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PRODUCTIVITY VERSUS POWER: THE ROLE OF LAW AND TECHNOLOGY, (MIS)PERCEPTIONS AND IDEOLOGY

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ARTICLE

PRODUCTIVITY VERSUS POWER: THE ROLE OF LAW AND TECHNOLOGY, (MIS)PERCEPTIONS AND IDEOLOGY

Oren Bar-Gill & Yochai Benkler[*]

ABSTRACT

Power and productivity mediate economic outcomes across markets–both product markets and labor markets. We develop a neoclassical economic framework that combines productivity and power, and presents the balance between them as an equilibrium outcome determined by strategic investments–by firms, consumers and workers–in law, technology, (mis)perceptions and ideology. An actor's choice of investment–most important, the choice between a productivity-increasing investment and a power-increasing investment–can be explained by the relative marginal return from the different investments. Whereas the incentives of firms and consumers and those of firms and workers are roughly aligned with respect to productivity-increasing investments, they are diametrically opposed with respect to power-increasing investments. Since investments affect surplus and thus the resources available for future investment, the model features multiple equilibria and path dependence. Policy intervention may be needed to shift the market from a bad equilibrium, with low productivity and adverse distributive consequences, to a more efficient and more equitable equilibrium. Policy intervention may also be needed to control welfare-reducing, power-seeking investments. While some degree of market power may be needed to support long-term efficiency, innovation and economic growth, firms will often seek excessive market power that will reduce overall welfare. Policy-makers should strive to optimize power structures across different markets, e.g., by influencing the relative return from different power-increasing and productivity-increasing investments. The explanatory power of our theoretical framework is demonstrated through a series of detailed case studies–from the home broadband and net neutrality wars and the antitrust battles of Microsoft and now Google to the struggles between firms and unions during 19th century industrialization and the evolving story of Uber and the

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gig economy. Our framework informs ongoing debates in antitrust law, labor and employment law, intellectual property law, and consumer protection law, and in any other area of law that regulates, directly or indirectly, product or labor markets.

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I. INTRODUCTION

A. Productivity and Power

Power and productivity mediate economic outcomes across markets. The increasing power of the tech-giants–Apple, Google, Amazon and Facebook–is affecting the lives of billions of consumers, and drawing intense legal scrutiny. Indeed, between October and December of 2020 both Google and Facebook were the subjects of antitrust lawsuits by the U.S. Department of Justice,[1] diverse coalitions of state attorneys general, and the Federal Trade Commission.[2] These firms clearly invest in maintaining and increasing their market power. They also invest in increasing their productivity. What is the relationship between power-increasing and productivity-increasing investments? Does one come at the expense of the other? The decreasing power of labor unions is affecting the lives of millions of workers. Do firms deliberately invest in enhancing their power in the labor market? Do these power-increasing investments come at the expense of productivity-increasing investments? Did workers fight back with their own power-increasing investments? Why did they lose the fight? How do race, gender, and other atavistic markers of social subordination interact with these power increasing investments?

The answers to these crucial questions lie at the intersection of productivity and power. A growing literature in law and political economy argues that the major missing ingredient in prevailing analysis of the economy is power: how it is accumulated and used.[3] A central claim of these argument is that neoclassical economics mostly brackets power and treats it as an exception to normal market operations, and that as a result, policymakers in the past four decades, who have increasingly leaned on economic analysis in their decisions, have chosen policy outcomes that have harmed both

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[1] In doing so, the Department of Justice joined European competition regulators who have already brought three antitrust complaints against Google and issued 9 billion dollars in fines against the firm. Brent Kendall and Rob Copeland, *Justice Department Hits Google With Antitrust Lawsuit*, WALL STREET JOURNAL, October 21, 2020, https://www.wsj.com/articles/justice-department-to-file-long-awaited-antitrust-suit-against-google-11603195203 (last visited Oct 22, 2020).

[2] John D. McKinnon, *These Are the U.S. Antitrust Cases Facing Google, Facebook and Others*, WALL STREET JOURNAL, December 17, 2020, https://www.wsj.com/articles/these-are-the-u-s-antitrust-cases-facing-google-facebook-and-others-11608150564 (last visited Jan 31, 2021); Copeland, *supra* note 2; Brent Kendall and John D. McKinnon, *Facebook Hit With Antitrust Lawsuits by FTC, State Attorneys General*, WALL STREET JOURNAL, December 10, 2020, https://www.wsj.com/articles/facebook-hit-with-antitrust-lawsuit-by-federal-trade-commission-state-attorneys-general-11607543139 (last visited Jan 31, 2021).

[3] Jedediah Britton-Purdy et al., *Building a Law-and-Political-Economy Framework: Beyond the Twentieth-Century Synthesis*, YALE L. J. 52 (2020); Lina M Khan & Sandeep Vaheesan, *Market Power and Inequality: The Antitrust Counterrevolution and Its Discontents*, 11 HARV. L. POL'Y REV. 235–294 (2017); Brishen Rogers, *Beyond Automation: The Law & Political Economy of Workplace Technological Change*, 55 HARV. C.R. C.L. L. REV. (forthcoming, 2020); Yochai Benkler, *Power and Productivity: Institutions, Ideology, and Technology in Political Economy*, *in* POLITICAL ECONOMY AND JUSTICE (2021).

productivity and equality.[4] In this Article, we develop a neoclassical economic framework that combines productivity and power, and presents the balance between them as an equilibrium outcome determined by strategic investments in law, technology, (mis)perceptions and ideology. The investments are made by firms (as sellers of goods and services) and consumers in the product market, and by firms (as buyers of labor services) and workers in the labor market.

The investments by all actors respond both to opportunities to increase productivity and with it the overall surplus in the market, and to opportunities to increase their relative power and with it the share of the surplus that they enjoy. This framework allows us to integrate standard concerns of positive political theory — the pursuit of advantage through lobbying for legislation and through litigation — with a novel treatment of how investments in technology are shaped by power-seeking agendas. We then offer extensions that cover strategic investment in misperceptions, in ideology, and the harnessing of status-subordinated workers, most prominently along atavistic status markers such as race, gender, and nativity (immigration). As we develop our model, we illustrate its elements with known practices and political battles of the past fifty years

Moreover, our model sheds new light on the relationship between productivity or innovation, on the one hand, and equality, on the other hand. Many contemporary debates are framed as a tradeoff between these two policy goals. Examples of such debates include efforts that combine technology policy with questions of distribution, such as the Green New Deal, regulation of workplace surveillance, and constraints on the use of patients' records in building artificial intelligence health applications. We show analytically that productivity and innovation often go hand in hand with equality, rather than requiring that we sacrifice equality for the sake of innovation (or vice versa). Whereas some degree of market power is needed to support innovation (by ensuring sufficient return to investments in innovation), equilibrium levels of power will often be socially excessive. When inequality is the result of such excessive market power, the investment choices that produce inequality will tend to reduce productivity and innovation as well. Since firms choose between productivity-increasing investments and power-increasing investments, laws that promote equality by reducing the return to investments in power can spur investments in productivity and thus also promote productivity and innovation.

B. Model Preview

We use a formal model to study the interactions between productivity and power. In this model, there are two major markets, the product market

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[4] Benkler, *supra* note 2; Amy Kapczynski, David Singh Grewal & Jedediah Purdy, *Law and Political Economy: Toward a Manifesto*, LAW AND POLITICAL ECONOMY (2017), https://lpeblog.org/2017/11/06/law-and-political-economy-toward-a-manifesto/ (last visited Oct 8, 2018).

and the labor market. A firm operates in both markets–as a supplier in the product market and as a buyer in the labor market. Consumers operate as buyers in the product market. And workers operate as suppliers in the labor market.

In each major market, there is a surplus that is divided between the actors in that market. In the product market, the surplus is divided between the firm and the consumers. In the labor market, the surplus is divided between the firm and the workers. In both markets, the surplus enjoyed by each party, and the overall surplus, are determined by productivity and power. We use productivity to capture actions and investments that shift the supply and demand curves. And we use power to capture actions and investments that affect the price without shifting the supply or demand curves. Greater productivity increases the overall surplus and usually also the surpluses enjoyed by the different market participants, albeit to different degrees. Power is relative, such that greater power for one actor implies lesser power for another. An actor with increased power will enjoy an increased surplus. Productivity is affected by investments in technology that reduce costs or increase benefits, and by legal investments that reduce costs or increase benefits. Similarly, power is affected by investments in technology, e.g., actions taken to exclude competitors, or to coordinate with competitors, and by legal investments that help create or maintain market power.

In extensions, we add investments in (mis)perceptions, namely, investments that change beliefs about the costs and benefits of the product or service without actually changing these costs or benefits. Like investments in technology and in law, investments in (mis)perceptions can also affect productivity and power. We also add investments in ideology, defined as investments that change background assumptions or the shared common sense of participants in the economy, and is best understood as operating somewhere between changing beliefs and changing preferences. Finally, we introduce the possibility of workers who occupy different social status positions that have no effect on or basis in their productivity, but are exogenously determined by social convention, such as race or gender. Contrary to assertions in both neoclassical and Marxian analysis that markets tend to eliminate status subordination, we show that firms invest in exploiting and intensifying status subordination, as another type of power-increasing investments.

Overall, parties choose how to allocate their resources between the different investment options to maximize *their* surplus, in both the product and labor markets. For example, in our basic model firms allocate resources between: (i) productivity-increasing technology investments, (ii) productivity-increasing legal investments, (iii) power-increasing technology investments, and (iv) power-increasing legal investments. The allocation of finite resources between these investment options is determined by the relative marginal return of the different investments. Importantly, the return to an actor's investment depends, among other things, on the investment choices

of other actors. For example, the return to a firm's investment depends on the investment choices of consumers and workers.

Finally, the resources that an actor allocates among the different investment options are a function of the surplus enjoyed by this actor. For example, the resources that a firm allocates among the different investment options are a function of the firm's surpluses in the product and labor markets. This general equilibrium effect can result in multiple equilibria and in path dependence.

C. Main Results

The model generates a number of novel insights. First, we show that an actor's choice of investment–most important, the choice between a productivity-increasing investment and a power-increasing investment, but also the choice between different productivity-increasing investments or different power-increasing investments–can be explained by the relative marginal return from increases in productivity as compared to increases in power, and by the relative marginal return from different productivity-increasing or power-increasing investments. For firms, which operate in both the product market and the labor market, relative marginal return also determines in which market to invest.

