavioral traits can help to explain why companies that might theoretically increase profit through consumer subsidies do not engage in this behavior.
- In digital markets, market power may be better understood as the power to influence and dictate institutional development and change. This power gives these companies unprecedented influence over the preferences of their consumers.
- Incentives inherent in digital markets push companies towards consolidation and concentration.
- Although many goods from digital companies are of nominal price of zero, they do not come without cost. This shadow price is difficult for consumers to incorporate into decision making, especially when monetary prices are zero. This leads to overconsumption of these products, due to consumers not internalizing costs.

- The rise of digital companies and the major benefits associated with them makes our situation path dependent. It is impossible to return to a world without digital companies, and the trends towards concentration inherent to the markets are difficult to change.

- There are four forms of rent that are unique to digital markets: enclave rents, engagement rents, expected monopoly rents, and reflexivity rents. These rents interact with the market dynamics to further push these markets towards concentration.

- The push towards concentration extends to other markets as well due to the ubiquitous nature of digital markets today.

- Digital companies come with a host of social costs, which must be incorporated into an economic analysis. These costs range from the geopolitical to the ethical.

- There are major political impacts from allowing digital markets to continue their drive towards concentration. The greater the economic power of these companies, the more social and political power they will have. This power threatens democracy, equality of opportunity, and many of the meritocratic ideals of our society.

6 What is the Role of Antitrust?

Although antitrust authorities currently base decisions solely on a consumer welfare standard, there is no normative or economic reason that this standard must be the only way. Even those who have argued that consumer welfare was the proper standard have acquiesced that other goals are reasonable, albeit difficult to directly target. However, as I have shown, consumer welfare in digital markets has become difficult to ascertain as well. Therefore, the role of antitrust policy in relation to digital markets needs rethinking and reformulation for the modern world. It may be that a consumer welfare standard was efficient and beneficial in the past non-digital economy, but in our complex digitized world, the consumer welfare

standard may place too high a burden of proof on antitrust agencies. Doing this may inadvertently allow exactly that which antitrust agencies are supposed to stop: the rise of trusts and correlated market power.

6.1 Antitrust as a Social Tool

With the rise of the technology age, our society has seen digital markets grow rapidly, with a simultaneous trend toward concentration. There is evidence that this concentration has the power to not only impact society through the technology market, but that it can cause other dependent markets to similarly become more concentrated. These trends are like those that sparked the development of the foundational antitrust statutes of American antitrust law: the Sherman Antitrust Act (1890) and the Clayton Antitrust Act (1914). During this time, American economics was heavily influenced by the institutional school of economics, with many of the major voices impacting the drafting and implementation of these new laws (Panhans and Schumacher 2021). In our modern world, we are seeing many trends from the late 19th to early 20th century return: rising inequality, increasing market concentration, and public fears around the power of private firms. For this reason, we should look back to our predecessors and learn from both their successes and failures to develop our approach to our modern situation. The market power of Big Tech companies (such as Google, Facebook, Amazon, etc.) is like that of Standard Oil immediately before it was dissolved under the Sherman Antitrust Act, at least in sheer size. However, these companies have important social and political power that make their position different in many ways. For one, many of these companies are not universal pariahs like Standard Oil, but instead, heralded as the companies bringing some of the most impressive new innovations to market. Thus, we should learn from how our predecessors approached the breaking up of Standard Oil with caution. Expecting the same actions to work in today's world is foolish, not only because our world is more complicated than the early 20^{th} century was, but because the power of these modern companies has different underlying causes and impacts than Standard Oil's. Using this new

knowledge, we can create a new antitrust blueprint for the modern day that can best achieve our desired societal goals.

One of the fears brought up with Big Tech and the rise of targeted advertising is that companies will begin to choose what we will buy and want solely by impacting what we see. However, this fear ignores the fact that this is what corporate advertising has done for decades with Hodgson (2003) arguing companies have used everything from subliminal messaging to sexual images to make consumers want their product more. Since digital companies have developed power over the information users can see, the power of advertising to influence consumer preferences has grown. Geoffrey Hodgson points out how psychology has shown that in our overly complex world today, we require outside ideas to act as a structure for our own ideas of rationality (Hodgson 2003). Thus, when companies begin to control information and determine what views are acceptable, they can influence how consumers determine their own rationality.