The relative marginal return from different investments depends on context, including time. For instance, the relative return to investments in productivity-increasing technology vs. power-increasing legal investments can change along the life-cycle of a firm. When they were starting out, Google and Facebook likely had limited opportunities for legal investments and thus focused on technology investments–to improve their products and gain on the incumbents, Yahoo and MySpace. Over time, as Google and Facebook grew, the opportunities for legal investment also grew, and so the companies diverted more resources to these investments. In contrast, Uber made significant power-increasing investments–both technology investments and legal investments–from the very beginning.[5]

Second, our analysis highlights the strategic interactions between the investments of firms and consumers in the product market and between the investments of firms and workers in the labor market. With respect to productivity-increasing investments, the incentives of firms and consumers and those of firms and workers are roughly aligned, as greater productivity generally benefits both parties. This alignment is stronger when power is more symmetrically distributed between the parties. The alignment is weaker, when power imbalance allocates most of the productivity gain to one side. The case of Danish unions' support for extensive deployment of robots in Danish manufacturing offers an obvious example.[6] Still, there is a question of whether the parties' investments are complements, such that

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[5] *See* Section VII.E. below.

[6] *See* CARSTEN STENO & MARLENE GROULEFF, DENMARK, A POWERHOUSE OF ROBOTICS AND AUTOMATION (2020).

a larger investment by one justifies a larger investment by the other, or substitutes, such that a larger investment by one party reduces the benefit from the other party's investment. With respect to power-increasing investments, the incentives of firms and consumers and those of firms and workers are opposed, since increasing the firm's power implies a reduction in the power of consumers or workers, and vice versa. Therefore, when one side makes power-increasing investments, the other side may need to counter with its own power-increasing investment. But it is also possible that, e.g., firms amass so much power that the marginal return from any counter-investment by consumers or workers becomes too small to justify such investment.

These interactions between firms and consumers in the product market and between firms and workers in the labor market create potential misalignment between the interests of consumers and workers. Consumers will oppose firms' power in the product market but support firms' power in the labor market (since firms' power in the labor market increases product-market surplus and this benefits consumers). Similarly, workers will oppose firms' power in the labor market but support firms' power in the product market (since firms' power in the product market increases labor-market surplus and this benefits workers). Therefore, the interests of consumers and workers are opposed with respect to the firms' power in the labor and product markets, respectively, at least where consumers and workers do not overlap perfectly or are represented by organizations whose performance metrics focus on outcomes in only one of the two markets (lower prices vs. higher wages). This insight explains the opposing positions that the consumer movement and labor unions took regarding deregulation in the 1970s.[7]

Third, the model draws attention to the twin phenomena of multiple equilibria and path dependence. Since investments affect surplus and thus the resources available for future investment, equilibrium investment levels can depend on initial resource levels. Similarly, non-marginal shocks can shift a market from one equilibrium to another, and a large one-time investment can change the playing field. For example, if the firm has many resources, then it will spend more money on legal and other investments that directly increase its surplus (as distinguished from the overall surplus) in the product and labor markets; and this increased surplus will sustain such high investment levels–in the present and going forward. On the other hand, if the firm starts with limited resources, then it will have less money to spend on legal and other investments that could increase its surplus; this firm will remain stuck in a low-resources, low-investment equilibrium. Of course, a firm that starts out with limited resources can gradually increase its investments and surplus–marginally larger investments result in marginally larger surplus that allows for even larger investments, and so on. Con-

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[7] *See* Section II.A. below.

versely, a firm with significant resources might gradually reduce investments and surplus–a negative shock that reduces the firm's surplus can force a reduction in investments that further reduces the surplus leading to another reduction in investments, and so on. A comparison between labor market outcomes in the United States and Europe nicely illustrates the multiple equilibria phenomenon: In the United States, successful collective action by firms in the 1970s and 1980s significantly diminished labor power and created an equilibrium with powerful firms and weak workers.[8] In this equilibrium, most of the surplus went to firms allowing investments that sustained the power asymmetry. In contrast, many European countries stayed in a symmetric equilibrium, where surplus was divided more equally between firms and workers. The more equal resources of firms and workers supported investments by both sides that sustained the symmetric equilibrium.

Finally, the formal analysis sheds light on the most important divergences between the actors' private incentives to invest and the socially optimal investment levels, thus emphasizing the main sources of welfare loss. Productivity-increasing investments–both investments in technology and legal investments–generally create both a private and a social benefit. The divergence here is smaller. The welfare effects of power-increasing investments–both investments in technology and legal investments–are subtler and more interesting: These investments increase the surplus enjoyed by the investing party, and have ambiguous effects on the overall surplus. We show when power-increasing investments are welfare-increasing, and when they are welfare-reducing. Specifically, in line with the fundamental Schumpetarian insight, firms may need some degree of market power to support long-term efficiency, innovation and economic growth. But while some degree of market power may be welfare-increasing, excessive market power will reduce overall welfare. Policymakers should strive to optimize power structures across different markets, e.g., by influencing the relative return from different power-increasing and productivity-increasing investments. In addition, as explained above, the dynamic effects of power, which make it easier for winners in power-seeking conflicts in one round to win in successive rounds, suggest that policy intervention may be needed to pull markets out of inefficient equilibria that feature low productivity and excessive power imbalance. It should also be noted that power-increasing investments can also constitute a deadweight loss. For example, both firms and consumers might invest substantial amounts of money in lobbying, with the investments canceling each other out and resulting in a law that does not meaningfully change the power balance in the market. If the initial power balance was socially optimal, then such wasteful investments should be discouraged. If the initial power balance was suboptimal, then policymakers

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[8] JACOB S. HACKER & PAUL PIERSON, WINNER-TAKE-ALL POLITICS: HOW WASHINGTON MADE THE RICH RICHER-AND TURNED ITS BACK ON THE MIDDLE CLASS (Simon & Schuster 1st ed. 2010).

should strive for correction while avoiding the deadweight loss of offsetting, power-increasing investments.

D. Case Studies

The explanatory power of these theoretical results is demonstrated through a series of detailed case studies. We begin with the home broadband market. Firms, specifically incumbent Infrastructure Owners (IOs), make power-increasing legal investments, lobbying and litigating against "open access" policies, to create or maintain monopoly power, as well as productivity-increasing technology investments to create or improve broadband infrastructure. Consumers play an indirect role. Governments who are imperfect representatives of consumers invest in their regulatory structures to resist lobbying by IOs. We suggest that these can be viewed as (indirect) power-increasing legal investments. Turning to welfare, we argue that IOs' investments in thwarting "open access" is welfare reducing; they are vying for market power so that they could extract short-term rents, not to support long-term innovation. Our analysis explains the disparate outcomes in the United States and in Europe: In the United States, IOs focused on power-increasing legal investments that limited the number of viable competitors and secured near-monopoly positions for incumbent IOs. These incumbents felt no need to make expensive productivity-increasing investments in Fiber-to-the-Home (FTTH). By contrast, in Europe, regulators have been able to muster the political power to mute the efficiency of the IOs' power-seeking legal investments. Thus, IOs and their Non-IO competitors have been forced to focus on productivity-increasing investments — primarily, in the last decade, investing in more FTTH infrastructure. With the large effect of FTTH investments on long-term productivity and growth, the United States has settled on a lower-welfare equilibrium, whereas Europe has been able to reach a higher-welfare equilibrium.

Next, we turn to the net neutrality wars. Firms, the broadband providers, made power-increasing legal investments to create or maintain monopoly power by opposing net neutrality, as well as power-increasing technology investments–developing technologies, like policy routers, to inspect and discriminate among different information packets. These two power-increasing investments were complements. On the other side, consumers made power-increasing legal investments to support net neutrality. The legal battles reflect the strategic interaction between power-increasing legal investments by firms and by consumer organizations. Turning to welfare, we argue that the power-increasing investments by broadband providers were designed to create or maintain market power, beyond what was necessary to sustain efficient innovation, and were thus welfare reducing. From another angle, the investments by both sides were welfare-reducing: The years-long legal battles wasted resources, on both sides, ending at the same point, perhaps, that we would be in without any legal investments. More important, the preceding power-increasing investments likely hindered

productivity-increasing investments in innovation, given evidence that open, content-neutral infrastructure is much better at spurring innovation.

Our third case study focuses on Microsoft in the 1990s. Microsoft made power-increasing legal investments, e.g., exclusionary licensing practices, and extensive litigation investments; power-increasing technology investments, e.g., Windows issuing false error reports when the competing DR-DOS was used and, more importantly, introducing non-standard elements in Explorer and ActiveX; and power-increasing investments in misperceptions, e.g., false claims that DR-DOS suffers from incompatibilities and that a new and improved MS-DOS is just around the corner. These power-increasing investments by Microsoft were designed to create or maintain (excessive) market power and were thus welfare reducing. What were the effects of these power-increasing investments on productivity? Microsoft's power-increasing investments forestalled productivity-increasing technology investments by Microsoft's competitors. For its part, Microsoft struggled to keep up with its competitors on the productivity dimension and decided to exert power and exclude them from the market.

Our fourth case study focuses on the allegations in the antitrust lawsuits brought against Google in late 2020. The allegations in the complaints exhibit remarkable parallels between what Google is alleged to have done over the past fifteen years and what Microsoft was adjudicated to have done in the 1990s. Google is alleged to have made power-increasing legal investments, entering into exclusive dealing agreements with mobile phone manufacturers, wireless services companies, automobile manufacturers, personal assistant manufacturers (e.g., Alexa), and browser developers, to have its search engine embedded as the default application in these various contact points. Google also allegedly made power-increasing technology investments, most prominently in developing Android to create a bottleneck control point over mobile search, which it then leveraged to lock-in users and deny competitors interoperability. The state-led suits further allege that Google designed its advertising auction architecture to inhibit competition by other advertising platforms. Google also allegedly entered an illegal monopolization agreement with Facebook, designed to defeat the "header bidding" technology that publishers used to circumvent Google's ad network bottleneck. Building on productivity-enhancing innovations early in its lifecycle, Google then shifted much of its focus to a broad range of legal and technological investments that were designed to maintain and expand Google's market power in search and advertising — its core business and its core source of profit.

Our fifth case study focuses on the labor market. It describes classic instances from 19th century industrialization, where leading sectors of the first and second wave of industrialization invested in technologies and work processes explicitly intended to break the power of strong craft unions. In the case of cotton, these investments also specifically aimed to replace unionized adult male workers with nonunionized women and teenagers, who were paid less and considered more docile (and less able to organize) than

men. There is clear evidence that firms pursued development of the "self-acting mule", or automated spinning machinery, in order to break the strong spinners union in what was then Britain's leading export industry. There is also evidence that unions and firms came into conflict over the configuration of spinning mules, with male-dominated unions seeking configurations that required more physical strength and stamina, and firms seeking configurations that allowed them to employ lower-paid and non-unionized women. And in the U.S., in the case of the pneumatic iron molding machine, a technology with inferior productivity was introduced by McCormick Reaper explicitly to replace the very powerful craft iron molders union, which was at the heart of labor organizing in Chicago in the post-bellum period, with low-skilled workers easy to replace in time of strikes. In our terminology, firms made power-increasing technology investments; and, in some cases, workers made power-increasing investments to counter the firms' investments.