Suppose a company decided to donate money to enough politicians to effectively block antitrust action for an extended period.[100] It then could be that for years action is stifled for no other reason than the lobbying of this company. Then suppose some years later this company becomes even larger, and individuals finally begin to recognize the issues associated with this market power. If they have been told for years that action against this company is untenable or impossible, they will be much less likely to seek direct action and instead might tinker around the edges. Although these actions may still lead to some welfare gain, they would not be the optimal choice as the main issue itself is not addressed. Thus, allowing large technology companies to obtain massive market power, which then translates into political power, threatens not only the competitive aspects of the market, but the potential for the regulator to act in the future. However, the reverse is also true: action today (even if it is unsuccessful) can lead to more action in the future, which increases the chances of positive

100. For the sake of this argument, I use political donations (which are legal) compared to bribes (which are illegal), but it seems apparent that any politician dependent on campaign donations likely is in some way beholden to what their financial backers want.

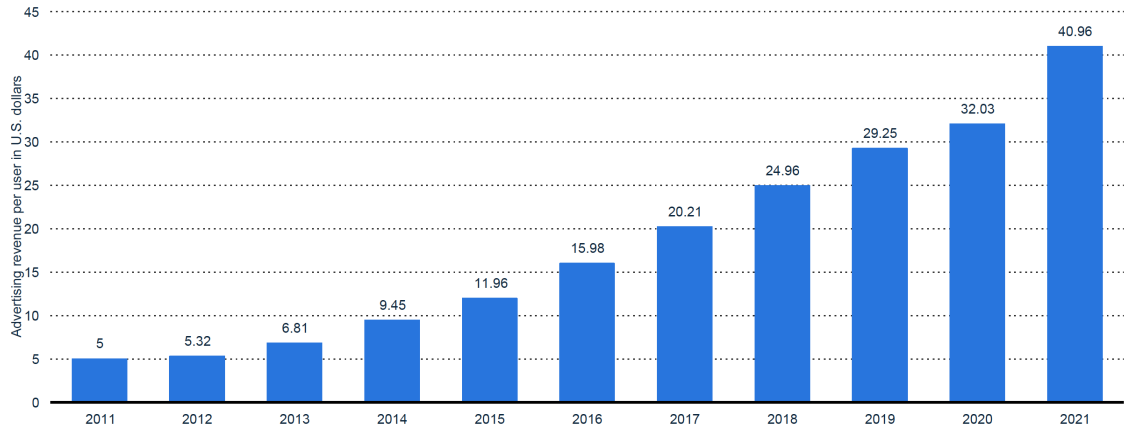
social outcomes.

Beyond just the strictly theoretical fears associated with market power, there are major concerns facing our society today that can be shown empirically. Firstly, although Meta is already one of the biggest firms in the world today, it has relatively little penetration into the largest continental market, Asia, with only 26% of the total population using Facebook as well as only 19% of Africa having a Facebook account (Statista 2021). Although this data is likely heavily impacted by the banning of Facebook in China and the limited access to the necessary hardware in Africa, it shows that Meta still has room to grow. On a global level, Meta has nearly 46% of the world population on at least one of its platforms, while roughly 35% of the world has a Facebook account, showing that growth potential for Meta still exists (Statista 2021; Meta Platforms Inc. 2021). This further means that the market power will likely not be subdued by increasing acquisition costs associated with higher levels of penetration for some time. Another interesting trend surrounding Meta has been the steady increase in revenue per user over the past decade (see Figure 6), a trend directly tied to advertising revenue since this makes up 98% of Meta's total revenue (Meta Platforms Inc. 2021). Thus, not only is Meta increasing its user base consistently, but it is capitalizing more on those users, likely due to the associated network effects from the increase in users.

This rise in market power is like Standard Oil's growth at the turn of the 19th century, as shown through evidence in popular newspapers at the time. As early as 1881, competitors were discussing the possibility of grouping together to protect themselves from the power of Standard Oil (*The New York Times* 1881). By 1889, there was evidence that Standard Oil was attempting to create a horizontal monopoly, as it was thwarted in its attempt to build massive private docks for shipping its oil to Long Island (*The New York Times* 1889a). Similarly, to many major tech companies responding to calls for antitrust action today, Standard Oil argued that this action was mutually beneficial to the company and the state. Simultaneously, competitors were beginning to sue for equality of rates on railroads that had been pressured by Standard Oil *The New York Times* (1889b), drawing parallels to the

Meta's (formerly Facebook Inc.) average revenue per user (ARPU) from 2012 to 2021 (in U.S. dollars)

Meta: average revenue per user 2011-2021



30

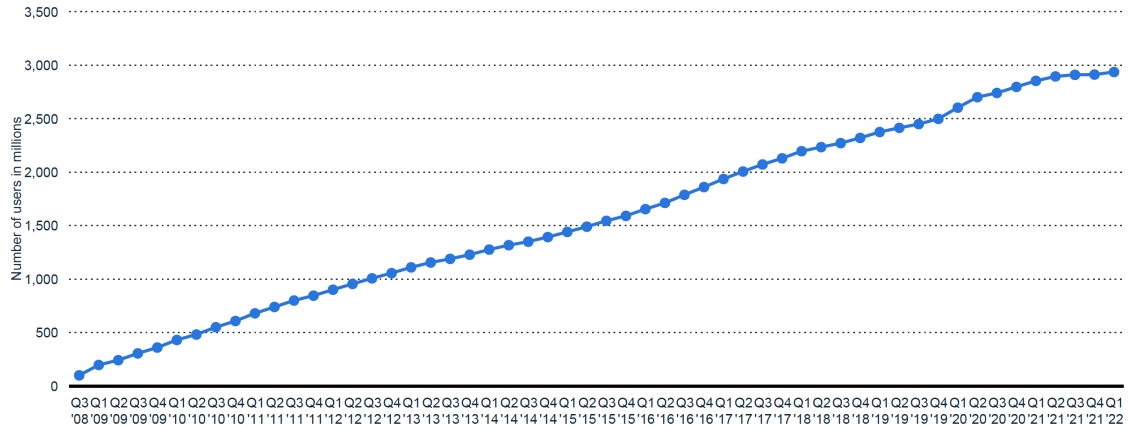
Note(s): Worldwide; 2011 to 2021
Further information regarding this statistic can be found on page 91.
Source(s): Facebook; Meta Platforms; ID 234056

Segment - Family of Apps statista

Figure 6: Meta Platforms Average Revenue Per User (Statista 2022)

Number of monthly active Facebook users worldwide as of 1st quarter 2022 (in millions)

Facebook: number of monthly active users worldwide 2008-2022



31

Note(s): Worldwide; Q3 2008 to Q1 2022
Further information regarding this statistic can be found on page 92.
Source(s): Facebook; Meta Platforms; ID 264810

Segment - Family of Apps statista

Figure 7: Facebook Monthly Active Users Over Time (Statista 2022)

rise of backlash that Apple's App Store commission has brought from some app developers . There is also evidence from the past that the power of a company stifles criticism and competition in related markets. For example, Standard Oil's power caused railroads (which were used to ship oil to refineries as well as to final destinations) to support Standard Oil as it was their largest client (*The New York Times* 1896).[101] Even before the famous break up of Standard Oil in 1911, there was an earlier attempt in Ohio. In this case, they let Standard Oil do the breakup itself, which led to major delays and eventually John D. Rockefeller was questioned as to why the firm was still together (*The New York Times* 1898).

As can be seen, many of the same issues facing society with the rise of Big Tech monopolies were seen over the years with Standard Oil. However, unlike in Standard Oil's situation, the world today has changed drastically. Information travels across the country, not in days or hours, but in microseconds. It took 41 years from the establishment of Standard Oil for it to be deemed a trust and broken up under the Sherman Antitrust Act. Companies under the same scrutiny today like Amazon, Meta, and Google are all younger than this. However, as shown with archival evidence, these same questions were raised about Standard Oil at around the same time in its development. Although Standard Oil was first publicly declared a trust by *The New York Times* in 1881, only 11 years after it was established, it took another 30 years for antitrust authorities to finally take major action. The coronavirus pandemic and the associated movement of many social interactions into digital spheres has shown vividly the impact that some digital companies have on the day-to-day life of people in our world today, including many of the negative impacts. If we let them run free without any countervailing pressure, we risk these problems getting too extreme for any real change to be done.