Our sixth and final case study returns to the present and focuses on Uber. It straddles both the product market and the labor market. Uber has become synonymous with technological transformation of labor markets (i.e., "uberization" of work). Uber's technology increased productivity in both the labor market and the product market (or rather the service market–the transportation services market), by reducing transactions costs and making entry easier for new drivers. But Uber also made significant power-increasing investments. In the product market, Uber engaged in below-cost pricing, with the explicit intention of driving competitors out of the market. It also made significant investments in technology, law, misperceptions and ideology to increase its power in both the product market and the labor market. We discuss design features of the drivers' side of the app, lobbying and litigation efforts focused specifically on the status of drivers and their legal ability to organize, and campaigns to create misperceptions among drivers about how much money they could make or how costly leasing a car from Uber would be.

E. Prior Literature

Economists have long studied the relationship between market power and innovation. Influential work by Arrow and Nordhaus in the 1960s spawned a literature on the costs and benefits of market power secured by patents on innovation.[9] Perhaps more influential in innovation economics, the Neo-Schumpeterian tradition focused on how market structure shapes the rate and direction of innovation. Neo-Schumpeterian economics posits that firms innovate in order to differentiate themselves from competitors and thus secure market power and monopoly rents, and that this is the core driver of sustained productivity growth. On the one hand, monopoly

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[9] KENNETH ARROW, ECONOMIC WELFARE AND THE ALLOCATION OF RESOURCES FOR INVENTION (1962); F. M. Scherer, *Nordhaus' Theory of Optimal Patent Life: A Geometric Reinterpretation*, 62 AM. ECON. REV. 422–427 (1972).

rents are necessary to cover the cost of investment in innovation. On the other hand, excessive market power and insufficient competition undermine the incentives to innovate, since powerful firms feel less need to innovate and stay ahead of potential competitors. There is a trade-off, but some positive level of market power is needed.[10] While in simple, static economic models market power is always welfare-reducing, in neo-Schumpeterian economics some degree of market power is a precondition to innovation; and innovation, in turn, is the primary driver of growth, and hence of welfare. The past thirty years have seen the emergence of several more comprehensive neo-Schumpterian growth models[11] and efforts to extend the insights across a broad range of micro, meso, and macro-level economic phenomena.[12]

Our analysis incorporates the basic neo-Schumpetarian insights, and adds to them in several ways. First, we allow for direct investments in creating or maintaining market power (e.g., investments in excluding competitors), which are distinct from the neo-Schumpetarian investments in innovation or productivity that indirectly create market power. We thus introduce a trade-off between productivity-increasing investments and power-increasing investments. Second, we consider investments in law, (mis)perceptions and ideology, in addition to investments in technological innovation. Third, whereas neo-Schumpetarian models focus on the product market, our framework includes both the product market and the labor market, and explores the relationship between the two markets. Fourth, we introduce investment decisions by consumers and workers and study the interaction between these investments and firms' investments.

Other strands in the economic literature are also relevant to our analysis. At least since Stigler's influential work on regulation, economists have studied the investments firms make in manipulating law and policy to exclude competitors and increase their market power.[13] Labor economists have long studied the ways in which unionization and other dimensions of institutional change shape bargaining power in labor markets.[14] Work in

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[10] JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY (1st ed. 2008); Richard R. Nelson, *The Simple Economics of Basic Scientific Research*, 67 J. POLIT. ECON. 297–306 (1959); RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE (digitally reprinted ed. 2004); FREDERIC M SCHERER, INNOVATION AND GROWTH: SCHUMPETERIAN PERSPECTIVES (1989).

[11] PHILIPPE AGHION, UFUK AKCIGIT & PETER HOWITT, *What Do We Learn From Schumpeterian Growth Theory?* w18824 (2013), http://www.nber.org/papers/w18824.pdf (last visited Jul 28, 2020); Paul M Romer, *Endogenous Technological Change*, J. POLIT. ECON. 32.

[12] ELGAR COMPANION TO NEO-SCHUMPETERIAN ECONOMICS, (Horst Hanusch & Andreas Pyka eds., 2007).

[13] George J. Stigler, *The Theory of Economic Regulation*, 2 BELL J. ECON. MANAG. SCI. 3 (1971); J.-J. Laffont & J. Tirole, *The Politics of Government Decision-Making: A Theory of Regulatory Capture*, 106 Q. J. ECON. 1089–1127 (1991).

[14] Richard B. Freeman, *Unionism and the Dispersion of Wages*, 34 IND. LABOR RELAT. REV. 3–23 (1980); David Card, Thomas Lemieux & W. Craig Riddell, *Unions and wage inequality*, 25 J. LABOR RES. 519–559 (2004); L. Mishel, J. Schmitt & H. Shierholz, *Wage Inequality: A Story of Policy Choices*, 23

behavioral economics and consumer protection has considered firms' efforts to create and exploit consumer misperceptions.[15] More generally, old institutional economists,[16] economic and legal historians,[17] and Marxian economists[18] have considered power conflicts between capital and labor and the implications of these conflicts for the distribution of gains from productivity increases. And yet we have been unable to find in the literature efforts to formalize the perspectives of these diverse strands of work within economics and associated disciplines within a single framework.

Outside of economics, there has been significant work across diverse disciplines focused on how power relations shape economic behavior and the structure of economic relations. Work in political science and sociology has considered the investments firms make to shape law and regulation to increase their power in both product and labor markets.[19] There is extensive work in comparative politics that focuses on the different political alliances surrounding labor relations and industrial organization as the drivers of diverse models of welfare capitalism, particularly the differences among the liberal Anglo-American model, the European Christian Democratic

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NEW LABOR FORUM 26–31 (2014). Within labor economics, there is a longstanding debate as to the relative importance of these institutional determinants of bargaining power and the impact of technology, taken to be exogenous, for the relative productivity of different kinds of labor (more or less "skilled"), and hence for the distribution of wages. *See, e.g.*, CLAUDIA GOLDIN & LAWRENCE F. KATZ, THE RACE BETWEEN EDUCATION AND TECHNOLOGY (2010); Daron Acemoglu & David Autor, *What Does Human Capital Do? A Review of Goldin and Katz's The Race between Education and Technology*, 50 J. ECON. LIT. 426–463 (2012); Daron Acemoglu & David Autor, *Skills, tasks and technologies: Implications for employment and earnings, in* 4 HANDBOOK OF LAB. ECON. 1043–1171 (2011); David Card & John DiNardo, *Skill-biased technological change and rising wage inequality: Some problems and puzzles*, 20 J. LAB. ECON. 733–783 (2002).

15 *See, e.g.*, OREN BAR-GILL, SEDUCTION BY CONTRACT (2012).

16 JOHN R. COMMONS, LEGAL FOUNDATIONS OF CAPITALISM: JOHN R. COMMONS; WITH A NEW INTRODUCTION BY JEFF E. BIDDLE & WARREN J. SAMUELS (1995); Robert L. Hale, *Coercion and Distribution in a Supposedly Non-Coercive State*, 38 POLIT. SCI. Q. 470–494 (1923).

17 IVY PINCHBECK, WOMEN WORKERS IN THE INDUSTRIAL REVOLUTION (2004); MAXINE BERG, THE AGE OF MANUFACTURES, 1700–1820: INDUSTRY, INNOVATION, AND WORK IN BRITAIN (2nd ed ed. 1994); William Lazonick, *Industrial relations and technical change: the case of the self-acting mule*, 3 CAMB. J. ECON. 231–262 (1979); DAVID F. NOBLE, FORCES OF PRODUCTION: A SOCIAL HISTORY OF INDUSTRIAL AUTOMATION (1st ed ed. 1984); MORTON J. HORWITZ, THE TRANSFORMATION OF AMERICAN LAW: 1780–1860 (1977); Tine Bruland, *Industrial conflict as a source of technical innovation: three cases*, 11 ECON. SOC. 91–121 (1982); Kristine Bruland, *Industrialisation and technological change*, *in* THE CAMBRIDGE ECONOMIC HISTORY OF MODERN BRITAIN 117–146 (Roderick Floud & Paul Johnson eds., 1 ed. 2004), https://www.cambridge.org/core/product/identifier/CBO9781139053853A009/type/book_part (last visited Jun 16, 2020).

18 Samuel Bowles & Herbert Gintis, *Contested Exchange: New Microfoundations for the Political Economy of Capitalism* 58; Samuel Bowles & Herbert Gintis, *Power and Wealth in a Competitive Capitalist Economy*, 21 PHILOS. PUBLIC AFF. 324–353 (1992); Samuel Bowles, *Social Institutions and Technical Change*, 321 *in* TECHNOLOGICAL AND SOCIAL FACTORS IN LONG TERM FLUCTUATIONS 67–87 (Massimo Di Matteo, Richard M. Goodwin, & Alessandro Vercelli eds., 1989), http://link.springer.com/10.1007/978–3–642–48360–8_5 (last visited Apr 24, 2019).

19 HACKER AND PIERSON, *supra* note 9; Bruce Western & Jake Rosenfeld, *Unions, norms, and the rise in US wage inequality*, 76 AM. SOCIOL. REV. 513–537 (2011).

model, and the Nordic Social Democratic model.[20] In science and technology studies, there has long been a line of work on the "politics of artifacts," or the ways in which technology is a domain of strategic action to pursue power.[21] And the past two decades have seen extensive work on how various technological configurations shape the power that firms can exercise over consumers[22] or workers,[23] and on the battles that firms engage in to configure the legal ecosystem to increase their power in these relations.[24] In law, there has been a long tradition of legal scholarship exploring the ways in which firms, consumers, and workers have engaged in conflict over the basic legal framework for economic relations, and how these battles have distributed power in the economy.[25] Recently, there has been a revival of interest in law and political economy, or how law shapes power in economic and social relations.[26] Our analysis of ideology in Part V is strongly influenced by work in the Black radical tradition explaining the role of racialized caste in the construction of American labor relations,[27] and work

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[20] GØSTA ESPING-ANDERSEN, THE THREE WORLDS OF WELFARE CAPITALISM (1990); KATHLEEN ANN THELEN, VARIETIES OF LIBERALIZATION AND THE NEW POLITICS OF SOCIAL SOLIDARITY (2014).

[21] Langdon Winner, *Do artifacts have politics?*, DAEDALUS 121–136 (1980).

[22] JULIE E. COHEN, BETWEEN TRUTH AND POWER: THE LEGAL CONSTRUCTIONS OF INFORMATIONAL CAPITALISM (2019); SHOSHANA ZUBOFF, THE AGE OF SURVEILLANCE CAPITALISM: THE FIGHT FOR A HUMAN FUTURE AT THE NEW FRONTIER OF POWER (First edition ed. 2018); Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 UCLA LAW REV. 970 (2012); FRANK PASQUALE, THE BLACK BOX SOCIETY: THE SECRET ALGORITHMS THAT CONTROL MONEY AND INFORMATION (2015).

[23] Rogers, *supra* note 3; IFEOMA AJUNWA ET AL., *Hiring by Algorithm: Predicting and Preventing Disparate Impact* (2016), http://papers.ssrn.com/abstract=2746078 (last visited Mar 21, 2016); Kate Crawford Ifeoma Ajunwa, *Limitless Worker Surveillance*, 105 CALIF. LAW REV. 3 (2017); Veena Dubal, *The Drive to Precarity: A Political History of Work, Regulation, & Labor Advocacy in San Francisco's Taxi & Uber Economies*, 38 BERKELEY J. EMPLOY. LABOR LAW 73–135 (2017); Karen E. C. Levy, *The Contexts of Control: Information, Power, and Truck-Driving Work*, 31 INF. SOC. 160–174 (2015); Solon Barocas & Karen Levy, *What Customer Data Collection Could Mean for Workers*, HARVARD BUSINESS REVIEW (2016); Benkler, *supra* note 3.

[24] Yochai Benkler, *Communications infrastructure regulation and the distribution of control over content*, 22 TELECOMMUN. POLICY 183–196 (1998); Yochai Benkler, *The Battle over the Institutional Ecosystem in the Digital Environment*, 44 COMMUN ACM 84–90 (2001); JESSICA LITMAN, DIGITAL COPYRIGHT (Pbk. ed ed. 2006); JAMES BOYLE, THE PUBLIC DOMAIN: ENCLOSING THE COMMONS OF THE MIND (2008); COHEN, *supra* note 23; Eben Moglen, *Anarchism triumphant*, FIRST MONDAY (1999), http://moglen.law.columbia.edu/publications/anarchism.html (last visited Apr 28, 2019); LAWRENCE LESSIG, CODE: AND OTHER LAWS OF CYBERSPACE (Nachdr. ed. 2002).

[25] HORWITZ, *supra* note 18; K. Klare, *Law-Making as Praxis*, 1979 TELOS 123–135 (1979); WILLIAM E. FORBATH, LAW AND THE SHAPING OF THE AMERICAN LABOR MOVEMENT (1991); Mark Barenberg, *The Political Economy of the Wagner Act: Power, Symbol, and Workplace Cooperation*, 106 HARV. LAW REV. 1379 (1993).

[26] Kapczynski, Singh Grewal, and Purdy, *supra* note 4; Khan and Vaheesan, *supra* note 3; Dubal, *supra* note 23; Benkler, *supra* note 2.

[27] W.E.B. DU BOIS, BLACK RECONSTRUCTION: AN ESSAY TOWARD A HISTORY OF THE PART WHICH BLACK FOLK PLAYED IN THE ATTEMPT TO RECONSTRUCT DEMOCRACY IN AMERICA, 1860–1880 (1935); Barbara Jeanne Fields, *Slavery, Race and Ideology in the United States of America*, 0 NEW LEFT REV. 95 (1990); CEDRIC J. ROBINSON, BLACK MARXISM: THE MAKING OF THE BLACK RADICAL TRADITION (2000); Stuart Hall, *Race, articulation and societies structured in dominance* 42.

by feminist scholars focused on the economic and class dimensions of gender relations.[28] These also form the foundation of our extension to strategic investment in harnessing status-subordinated labor in Part VI. The neo-classical model developed in this Article pulls together all of these important strands in a single comprehensive framework, revealing new insights and elucidating the welfare-enhancing role of legal policy.

F. Policy Implications

While we do not offer specific, determinate policy recommendations in this Article, the examples and case studies throughout the paper offer a clear indication of the kinds of policy debates we believe will be informed by our framework. Antitrust law is an obvious domain of application: the analysis of mergers, predatory pricing, tie-ins and similar power-seeking practices will benefit from our account of the interaction between power and productivity in the relevant markets. Similarly, both labor and employment law are implicated: our framework explicates the conditions under which wages reflect relative power in the labor market rather than workers' productivity, suggesting a productivity-increasing potential for policy interventions that resist socially excessive power imbalances. In intellectual property law, our framework can help shed light on patenting and on digital rights management as power-seeking strategies, which can either increase or decrease productivity and welfare; and on trade secrets that limit labor market mobility and increase the power of firms in labor markets. In consumer protection law, recognizing the incentives of firms to invest in misperceptions increases the need for robust protection. But the implications are even broader: Civil procedure, in particular through the regulation of class action suits, shapes the relative power of firms and consumers in product markets, as does arbitration law, interpreted by the Supreme Court to allow class-barring arbitration clauses. The history of tort law is replete with examples of power-seeking behavior and investments in shifting law to aid one side or another — be it railroad responsibilities for fires caused by sparks, workplace injuries, products liability, or nuisance. We do not explore any of these in detail here, but note the scope of the research agenda that this Article introduces.

The remainder of this Article is organized as follows. Part II develops our framework of analysis. Part III characterizes the equilibrium investment levels and other outcomes and examines welfare implications. Part IV develops the (mis)perceptions extension. Part V develops the ideology extension. Part VI develops the extension to the economic role of social status subordination. Part VII demonstrates the value of our theoretical framework, by applying it to a series of detailed case studies.

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[28] Nancy Fraser, Fortunes of feminism: from state-managed capitalism to neoliberal crisis (2013); Nancy Folbre, Who pays for the kids? gender and the structures of constraint (1994); Joan Williams, Unbending gender: why family and work conflict and what to do about it (2001); Berg, *supra* note 18.

II. Framework of Analysis

Our framework covers two major markets, a Product Market and a Labor Market.[29] In each market, there are two major "components," Productivity and Power, where the magnitude of each component is determined by investments in technology and law. The investments are made by different parties–by firms and consumers in the product market and by firms and workers in the labor market.

There are many firms, consumers and workers. For expositional purposes, we will sometimes treat these groups as unitary actors. The large numbers of parties, especially consumers and workers, can result in a collective action problem that limits these parties' ability to invest. Treating these groups as unitary actors suggests that they can, in some cases, overcome the collective action problem.[30] But we will also depart, at times, from the unitary actor assumption. The analysis will often require that we peer into a group of actors. For example, a firm's power vis-à-vis consumers in the product market may depend on its ability to exclude competitors. And workers' power vis-à-vis firms in the labor market may depend on the overall number of workers.

We initially assume that consumers and workers comprise distinct groups. Later we explore the implications of overlap between these groups, namely, the reality that many individuals are both consumers and workers.

A. Product Market (PM)

1. Setup. — Consider a standard supply-and-demand framework (Figure 1), with an upward-sloping supply curve (S) and a downward-sloping demand curve (D). Let $\tilde{p}$ represent the price in this market and let $\tilde{q}$ represent the corresponding quantity. The suppliers' surplus, Π_S^{PM}, is represented by the blue area between the horizontal price line and the supply curve. The consumers' surplus, Π_D^{PM}, is represented by the red area between the horizontal price line and the demand curve. The overall surplus, Π^{PM}, is represented by the entire area (blue and red) between the supply and demand curves (from zero to $\tilde{q}$). We have: $\Pi^{PM} = \Pi_S^{PM} + \Pi_D^{PM}$.

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[29] Of course, in the real world there are many different product markets and many different labor markets.

[30] For example, unions can help solve workers' collective action problems and consumer organizations can help solve consumers' collective action problems. Also, spontaneous norm creation (e.g., a social media campaign that calls for a consumer boycott of firm A because it did X) can overcome collective action problems.

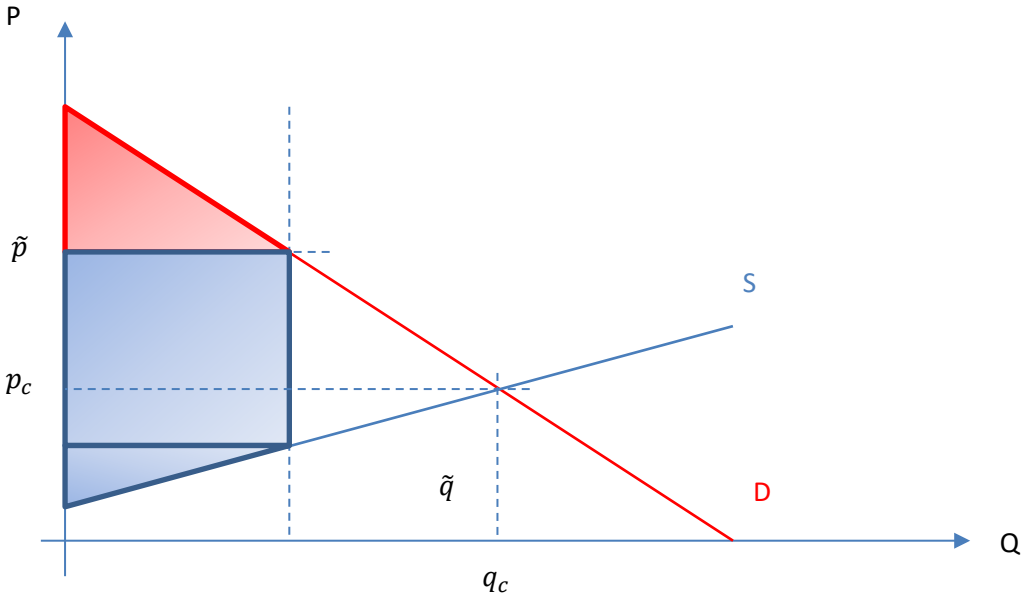

Figure 1: Standard Supply-and-Demand Framework

(a) Productivity. — The most fundamental building blocks in the standard framework are the supply curve and the demand curve. We define productivity, in the product market, as a feature of the supply and demand curves. The supply curve represents the marginal cost of producing (or procuring or providing) the good or service. On the supply side, increased productivity means lower production costs, thus shifting the supply curve down. This higher productivity directly increases the suppliers' surplus, Π_S^{PM}, and thus the overall surplus, Π^{PM}. The lower production cost will also tend to reduce the price and thus increase the consumers' surplus, Π_D^{PM}. The demand curve represents the benefit, to consumers, from the product or service (or, more precisely, consumers' willingness to pay for the product or service). On the demand side, increased productivity means higher product quality and thus greater benefit to consumers from purchasing the product, thus shifting the demand curve up. This higher productivity directly increases the consumers' surplus, Π_D^{PM}, and thus the overall surplus, Π^{PM}. The higher quality will also tend to increase the price and thus increase the suppliers' surplus, Π_S^{PM}.