Although recognizing an issue is an important task, it is not the whole job. We must also understand the pros and cons of remedies and if possible, develop an approach that will maximize the benefits while minimizing the costs to society. The typical reactions

101. It is also true that by 1903 Standard Oil, or its major shareholders, were also major shareholders in many railroads.

by antitrust authorities to break up and increase competition is unlikely to be optimal in this scenario, as has been shown there are network effects and incentives to concentration which might lead this competition to be short-lived. Furthermore, as mentioned above, the market dynamics of technology include high upfront research costs (both pecuniary and opportunity) as well as extreme economies of scale. These dynamics will lead an increase in competition to most likely harm the smallest companies primarily, while minimally impacting the largest firms which are the real targets. Another more nuanced and directed policy would be Paul Romer's (2021) pitch to tax digital advertising revenues. This strategy is better than litigating antitrust cases because the lengthy litigations would allow for market power to be utilized to expand revenue and foil the ongoing litigation. Instead, this would be an immediate progressive marginal tax on the revenue from digital advertising. This would be better than an income tax as it would limit the ability of companies to use clever accounting to get around paying the tax. Some might argue that this tax scheme would disincentivize gleaning revenue from these streams, but that is what Romer argues this tax *should* do (Romer 2021).

Romer's policy, however, fails to acknowledge some important aspects of digital markets. Although he shows that companies can utilize subscription services, he ignores that these companies use subscriptions that enhance user experiences, while simultaneously profiting on the data generated from the consumer. Also, Romer ignores the results shown by Matthew Rabin (1998) that consumers are more sensitive to relative changes in prices than the absolute level. This would mean that consumers who are suddenly required to pay for goods that they formerly received for no (nominal) price would likely feel a welfare loss.[102]

Across the political spectrum, there have been calls for the nationalization of these companies, from the Marxist economist Rob Larson (2020) and socialist political scientist James Muldoon (2020), to the former Trump campaign manager and Cambridge Analytica co-founder Steve Bannon, while Republican senator Josh Hawley goes as far as to ask whether

102. See also the above description of the specialness of zero-price.

they should exist at all (Nguyen 2018; Allan Smith 2019). Although those in support of nationalization argue that this action would place society in control of the way individual's data will be used, rather than private companies, this option fails to alleviate many of the ethical concerns and raises many others. For one, if social media and internet search are influenced by algorithms that push users to see information that corroborates their pre-existing beliefs, nationalized versions might instead censor information and viewpoints that are harmful to the continual power of the government.[103] Moreover, while private conglomerations of personal data are worrisome, it is not clear that governmental control of these data would be less worrisome. It may even be more worrisome as the NSA's spying on citizens has shown. Thus, even the seemingly simple action of giving the control of data conglomeration to the government is wrought with ethical issues and thus negative economic impacts.

As many issues in our world, there is no perfect response to the question of Big Tech companies and how to handle the market concentration seen in recent years. Important information can be gleaned from the delayed action on Standard Oil and its resulting impacts as a model of a future we might see if we take a similar approach. There are many previous approaches but as any institutionalist would say, we must design our policy to the unique market characteristics of our target. Thus, learning from past actions can help us design new policies, but we should not expect that a prior action is necessarily the best for today's situation. We must see the threat posed by Big Tech and respond by developing our own countervailing threat to Big Tech. Only with countervailing power can we dismantle the power structure that these companies have developed.