We define a variable Py^{PM} that represents productivity in the product market. Higher productivity increases the suppliers' surplus, the consumers' surplus and the overall surplus:

$$\frac{d\Pi_S^{PM}}{dPy^{PM}} > 0, \frac{d\Pi_D^{PM}}{dPy^{PM}} > 0 \text{ and } \frac{d\Pi^{PM}}{dPy^{PM}} > 0.$$

(b) Power. — How is market power represented in this standard supply-and-demand framework? Notice that the price, $\tilde{p}$, in Figure 1, is higher than the competitive price, p_c, which obtains at the intersection of the supply and demand curves. This implies that suppliers enjoy market power. When $\tilde{p}$ is lower than p_c, we will say that consumers enjoy market power. More generally, it is useful to describe the theoretical, perfect-competition benchmark, p_c, as the no-power scenario.[31] As compared to this benchmark, when suppliers gain power, four things happen: (1) price goes up,[32] (2) the suppliers' surplus, Π_S^{PM}, increases, (3) the consumers' surplus, Π_D^{PM}, decreases, and (4) overall surplus, Π^{PM}, decreases. And when consumers gain power, relative to the benchmark: (1) price goes down, (2) the consumers' surplus, Π_D^{PM}, increases, (3) the suppliers' surplus, Π_S^{PM}, decreases, and (4) overall surplus, Π^{PM}, decreases. When $\tilde{p} > p_c$, we will say that suppliers enjoy more power than consumers and when $\tilde{p} < p_c$, we will say that consumers enjoy more power than suppliers. Importantly, if a market is in the $\tilde{p} > p_c$ range, consumers may gain some power, and pull the price down, closer to p_c ; and suppliers may gain more power and push the price further up.

We define a variable P^{PM} that represents relative power in the product market. At the perfect competition, no-power benchmark, we have $P^{PM} = 0$. An increase in P^{PM} represents an increase in firms' power, and a decrease in P^{PM} represents an increase in consumers' power. A higher P^{PM} means a larger suppliers' surplus and a smaller consumers' surplus:

$$\frac{d\Pi_S^{PM}}{dP^{PM}} > 0 \text{ and } \frac{d\Pi_D^{PM}}{dP^{PM}} < 0.$$

The effect on the overall surplus is contingent: when $P^{PM} > 0$, we have $\frac{d\Pi^{PM}}{dP^{PM}} < 0$; and when $P^{PM} < 0$, we have $\frac{d\Pi^{PM}}{dP^{PM}} > 0$. Overall surplus increases as we get closer to the perfect-competition, no-power benchmark, and decreases as we move away from this benchmark.

(c) Investments. — Our framework comprises of two major components: productivity and power. Each component affects the suppliers' surplus (Π_S^{PM}), the consumers' surplus (Π_D^{PM}) and the overall surplus (Π^{PM}). And each component is endogenously determined by the investment strategies of the suppliers and consumers. These investments take one of two forms: (1) investments in technology, and (2) legal investments that include lobbying, litigation and the design of standard form contracts.

The basic components of our framework are depicted in Figure 2 below.

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[31] We use perfect competition as a theoretical, conceptual benchmark. Actual markets that exhibit perfect competition are exceedingly rare and, perhaps, non-existent. Indeed, were perfect competition the normal case, there would be no innovation, and no sustained productivity growth.

[32] Price increases with suppliers' power only up until the monopoly price.

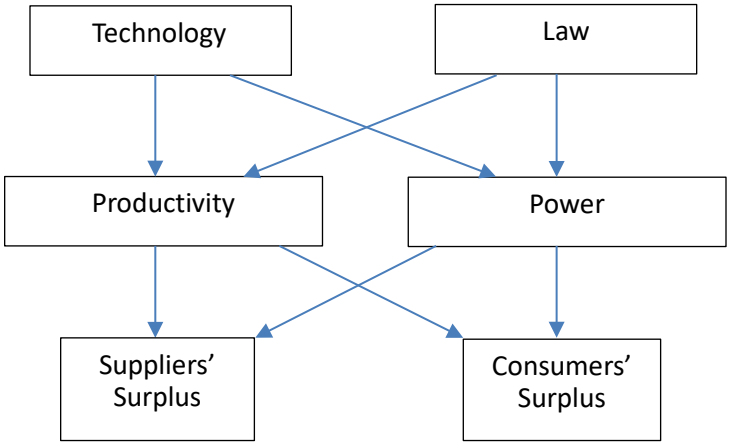

Figure 2: Framework of Analysis

Our framework allows for interactions between productivity and power. For example, a firm can invest in a new technology that increases the benefit from its product or allows for the introduction of a new product. Being the only provider of the new or improved product, the firm enjoys market power (which can also be bolstered by legal investments, e.g., in securing a patent). Thus, productivity-increasing investments can also be power-increasing (a neo-Schumpetarian argument). Productivity and power can interact in yet another way. When a firm enjoys greater market power, it can extract a larger share of the overall surplus. For this firm, the return to productivity-increasing investments is larger; and thus the firm will invest more in increasing its productivity.

Investments–in technology and in law–play a central role in our analysis. They also imply an inherently dynamic framework: Parties invest to increase their surplus, which means that surplus–suppliers' surplus, consumers' surplus and overall surplus–in period t+1 can be different from surplus in time t. We thus employ a dynamic extension of the standard supply-and-demand framework depicted in Figure 1. Let $\Pi_S^{PM}|_t$ denote the suppliers' surplus at time t, let $\Pi_D^{PM}|_t$ denote the consumers' surplus at time t, and let $\Pi^{PM}|_t$ denote the overall surplus at time t. What we really care about is the aggregate of the overall surplus, $\sum_t(\Pi^{PM}|_t)$, across all relevant time periods t=1,2,… , and about how this aggregate overall surplus is divided between firms, $\sum_t(\Pi_S^{PM}|_t)$, and consumers, $\sum_t(\Pi_D^{PM}|_t)$.[33] Our definition of welfare is thus inherently dynamic; and this will play a critical role in our analysis of innovation. With a slight abuse of notation, we will sometimes use Π^{PM} to refer to the static, single-period surplus and sometimes use Π^{PM} to refer to

[33] We assume no temporal discounting (i.e., a discount factor of 1). The framework can be readily extended to allow for temporal discounting (i.e., a discount factor smaller than 1).

the aggregate $\sum_t(\Pi^{PM}|_t)$; the same holds for Π_S^{PM} and Π_D^{PM}. The specific usage will be clear from the context.

The dynamic framework triggers two related observations: First, both descriptive and normative analyses may require intertemporal tradeoffs. For example, a firm may choose an investment that reduces its period 1 profits, if this investment promises to increase the firm's surplus and profits in future periods. And a policy that reduces overall surplus or consumer surplus in period 1 may be desirable, if it increase overall surplus or consumer surplus in future periods. Second, we defined perfect competition as the zero-power benchmark. And we noted that when a firm increases its market power, relative to this benchmark, the overall surplus and the consumer surplus decrease. In a static framework, this result suggests that any (positive) degree of market power is welfare reducing. In a dynamic framework, the welfare implications are more subtle: some degree of market power may be necessary to support investment in innovation that increases the overall surplus and the consumer surplus in future periods. Therefore, a non-zero level of market power may be socially optimal.[34]

Next, we describe the investments in each of the two major components–productivity and power. For each component, we consider investments in technology and law. The question how parties allocate their resources among the different investment options will be addressed in Part III.

2. Productivity. — In our framework, the notion of productivity represents the location of the supply and demand curves. Parties can affect productivity by investing in technology or law.

(a) Technology. — Technology can reduce production costs and shift the supply curve downward. And technology can increase the quality of the product or service and shift the demand curve upwards. Firms invest resources, R_{TPy}^{PM}, in productivity-increasing technology. Initially, we lump together (i) investments in technology that reduce the cost of production, pushing the supply curve down, and (ii) investments in technology that increase the benefit that consumers gain from the product (by raising product quality), pulling the demand curve up. Firms clearly have an incentive to invest in reducing the cost of production. They also have an incentive to invest in increasing the quality of their product and thus the benefit to consumers from purchasing the product–higher quality allows the firms to charge a higher price (at least if firms enjoy some market power).

Firms' investments in productivity-increasing technology, R_{TPy}^{PM}, affect both the suppliers' surplus, Π_S^{PM}, and the consumers' surplus, Π_D^{PM}. The marginal return of the R_{TPy}^{PM} investment, in terms of overall surplus, depends on the relative power of suppliers and consumers. For example, if we are closer to the competitive equilibrium, then an investment that raises the

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[34] *See, e.g.*, PHILIPPE AGHION & PETER HOWITT, ENDOGENOUS GROWTH THEORY, Chapter 7, p. 205 (1997) ("*to the extent that monopoly rent is what induces firms to innovate and thereby makes the economy grow, product market competition can only be detrimental to growth*").

demand curve will have a larger effect on overall surplus; and if we are further away from the competitive equilibrium, e.g., because suppliers have significant market power, then the same investment would have a smaller effect on overall surplus. The marginal return of the R_{TPy}^{PM} investment, in terms of the suppliers' surplus is different: When the firm enjoys greater market power and extracts a larger share of the overall surplus, the firm's private return to productivity-increasing investment is higher.

Consumers invest resources, CR_{TPy}^{PM}, in productivity-increasing technology. Consumers' technology investments are generally focused on innovations that increase the benefit that consumers gain from the product, pulling the demand curve up. Examples include parents hacking their diabetic children's glucose monitors so they can upload the data to the Internet and monitor the children's glucose levels remotely; and mountain bikers and surfers modifying their bikes and surfboards to increase user control.[35] Often, firms will adopt and "productize" these user innovations, as with surfboards or with the increasing integration of open source software into the software industry production cycle. When this happens, the user-consumer innovations can also push down the supply curve by reducing the cost to firms.

(b) Law. — Parties make legal investments that increase productivity–that shift the supply curve down or shift the demand curve up. Firms spend resources, R_{LPy}^{PM}, promoting laws that (i) reduce production costs (pushing the supply curve down), e.g., by lowering tariffs on imported factors of production, or (ii) increase the benefit to consumers from the product (pulling the demand curve up), e.g., by removing regulatory restrictions on the permissible uses of the product.[36] Some laws simultaneously increase benefits and costs. Consider rules that mandate a certain minimum quality (e.g., airbags). Such rules increase benefits (demand curve goes up) and increase costs (supply curve goes up). As long as the benefits outweigh the costs, investments in promoting such rules are productivity-increasing legal investments. When benefits outweigh costs, the overall surplus increases. The suppliers' surplus and the consumer surplus also increase. The relative magnitude of these effects–on suppliers and consumers–depends on the relative power in the product market (which determines the law's effect on price).[37]

Consumers spend resources, CR_{LPy}^{PM}, promoting similar laws. As explained above, when it comes to reducing costs (shifting the supply curve down)

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[35] Eric von Hippel, Free Innovation 1–3 (2016); Eric von Hippel, Democratizing Innovation 93–95 (2005)..

[36] Another example is Zuckerberg's call for government regulation of social media. *See* Mark Zuckerberg, *The Internet Needs New Rules. Let's Start in These Four Areas,* Opinions (Mar. 30, 2019, 10:00 PM), https://www.washingtonpost.com/opinions/mark-zuckerberg-the-internet-needs-new-rules-lets-start-in-these-four-areas/2019/03/29/9e6f0504–521a-11e9-a3f7–78b7525a8d5f_story.html.

[37] Even if the consumer surplus increases, there can be winners and losers (e.g., the poor may prefer a lower-quality, lower-price product).

and increasing benefits (shifting the demand curve up), the interests of firms and consumers are aligned.

(c) Inter-market links. — Greater labor market productivity increases surplus in the product market. Also, when firms enjoy more power in the labor market and thus pay lower wages, this increases surplus in the product market, as lower wages translate into lower product prices. Therefore, firms and consumers will both invest in technology and law that (i) increases labor market productivity, and (ii) increases firms' labor market power. Therefore, we count within R_{TPy}^{PM}, CR_{TPy}^{PM}, R_{LPy}^{PM} and CR_{LPy}^{PM} investment in technology and laws that increase the firms' surplus in the labor market, Π_D^{LM}, and thus indirectly increase the overall surplus in the product market.[38] These inter-market links formalize observed political phenomena, such as the role of consumer advocacy organizations in supporting airline, trucking, and telecommunications deregulation in the 1970s in direct conflict with the major unions in these sectors. Similarly, consumer advocacy organizations and unions have in the past found themselves on opposite sides of free trade agreements (where imports increase competition and create downward pressure on wages, in the labor market, but reduce prices in the product market). The tension between what is good for consumers and what is good for workers emerges primarily when different agents represent different parts or aspects of the broad population of worker-consumers. Specialist organizations that cover non-overlapping portions of the population create potential agency problems for the population who are both consumers and workers. By comparison, systems where union coverage is universal enough so that unions can take into consideration their members' interests as both consumers and workers, or jurisdictions where the role of state coordination in the economy is large enough so that "citizens" becomes the category that overlaps the two populations (consumers, workers), are likely to be able to avoid this tension.

(d) Summary. — The level of productivity, Py^{PM}, is affected by firms' and consumers' technology investments:

$$\frac{dPy^{PM}}{dR_{TPy}^{PM}} > 0 \text{ and } \frac{dPy^{PM}}{dCR_{TPy}^{PM}} > 0.$$

Productivity, which we define to include all factors that shift the supply or demand curves, is also affected by legal investments. Firms' legal investment, R_{LPy}^{PM}, and consumers' legal investment, CR_{LPy}^{PM}, produce a law $\lambda_{Py}^{PM}(R_{LPy}^{PM}, CR_{LPy}^{PM})$. We assume that a larger λ_{Py}^{PM} increases the surplus through a higher Py^{PM}, i.e.,

$$\frac{dPy^{PM}}{d\lambda_{Py}^{PM}} > 0.$$

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[38] These observations are qualified in Section II.C. below, where we consider the overlap between consumers and workers, i.e., that the same people can be both consumers and workers. Specifically, consumers will not invest in increasing firms' labor market power, if the resulting reduction in wages outweighs any benefit in terms of lower product-market prices.

With respect to productivity, the interests of firms and consumers are aligned, namely, they both benefit from higher productivity, and thus they both invest in laws that increase the surplus:

$$\frac{d\lambda_{Py}^{PM}}{dR_{LPy}^{PM}} > 0 \text{ and } \frac{d\lambda_{Py}^{PM}}{dCR_{LPy}^{PM}} > 0.$$

3. Power. — Power, in our framework, affects price–and through price the size and division of the surplus–without changing the location of the supply and demand curves. Parties can influence their relative power by investing in technology or law.

(a) Technology. — Firms invest resources, R_{TPr}^{PM}, in power-increasing technology. These are investments that exclude competitors and thus increase or maintain market concentration and monopoly power. In the standard supply-and-demand framework (Figure 1), these investments move neither the supply curve nor demand curve. Rather, they affect only the price charged and the quantity sold. In particular, an investment R_{TPr}^{PM} that increases the suppliers' power will increase suppliers' surplus, Π_S^{PM}, while reducing both the consumers' surplus, Π_D^{PM}, and the overall surplus, Π^{PM} (assuming that we are in the $P^{PM} > 0$ range).

Such power-increasing investments include product design choices. For example, in the mid-1900s, Microsoft designed its Internet Explorer browser to stave off competition.[39] Another example is Apple's choice of product design features that lock consumers in. Specifically, Apple introduced a range of non-standard interfaces, so that shifting from an Apple product to a competitor's product (including shifting one's data between products) would be difficult and expensive. Consumers cannot even purchase generic replacement power cords, because of Apple's design choices. Or consider firms investments in unnecessarily complex and confusing product design or pricing schemes, which can increase firms' market power by making it harder for consumers to comparison-shop.

Consumers invest resources, CR_{TPr}^{PM}, in power-increasing technology–to increase their own power or to reduce (or keep in check) the firms' power. For example, consumer groups supported free and open source software that limited the power of firms with proprietary software. Another example concerns digital-rights management (DRM): Firms used DRM to increase their market power and segment markets, as when they introduced regional-zone-enforcing DVD players and regional price discrimination in the sale of DVDs. Consumer groups supported DRM-defeating innovation that allowed consumers to play any DVD on non-regional zone enforcing DVD players.

(b) Law. — Parties make legal investments that increase their power. Firms spend resources, R_{LPr}^{PM}, promoting laws that create or strengthen monopoly power, e.g., by imposing stringent licensing or capital requirements that prevent entry by potential competitors. Consumers spend resources,

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[39] *See* Section VII.C. below.

CR_{LPr}^{PM}, promoting laws that increase competition in the suppliers' market. For example, consumer groups supported net neutrality rules that would have limited the market power of broadband providers and of the large incumbent information services (and content) providers. On the grandest scale, the consumer movement was absolutely central to the deregulation of airlines, trucking, and banking in the 1970s, which led to increased entry into these markets and thus to enhanced competition (until investments by firms, a decade later, enabled reconcentration starting in the 1990s).

(c) Summary. — Relative power, Pr^{PM}, is affected by firms' and consumers' technology investments. Since a larger Pr^{PM} means that firms enjoy greater power (and a smaller Pr^{PM} means that consumers enjoy greater power), firms' investments in power-increasing technology, R_{TPr}^{PM}, increase Pr^{PM}:

$$\frac{dPr^{PM}}{dR_{TPr}^{PM}} > 0;$$

and consumers' investments in power-increasing technology, CR_{TPr}^{PM}, decrease Pr^{PM}:

$$\frac{dPr^{PM}}{dCR_{TPr}^{PM}} < 0.$$

Relative power is also affected by legal investments. Firms' legal investment, R_{LPr}^{PM}, and consumers' legal investment, CR_{LPr}^{PM}, produce a law $\lambda_{Pr}^{PM}(R_{LPr}^{PM}, CR_{LPr}^{PM})$. We assume that a larger λ_{Pr}^{PM} increases firms' relative power Pr^{PM}, i.e.,

$$\frac{dPr^{PM}}{d\lambda_{Pr}^{PM}} > 0.$$

With respect to power-affecting laws, the interests of firms and consumers are diametrically opposed: firms seeks to increase λ_{Pr}^{PM} and consumers seek to reduce λ_{Pr}^{PM}, i.e.,

$$\frac{d\lambda_{Pr}^{PM}}{dR_{LPr}^{PM}} > 0 \text{ and } \frac{d\lambda_{Pr}^{PM}}{dCR_{LPr}^{PM}} < 0.$$[40]

Finally, as explained above, productivity-increasing investments–in technology or in law–can also affect power (- the neo-Schumpetarian argument).[41]

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[40] There can be a complementarity between power-increasing technology investments and power-increasing legal investments. For example, legal investments by broadband providers to oppose net neutrality were only beneficial thanks to technology investments that enabled paid prioritization (policy routers that allowed broadband providers to inspect and discriminate among packets of data). *See* Section VII.B. below. Formally, this means that $\frac{dPr^{PM}}{dR_{LPr}^{PM}} = \frac{dPr^{PM}}{d\lambda_{Pr}^{PM}} \cdot \frac{d\lambda_{Pr}^{PM}}{dR_{LPr}^{PM}}$ can be a function of R_{TPr}^{PM}, and that $\frac{dPr^{PM}}{dR_{TPr}^{PM}}$ can be a function of R_{LPr}^{PM}.

[41] Our model uses reduced-form functions to capture the relationship between different investments and the surplus enjoyed by each actor, mediated by productivity and power. A next step, reserved for future work, would utilize existing, more specific models–of the product market, of the labor market, of lobbying, etc'–to impose more structure on, or perhaps even replace, the reduced form functions used in the current framework.

B. Labor Market

1. Setup. — The framework of analysis developed, in Section A, for the product market applies, with appropriate adjustments, to the labor market. Here too we have two major components: technology and power. Each component affects the workers' surplus (Π_S^{LM}), the firms' surplus (Π_D^{LM}) and the overall surplus ($\Pi^{LM} = \Pi_S^{LM} + \Pi_D^{LM}$). Note that, in the labor market, workers are the suppliers and firms are on the demand side of the market. Each of the two components is endogenously determined by the investment strategies of the firms and the workers.

We define a variable Py^{LM} that represents productivity in the labor market. Higher productivity increases the firms' surplus, the workers' surplus and the overall surplus:

$$\frac{d\Pi_S^{LM}}{dPy^{LM}} > 0, \frac{d\Pi_D^{LM}}{dPy^{LM}} > 0 \text{ and } \frac{d\Pi^{LM}}{dPy^{LM}} > 0.$$

We define a variable P^{LM} that represents relative power in the labor market. At the perfect-competition, no-power benchmark, we have $P^{LM} = 0$. An increase in P^{LM} represents an increase in firms' power, and a decrease in P^{LM} represents an increase in workers' power. A higher P^{LM} means a larger firms' surplus and a smaller workers' surplus:

$$\frac{d\Pi_D^{LM}}{dP^{LM}} > 0 \text{ and } \frac{d\Pi_S^{LM}}{dP^{LM}} < 0.$$

The effect on the overall surplus is contingent: when $P^{LM} > 0$, we have $\frac{d\Pi^{LM}}{dP^{LM}} < 0$; and when $P^{LM} < 0$, we have $\frac{d\Pi^{LM}}{dP^{LM}} > 0$.
Overall surplus increases as we get closer to the perfect-competition, no-power benchmark, and decreases as we move away from this benchmark.