In recent years there has been a visible increase in calls for antitrust action against the so-called "Big Four" technology companies: Amazon, Google/Alphabet, Facebook/Meta, and Apple. This has led some to call this economic age the "Second Gilded Age," hear-

103. Examples of this include many claims made regarding China's state involvement in domestic companies. One such example is that when Google sought to enter China's market, the government required it censor certain topics to meet the standards of the so-called "Great Firewall". This eventually led to an internal backlash at Google against this policy and Google's eventual ending of its Chinese subsidiary. See https://www.technologyreview.com/2018/12/19/138307/how-google-took-on-china-and-lost/

kening back to the original Gilded Age of the early 20th century, with major trusts such as Standard Oil. The Gilded Age saw the development of modern antitrust policy, and many hope to see modern technology companies go the way of Standard Oil: broken up by government action. However, due to idiosyncratic aspects of the market structures and business models, the Big Four are different from the monopolies for which the current antitrust law is designed. By investigating how regulators approached prior accusations of monopoly power and where their actions could have been improved, the understanding of policy remedies for modern issues is enhanced. This process can be assisted by using theoretical explanations of monopoly power, such as Frank Knight's, to classify when action is beneficial or not.

It would first be important to describe the concerns that have been raised regarding the individual firms among the Big Four. Apple, for example, has been the subject of a recent lawsuit from Epic Games to limit Apple's ability to take commissions from sales on its iOS App Store. This is antitrust in nature because Apple restricts the access of third-party app developers to their software unless they pledge to sell their app through Apple's proprietary App Store (Surowiecki 2021). This case not only impacts Apple, but might also Google, Microsoft, and other operating system developers. Like Apple, Amazon has come under fire due to their Marketplace. This unique business model, which has been immensely profitable for Amazon, is unlike typical online sales because Amazon allows third-party vendors to sell on their site, while simultaneously selling their own products. This has led some to worry that Amazon has warped the search algorithm on their site to further benefit itself. For example, some argue that Amazon incentivizes advertisement on their site by offering higher placement in search results, as well as using sales data to mimic top performing products from competitors (Surowiecki 2021). Unlike Apple and Amazon, the fears around Google are more reminiscent of the fears that led to the breakup of Standard Oil. The major threat posed by Google is their near complete domination of the search engine market, to the point their name is now synonymous with using a search engine. As of 2021, over 90% of internet search go through Google, meaning that many companies are highly dependent on how Google's

search algorithm ranks them.[104] The last of the "Big Four," and the one which Surowiecki claims is most likely to see antitrust action soon, is Facebook (or, as of October 2021, Meta). The main fears regarding Meta come from obvious instances of copying competitors (such as Snapchat's Stories feature) as well as anti-competitive mergers (such as the purchases of WhatsApp and Instagram), which has led to Meta-owned properties accounting for over 60% of social media usage (Surowiecki 2021). Thus, Meta and Google are more closely related to the historical use of antitrust law, which focused on market power, compared to Apple and Amazon, which both hold less than 50% of any of their major markets.

The concerns surrounding Amazon and Apple are novel ones that have arisen through the rise of technology and digital markets, however the concerns about Google and Facebook are like those that antitrust policy has consistently approached. Thus, it would be useful to investigate some of the lessons gleaned from past antitrust actions (or inaction). One of the main aspects that we have seen develop in antitrust, and society as whole, is the granting of legal personhood to corporations,[105] and the associated protections (especially around privacy). This has greatly limited the scope of antitrust lawsuits, as they have relied heavily on economic indicators to prove "anti-competitive" actions (Edwards 1975, 346–348). Furthermore, issues arise as these illegal actions can best be proven through hard to obtain internal communique, instead of solely economic markers.[106] According to Corwin Edwards (1975), understanding the history of antitrust action shows how static antitrust laws limit the ability of regulators to adjust to evolving market dynamics. We have evidence, even back in 1975, that limiting mergers, and forcing companies to show social welfare gain to the merger, is a way to limit growth of market share. Moreover, this can protect the efficacy of antitrust action, as larger companies result in longer, more expensive, and less guaranteed litigations. The breadth of a company is important as well, as even if companies do not necessarily have

104. Here one should remember the joke "the cure to cancer might be on the second page of results, but we would never know".

105. This is embodied best in the *Citizens United* Supreme Court case.

106. This has led to the rise of the Chicago School of antitrust since the typical economic markers are most dependent on price setting power, rather than market power or share. Thus, this political decision has tied the hands of antitrust action.

extreme market power in any one market, they can have better vertical integration, allowing for easier entrance into new markets, as well as the social power derived from extreme size (Edwards 1975).