Investments. Each of the two major components, productivity and power, is endogenously determined by the investment strategies of the firms and workers. These investments take one of two forms: (1) investments in technology, and (2) legal investments that include lobbying, litigation and the design of labor contracts.

Next, we describe the investments in each of the two major components–productivity and power. For each component, we consider investments in technology and law. The question how parties allocate their resources among the different investment options will be addressed in Part III.

2. Productivity. — In our framework, the notion of productivity represents the location of the supply and demand curves. In the labor market, the emphasis is on increasing the benefit from labor (or the productivity of labor) rather than on reducing the cost of labor.[42] We thus focus on the

[42] The cost of labor would be measured by the value of time to the employee, e.g., rather than spend an hour on the job the employee could enjoy an hour of leisure. We take this value of leisure to be exogenous and not a part of the definition of labor productivity.

demand curve. Parties can affect productivity by investing in technology or law.

To be clear: Our discussion (below) considers multiple, historical examples, where firms made investments that were designed to increase the supply of labor. But in all of these examples the primary effect of the investment was to change the power balance, and the new workers were either unskilled workers who were more readily replaceable than incumbent skilled workers, and hence had less bargaining power, or were from demographic or socio-economic groups that by social convention and lack of political power formed a distinct labor supply–specifically, Black workers, women, children, or immigrants. Therefore, we believe that it is more accurate to characterize firms' investments to open the labor market in this way not as productivity-increasing investments that simply push the supply curve outward in a single, unified labor market, but rather as power-increasing investments that introduce a new, distinct labor supply in order to enhance the firms' power vis-à-vis the incumbent workers. Accordingly, we discuss such examples in the next section, which focuses on power-increasing investments. We acknowledge that there are investments that firms can make, such as cooperating with public vocational training programs, lifelong retraining, or public health, that shift the supply curve outward in ways that can be understood as productivity-increasing. Practically, these seem to have been less common in the behavior of firms than the kinds of power-increasing investments on which we focus in the context of labor markets.

(a) Technology. — Firms invest resources, R_{TPy}^{LM}, in productivity-increasing technology. Technology that increases the productivity of labor, and thus the benefit to firms from labor, shifts the demand curve upwards. Investments that increase workers' productivity include: purchasing better equipment, establishing a better work environment, investments in training, and investing in process innovations like Toyota Production System or LEAN manufacturing that encourage continuous improvement by workers.[43]

Workers invest resources, WR_{TPy}^{LM}, in productivity-increasing technology. These include investments in training and professional education. High-commitment, high-performance organizations, such as the Toyota Production System or the extension of continuous improvement to LEAN manufacturing provide another example. These organizations or systems assume that workers know a lot about shop-floor processes and potential improvements to these processes and that knowledge about these potential improvements is sticky and often tacit. Therefore, utilization of such

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[43] THE FIRM AS A COLLABORATIVE COMMUNITY: RECONSTRUCTING TRUST IN THE KNOWLEDGE ECONOMY, (Charles C. Heckscher & Paul S. Adler eds., 2006); MICHAEL BEER, RUSSELL A. EISENSTAT & NATHANIEL FOOTE, HIGH COMMITMENT, HIGH PERFORMANCE: HOW TO BUILD A RESILIENT ORGANIZATION FOR SUSTAINED ADVANTAGE (1st ed ed. 2009); ZEYNEP TON, THE GOOD JOBS STRATEGY : HOW THE SMARTEST COMPANIES INVEST IN EMPLOYEES TO LOWER COSTS AND BOOST PROFITS (2014).

knowledge must rely on intrinsic motivations of workers to invest in business process innovation, shop floor workflow, and incremental improvement of actual physical technology. One of the classic examples was Xerox's Eureka! System, which was developed after ethnographic studies of French Xerox photocopier repair technicians found that the technicians kept two separate repair manuals. The first was a clean original to show bosses. The second was a marked-up manual they actually used, in which they recorded their own procedures and insights into the many ways in which the machines could fail, and be repaired–procedures and insights that the engineers who had designed the machines and wrote the manual did not anticipate. Recognizing this, Xerox then developed a system, Eureka!, to allow technicians to communicate with each other about diagnosis and repair of machine failures. This system became one of the first examples of collaborative knowledge sharing, or peer production, that has become such a foundational practice in software development.[44]

(b) Law. — Parties make legal investments that affect productivity. When it comes to increasing labor productivity (shifting the demand curve up), the interests of "high-road" firms and workers are aligned, but are in competition with the interests of "low road" firms. By "high road firms" we mean firms that care about long-term profitability and about mainfirms" we mean firms that focus on short-term profitability. There are many examples of both kinds of firms co-existing in real-world markets.[45] High-road firms spend resources, R_{LPy}^{LM}, promoting laws that increase labor productivity. For example, such firms invest in laws that establish and enforce labor standards, such as health and safety protections (e.g., healthcare benefits, paid sick leave, etc'), that increase the productivity of the workforce. Even though such standards are efficient, they might not be adopted voluntarily, because competing low-road employers might offer higher wages, rather than the efficient standards, and attract workers who do not know about, or underestimate the value of, the benefits from labor standards. Such "defection" from the efficient standard is even more attractive when workers have weak bargaining power and get minimum wages with or without the efficient standards. Indeed, when workers have weak bargaining power, they will accept inefficiently low standards even though they fully understand the value of the benefits from labor standards. While firms will often prefer self-regulation, mandatory legal requirements are a direct way of overcoming these kinds of collective action failures. Workers spend resources, WR_{LPy}^{LM}, promoting similar laws.

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[44] Cristina Bayona-Sáez & Teresa García-Marco, *Assessing the effectiveness of the Eureka Program*, 39 RSCH. POL'Y. 1375, 1376 (2010); *See also* Daniel Bobrow & Jack Whalen, *Community knowledge sharing in practice: the Eureka story*, 4 REFLECTIONS: SOC'Y FOR ORG. LEARNING J. 47, 51–58 (2002).

[45] Classic examples include Walmart and Costco, *See* Ton, GOOD JOBS, *supra* (YB to cite), Japanese and German automobile manufacturers as compared to American manufacturers (see John Paul MacDuffie and Susan Helper, *Collaboration in Supply Chains: With and Without Trust*, *in* FIRM AS COLLABORATIVE COMMUNITY, *supra* note 43.

(c) Inter-market links. — Greater product market productivity increases surplus in the labor market. Also, when firms enjoy more power in the product market, this increases surplus in the labor market. Therefore, firms and workers will both invest in technology and law that (i) increases product market productivity, and (ii) increases firms' product market power.[46] Therefore, we count within R^{LM}_{TPy}, WR^{LM}_{TPy}, R^{LM}_{LPy} and WR^{LM}_{LPy} investment in technology and laws that increase the firms' surplus in the product market, Π^{PM}_{S}, and thus indirectly increase the overall surplus in the labor market.

(d) Summary. — The level of productivity, Py^{LM}, is affected by firms' and workers' technology investments:

$$\frac{dPy^{LM}}{dR^{LM}_{TPy}} > 0 \text{ and } \frac{dPy^{LM}}{dWR^{LM}_{TPy}} > 0.$$

Productivity is also affected by legal investments. Firms' legal investment, R^{LM}_{LPy}, and workers' legal investment, WR^{LM}_{LPy}, produce a law $\lambda^{LM}_{Py}(R^{LM}_{LPy}, WR^{LM}_{LPy})$. We assume that a larger λ^{LM}_{Py} increases the surplus through a higher Py^{LM}, i.e.,

$$\frac{dPy^{LM}}{d\lambda^{LM}_{Py}} > 0.$$

With respect to productivity, the interests of firms and workers are aligned, namely, they both benefit from higher productivity, and thus they both invest in laws that increase the surplus:

$$\frac{d\lambda^{LM}_{Py}}{dR^{LM}_{LPy}} > 0 \text{ and } \frac{d\lambda^{LM}_{Py}}{dWR^{LM}_{LPy}} > 0.$$[47]

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[46] Yochai Benkler, *A Political Economy of Oligarchy: Winner-take-all ideology, superstar norms, and the rise of the 1%* (2017), http://www.benkler.org/Political%20economy%20of%20oligarchy%2001.pdf. (unpublished manuscript) (describing the alignment of unions with regulated industries in trucking, airlines, and telecommunications regulation against consumer advocates seeking greater competition in these product markets. As a result of deregulation, unionized male workers in recently deregulated industries were the sector of labor that saw the largest drop in wages in the 1980s).

[47] The relationship between the interests of firms and workers can be more complicated. Consider changes in procedures or technologies that could increase productivity, as measured by output per hour, such that fewer hours of work are needed to complete the same job. If workers are paid per hour and, for some exogenous reason, the hourly wage is fixed, then workers will resist such productivity-increasing technologies. We view this as a power issue, rather than a productivity issue. If workers had more power, then hourly wages would increase to reflect the increased output per hour, and workers would support the productivity-increasing technology. A related issue involves shop floor procedures that increase work rate or pacing–eliciting and harnessing more labor effort per hour, e.g., by reducing breaks (formal breaks or informal breaks) or speeding up the assembly line so as to require more human effort per minute. Reducing breaks are not productivity-increasing changes, as we define them. While output per nominal hour increases in a technical sense, this comes at the expense of workers' leisure time and somatic well being (exhaustion) in the short run and (likely) health in the long run. If we measured output per minute worked, there would be no increase. Speeding up the assembly line so as to require more human effort per minute may be productivity increasing. Workers may support such changes, if they are accompanied by higher wages sufficient to compensate for the lost leisure or increased physical and mental effort per minute. But if, for some exogenous reason, the hourly wage is fixed, then workers will resist such productivity-increasing technologies. *See, e.g.*, David F. Noble, *Social Choice in Machine Design*, *in* CASE STUDIES ON THE LABOR PROCESS 18–50 (1979), http://fab.cba.mit.edu/classes/865.15/classes/machines/noble-1979.pdf (last visited Nov 11, 2019).

3. Power. — Power, in our framework, affects wages–and through wages the size and division of the surplus–without changing the location of the supply and demand curves. Parties can influence their relative power by investing in technology or law.