To properly understand the complete consequences of any policy, it will be important to understand what we have learned from the past, but it is also important to develop a theory of monopoly and whether there is theoretical support for focus on market share. One important theoretical aspect of monopoly is that beyond the typical focuses on frictions or economic barriers to entry, there might exist institutions that restrict competition in a market. Knight (1921) expands on this idea by saying that these institutions can allow for the development of a sort of "coercive power" that restricts the market as cited in (Salerno, Dorobat, and McCaffrey 2021, 6–7). This point is nuanced as it does not assume that a company's market share necessarily grants them monopoly rents. For example, Knight's argument disagrees that the typical notions of the genesis of monopoly rents come from the ability to restrict output (Knight 1921). This is because a company, even if they control a significant share of the market, will have some sort of potential competition. This potential competition, however, can be limited or restricted by the "coercive power" mentioned above. For example, this competition could be restricted by institutional barriers. Here Knight makes the distinction between barriers that result from natural barriers to supply and potential competition (e.g., natural monopolies). Since natural barriers are included in free competition, there would be no way to distinguish the monopoly gains associated with these barriers. However, when coercive power is expressed (actively or passively), monopoly gains can be recognized (Salerno, Dorobat, and McCaffrey 2021).

This understanding of the theoretical foundations of monopoly (the target of antitrust policy) will help antitrust authorities to see where monopoly rents are existing without extreme market share. As detailed earlier, the market structure of these technology companies, which depend heavily on data and the associated network effects, develops institutional barriers to potential competition. This lack of potential competition can allow for monopoly

rents to develop as companies begin to have price-setting power, without having to consider the potential of a competitor entering at a lower price. However, in another sense, these technology companies are like natural monopolies as it is inefficient to compete due to the extreme economies of scale associated with data-based revenue streams. Thus, Knight's theory does not give a definitive answer to the general question, but it can allow us to better understand the way antitrust action can be argued for individual cases.

Take for example Amazon. As mentioned above, Amazon's Marketplace is one of their most profitable endeavors, but even though the company is nearly synonymous with online retail, they do not control most of the market and are below Walmart's revenue in total retail sales (Surowiecki 2021). However, Knight's theory allows us to see how Amazon could still be generating monopoly rents in this instance. Since Amazon holds power over their online marketplace , Amazon has a coercive power (even if it is not always exercised). Furthermore, it could be argued this is no longer truly free competition because there exists an institutional barrier to complete competition. One example of this barrier might be that competitors fear that speaking out against Amazon's power might hurt their performance on Amazon's platform, leading to limitations on what competition might exist. It should be noted that this type of monopoly rents has seen attention from President Biden's administration, as a recent executive order encouraged the FTC to develop rules to limit the power of marketplace owners to engage in anti-competitive practices (Office of the President 2021).

As mentioned earlier, antitrust has drifted over the past century to focus on solely economic factors, leading to institutional aspects being ignored. This not only limits the power of antitrust law to enact social changes, but as shown through Frank Knight's monopoly theory, it might also limit our ability to truly understand where monopoly rents exist. Earlier discussion has mentioned how focusing on market share or prices can cause myopia in determining the monopoly rents associated with companies. This discussion expands this to show that ignoring institutional constraints can blind regulators to the true nature of monopoly rents in the economy. This further shows why antitrust should not be a solely

economic determination, but should consider the social interactions involved, thus returning to its institutionalist roots.

As mentioned above, digital markets have a nuanced impact on society, with both major costs and benefits. The impacts of digital markets on society are multi-faceted and to expect a blanket action such as "breaking them up" to maximize social welfare is naïve. When transactions are properly understood, the impacts of antitrust action will be better understood in turn. Through understanding the real-world rather than a theoretical one, antitrust agencies can better design policy for specific markets. Just as economics has long heralded the division of labor and specialization as efficiency enhancing, the customization of antitrust policies for specific markets and the specific nature of those markets will enhance efficiency as well as social welfare.

6.2 Summary of Section

- Antitrust action can be a social tool as well as an economic one.
- The knowledge gained from the rise of Standard Oil in the early 20^{th} century offers an understanding of the trajectory of digital markets.
- Many of the current policy recommendations see the social threats associated with digital market concentration, but fail to acknowledge the social threats associated with their proposed policies (e.g., how socialization of digital companies does not alleviate the fear of data centralization and may actually exacerbate it).
- Since blatant anti-competitive actions are rare, I offer Frank Knight's theory of monopoly as a theoretical understanding of when non-optimal concentration exists. The application of Knight's theories teach us that when companies hold coercive power, monopoly rents exist.

7 Conclusion

This thesis has investigated a topic that is of interest to many economists, so many may wonder where this thesis differs from the countless reports on digital markets currently. The main differentiating factors are the approach I take to analyzing behavior and my policy recommendations. Through analyzing these markets I have not only described the consumer and firm behavior seen, but also offered novel explanations for these developments that focus on the power of institutions. Many prior investigations, such as the University of Chicago's Stigler Center report from 2019, focus heavily on offering ways to reintroduce competition into these markets (Stigler Center 2019). This focus on reintroducing competition implicitly sees competition as the best option. However, as I have shown in this thesis, these markets have inherent trends towards concentration that make any competition transitory at best, meaning competition policy needs another option. Instead, my policy offerings are more comprehensive and seek to rearrange the institutional dynamics that have led to the large conglomerations of power seen in tech companies. Furthermore, my analysis of these markets has not stopped at pointing out behaviors that support the concentration of these markets, instead seeking to explain these behaviors. This explanation helps to show antitrust authorities what policies are best at targeting the underlying issues at play.

Digital markets are bound to change everything about our society, if they have not already done so. From commerce to information sharing, from social interactions to running a business, the ubiquitous nature of digital markets has permeated nearly all of society. Everything from shirts to jobs are found on the internet. But these digital marketplaces are extremely concentrated. Nearly 90% of internet searches run through Google. Nearly half of the world's population (excluding China) has an account on a Meta owned social media platform. Amazon has developed into the predominant online marketplace for any good imaginable, as well as countless forms of business analytics software. And last but not least, Apple has grown so prevalent that iPhones, iPads, and MacBooks have become synonymous

with the awe inspiring technological innovation seen in the past 40 years.

However, there are threats associated with these companies. One of the most prominent was the immense social power these companies quietly gained that boiled over with the silencing of the President of the United States online in early 2021. In the more theoretical investigations, mainstream economists have begun investigating the structure of two-sided markets with network effects to understand digital markets. These investigations have yielded intriguing results. However, as much as mainstream economics begins to show that digital markets may be inherently tending towards concentration, antitrust agencies still seek to "boost competition". Although economic theory has long supported competition as a panacea, in digital markets, where utility is positively correlated with size, this may no longer be a long-term solution. Breaking up firms such as the "Big Four" may just push the concentration down the road, instead of restructuring the economic conditions so that concentration does not arise.

Instead, in our digital world, a different role is needed from governments. Although antitrust is one tool (such as a way to limit anti-competitive size or mergers), governments need to design new policies and agencies which focus specifically on regulating and shaping digital markets to protect society from the worst potential costs. This role for competition policy is not a new one: institutionalist economists who pushed for the passing of the Sherman Act, Clayton Act, and the FTC Act held similar views. For them, the economy and social interactions were two sides of the same coin. If the economy would influence social interactions, there would necessarily be an economic impact from social changes. While sometimes it is reasonable to allow market dynamics to play out, this interconnection means that governments have a unique role to help shape society.

One potential policy change is the development of a designated digital market regulator, similar to the FCC's role for communications. By removing the analysis of this complicated and unique type of market from the broadly focused FTC and DOJ, this new regulator can have more experts on digital markets on staff. This is not a novel idea in and of itself, as

the Stigler Center (2019) report makes a similar proposal, but the extent and breadth of viewpoints I argue this regulator must have is novel. This regulator must employ not only economists to investigate the impacts of the behavior of these firms, but also needs computer systems experts, anthropologists, sociologists, psychologists, and consumer advocates. The computer systems experts will allow this regulatory body to properly audit the algorithms and data collection methods of these companies with an eye towards the economic impact. The social scientists will help to understand the social benefits of the goods provided by these companies, as this regulator will not easily be able to determine welfare through economic indicators alone. The consumer advocates will offer the regulator the perspective of the consumers it seeks to protect. These advocates can also direct the regulator to areas of consumer concern. Through this the regulator can determine the costs and benefits of these companies and develop regulatory actions to reign in actions that hurt society. They can also push companies to offer users subsidies, which can result in Pareto improvements in welfare. Even so, this regulator will also need to have proper constraints on power, so as to limit regulatory capture and abuse of power.

However, the development of a completely new governmental regulatory body is time intensive and politically difficult process, especially in our current political climate. Thus, we need some immediate options as well so that these companies do not develop enough political and social power to negate any future regulation. One immediate option is to continue elaborating on the costs of allowing concentration in these markets. This process will influence how individuals interact with these companies, increasing their hesitancy to interact. It is true that companies like Google and Meta have immense power over the information that people see, but this power is not an impenetrable wall. Even small sustained actions can push some consumers away from these companies or make them more vocal regarding the economic power of these companies. This can either decrease the power of the companies or push the trend of institutional change in more socially beneficial directions. Moreover, growing discontent with the actions of digital companies can force companies to acquiesce

to demands, lest they are completely destroyed. Nonetheless, these immediate actions are solely a stopgap procedure. Since governments are a conglomeration of social power, they are uniquely situated to influence social institutions and are necessary for counteracting the growing power of digital companies. Without major governmental action, the structure of the market will remain unchanged and the tendencies of digital markets will inevitably lead to trust-like technology companies in the future (whether any of these future companies will be one of the current "Big Four" is anyone's guess).

Any understanding of digital markets requires knowledge of the market and how economic interactions take place. This knowledge includes the institutional impact of social norms on prices of Apple products, how Google's major share of the search engine market can influence consumer preferences, and how concentration in digital markets can cause concentration in other markets. Market power in digital markets should also be seen as power over institutions, and therefore consumer behavior. This institutional power is a type of market power beyond just that over other producers, as it impacts consumer preferences as well. I also argue that there is a unique issue at play in digital markets. These markets are a combination of network effects and negligible marginal costs that materializes into extremely concentrated markets. Due to the low marginal costs and common usage of zero prices, mainstream antitrust standards have limited applicability. To counter the lack of applicability of mainstream standards for antitrust action (such as consumer welfare and the SSNIP test), knowledge of the many social costs can offer justification for welfare loss and therefore antitrust action.

Nevertheless, this analysis could be expanded by further investigation of the impact of non-positive prices on consumer and firm behavior in marketplaces. Economic models of markets that are owned by a participant in the market are also an area of study which has untapped potential. Beyond solely economic theories, greater interdisciplinary work in economics, especially in policy design, can help to develop the policies needed to face to changing world we see today. Moreover, further economic research which seeks to incorporate broad social impacts (such as threats to democracy, privacy, etc) into a consumer welfare

analysis, could allow for a unique synthesis of this approach and the mainstream consumer welfare model.

It is true that this analysis has deviated from investigating consumer welfare in the strict economic sense because it includes factors beyond solely prices and income of the consumers. However, the consumer welfare standard implicitly assumes that consumer preferences do not change due to social interactions. Furthermore, it assumes that consumer preferences are given *a priori*, which raises the major question: *what is before one's interaction with society*? A proper institutional understanding requires one to understand all consumer preferences are conditioned on and influenced by the society in which they live. This necessarily means that our actors are no longer acting as mainstream economic theory assumes they do (i.e., rational with exogenous preferences). Instead, a broader conception of consumer welfare is warranted when consumer preferences are understood to be constantly in flux. Since consumer preferences are ever-changing and those changes are influenced by the society around consumers, impacts on society should be incorporated into considerations regarding antitrust action.

The history of antitrust law began with institutional economics. These economists argued that the size of firms was worrisome not only due to the economic effects, but also the social ramifications. In order to properly analyze these social impacts, they had to investigate social costs extensively. However, as the 20^{th} century progressed, antitrust economics drifted away from its socially conscious origins towards a neoclassical economic focus. This view assumes that most markets' natural tendency is to have competition, while I have shown digital markets have unique characteristics that make monopoly the natural tendency. Thus, for economics to offer useful theories and prescriptions for our future with digital markets, it must innovate in its understanding of how markets behave.

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