(a) Technology. — Firms invest resources, R_{TPr}^{LM}, in power-increasing technology. These are investments that exclude competitors and thus increase or maintain market concentration and monopsony power.[48] Firms also invest in innovations that increase competition among labor suppliers (workers). Classic historical examples include developing the self-acting (automated) spinning mule to replace skilled "spinners" in the textile industries with lower-paid, lower skilled "minders," and the shift to yoking rows of smaller mules instead of pairs of larger mules, to replace men with underpaid women;[49] capping machines in canneries that reduced productivity but broke the tin smith cappers guild; and iron molding machines that produced inferior iron but broke the molders' guild.[50] A contemporary example is remote call center communications that allow American companies to import labor from countries like India and the Philippines, with weaker labor protections, lower cost of living and lower wage expectations. Another example is the investment in monitoring technologies that reduce the need to pay efficiency wages. Finally, firms invest in technologies, such as those supporting gig work, that make it easier to fissure the workplace and undermine worker's ability to organize.[51] We elaborate on some of these examples in Part VII below.

Workers invest resources, WR_{TPr}^{LM}, in power-increasing technology–to increase their own power or to reduce (or keep in check) the firms' power. These are investments that affect the number of workers or workers' ability to coordinate, to unionize. In particular, workers invest in resisting some of the firms' power-enhancing technologies. While contemporary usage of "Luddites" is derogatory, workers' successful resistance to the introduction of machines in some regions, through strikes and sometime machine breaking, increased the bargaining power of labor. In one case that we describe in Part VII, this kind of resistance resulted in wages being twenty percent higher in Lancashire where textile workers fought to a draw than in Glasgow where they lost the battle, even decades later. Workers also invest in technology with strong learning effects and skills complementarity that make it difficult or costly for the firm to replace its current workers. Piore and Sabel, for example, describe the adoption of the Jacquard loom by silk weavers in Lyon at the beginning of the 19^{th} century. The Lyon weavers deployed this

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[48] Notice that the firm's competitors in the labor market may be different from its competitors in the product market.

[49] PINCHBECK, *supra* note 18; BERG, *supra* note 18; Lazonick, *supra* note 18.

[50] Bowles, *supra* note 19; Martin Brown & Peter Philips, *The historical origin of job ladders in the US canning industry and their effects on the gender division of labour*, 10 CAMB. J. ECON. 129–145 (1986); ROBERT W OZANNE, A CENTURY OF LABOR-MANAGEMENT RELATIONS AT MCCORMICK AND INTERNATIONAL HARVESTER (1967); Winner, *supra* note 22.

[51] Rogers, *supra* note 4.

programmable manufacturing machine to retain their competitive edge against industrialized competition from England that threatened their high-skilled, artisan model of organization. The programmable looms complemented their higher skill by enabling them to compete with a much wider variety of patterns against the more standardized outputs that were coming out of England.[52] In combination with other innovations in fibers, dyes, and printing techniques, these technological investments enabled skilled artisanal workers in Lyon to compete and remain independent, rather than be pushed into lower-skilled, lower-paid mass production jobs, at least until the 1950s. More directly, David Noble's classic study of the development of numerical control machine tools emphasizes the difference between the integration of such machines in American plants, where unions had historically shied away from fighting over technological deployment, and a direct competitor in Norway, where the union made sure that the technology was deployed and managed in ways that complemented the highly skilled machinists rather than replaced them.[53]

(b) Law. — Parties make legal investments that increase their power. Firms spend resources, R_{LPr}^{LM}, promoting laws that create or strengthen monopsony power. For example, strict immigration constraints coupled with loose enforcement create a reserve army of undocumented workers that increase competition in the market for unskilled labor. Or monetary policy that emphasizes low inflation at the expense of a higher "natural" rate of unemployment decreases worker power by increasing competition from the unemployed. Laws that ensure broad enforcement of noncompete clauses or trade secret doctrines that make it harder for workers to switch employers within the same industry also increase firms' power,[54] by limiting the ability of workers to move to a competitor who is willing to pay more, even though such laws decrease the rate of innovation through knowledge spillovers.[55] Finally, firms invest in laws that make labor organizing more difficult, lobby for "right to work" laws, etc.[56]

Workers spend resources, WR_{LPr}^{LM}, promoting laws that regulate labor market entry (e.g., requiring certification for hairdressers) and labor laws that enable or facilitate collective bargaining (unionization).

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[52] MICHAEL J. PIORE & CHARLES F. SABEL, THE SECOND INDUSTRIAL DIVIDE: POSSIBILITIES FOR PROSPERITY 30 (Nachdr. ed. 2000).

[53] Noble, *supra* note 48 at 130–135.

[54] ORLY LOBEL, TALENT WANTS TO BE FREE: WHY WE SHOULD LEARN TO LOVE LEAKS, RAIDS, AND FREE RIDING (2013).

[55] Yochai Benkler, *Law, Innovation, and Collaboration in Networked Economy and Society*, 13 ANNU. REV. LAW SOC. SCI. 231–250 (2017).

[56] Mishel, Schmitt, and Shierholz, *supra* note 15; Richard W Hurd & Cohen, L, *Fear, Conflict, and Union Organizing*, *in* K. BRONFENBRENNER, S. FRIEDMAN, R. W. HURD, R.A. OSWALD & R. L. SEEBER (EDS.) ORGANIZING TO WIN: NEW RESEARCH ON UNION STRATEGIES 181–196 (1998); Elizabeth Tandy Shermer, *Perspective | The right to work really means the right to work for less*, WASHINGTON POST, https://www.washingtonpost.com/news/made-by-history/wp/2018/04/24/the-right-to-work-really-means-the-right-to-work-for-less/ (last visited Sep 8, 2020).

(c) Summary. — Relative power, Pr^{LM}, is affected by firms' and workers' technology investments. Since a larger Pr^{LM} means that firms enjoy greater power (and a smaller Pr^{LM} means that workers enjoy greater power), firms' investments in power-increasing technology, R^{LM}_{TPr}, increase Pr^{LM}:

$$\frac{dPr^{LM}}{dR^{LM}_{TPr}} > 0;$$

and workers' investments in power-increasing technology, WR^{LM}_{TPr}, decrease Pr^{LM}:

$$\frac{dPr^{LM}}{dWR^{LM}_{TPr}} < 0.$$

Relative power is also affected by legal investments. Firms' legal investment, R^{LM}_{LPr}, and workers' legal investment, WR^{LM}_{LPr}, produce a law $\lambda^{LM}_{Pr}(R^{LM}_{LPr}, WR^{LM}_{LPr})$. We assume that a larger λ^{LM}_{Pr} increases firms' relative power Pr^{LM}, i.e.,

$$\frac{dPr^{LM}}{d\lambda^{LM}_{Pr}} > 0.$$

With respect to power-affecting laws, the interests of firms and workers are diametrically opposed: firms seek to increase λ^{LM}_{Pr} and workers seek to reduce λ^{LM}_{Pr}, i.e.,

$$\frac{d\lambda^{LM}_{Pr}}{dR^{LM}_{LPr}} > 0 \text{ and } \frac{d\lambda^{LM}_{Pr}}{dWR^{LM}_{LPr}} < 0.$$

C. Workers and Consumers

To keep things simple, our basic framework, drew a sharp distinction between consumers who operate (as buyers) in the product market, and workers who operate (as suppliers) in the labor market. But, of course, there is a significant overlap between these two groups. Many consumers are also workers. This observation requires a further refinement of our framework. Consumers would think twice about a product market investment, if it harms them as workers in the labor market. And workers would think twice about a labor market investment, if it harms them as consumers in the product market.

For example, we saw that consumers may want to invest in increasing firms' labor market power, since this would result in lower prices in the product market. But if these consumers are also workers, then they would be reluctant to make an investment that increases firms' labor market power and thus reduces their wages.[57] We also saw that workers may want to invest in increasing firms' product market power, since this would result in a wage increase. Again, if these workers are also consumers, then they

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[57] This tradeoff between lower prices and lower wages can resolve in different ways for different groups of consumers-workers: middle-class (and above) individuals may benefit more from the lower prices and suffer less from the lower wages, whereas for lower-class individuals the price reduction would not compensate for the loss of income.

would be reluctant to make an investment that increases firms' product market power and thus increases product prices.

Nonetheless, historically we observe significant division between workers and consumers. One possible explanation is that the organizations that emerge to represent the interests of workers and consumers, respectively, are specialists. Their "wins" and "losses" are measured narrowly — by the effects on "their" role-specific constituency. This is particularly stark for consumer organizations, who have a large and diffuse constituency that ranges across a diverse range of workers at very diverse income levels and geographic locations. For example, strong support by consumer organizations for free trade in manufactured goods spreads the benefits across the entire importing country, whereas the costs to labor dislocation from low wage competition abroad are highly localized and borne by concentrated subcommunities of workers.[58] Unions may be more attuned to both sides of the equation for their own members, but most of the increased costs to consumers will be absorbed by non-member consumers. For purposes of our model, we take these mismatches between the mechanisms of collective action and the challenges for pursuing a single best-strategy as consumer-workers as sufficient justification to treat consumers and workers as distinct groups. (And thus as a justification to treat the product and labor markets as distinct arenas with non-overlapping strategic actors on the individuals' side, with consumers operating only in the product market and workers operating only in the labor markets; but with firms operating across the product and labor markets.) Obviously, well-functioning democratic governance can overcome this misalignment of representation for the majority of the population, as workers and consumers come together as citizens. Similarly, coordinated economies, where union coverage is very high and where government plays a significant role in mediating agreements among apex unions and apex employers, are likely to overcome such misalignment of representation (as in Denmark or Sweden).[59] We note that achieving and sustaining well-functioning democratic governance is far from a solved problem, and that many economies are not coordinated in a way that solves conflicts between workers and consumers.

III. INVESTMENTS, OUTCOMES AND WELFARE

After setting up the framework of analysis in Part II, we now use this framework to consider the parties' optimization problems, in Section A. Insights from the analysis of the parties' optimization problems and their

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[58] DAVID AUTOR, DAVID DORN & GORDON HANSON, *The China Shock: Learning from Labor Market Adjustment to Large Changes in Trade* (2016), http://www.nber.org/papers/w21906.pdf (last visited Dec 22, 2016).

[59] Even among coordinated economies, if there is systematic divergence among different types of workers (say, native/citizen industrial workers and noncitizen guest workers in service industries), we see dualized labor markets emerge with insiders and outsiders who enjoy different protections and with wage gains going to insider workers while the cost, to firms, of these wage gains are kept at bay through weaker protections for outsider workers (as, arguably, in Germany or France). THELEN, *supra* note 21.

manifestation as real-world outcomes are collected in Section B. We end this Part, in Section C, with a welfare assessment.

A. Optimization Problems

1. Firms' Optimization Problem. — We have seen that, in both the product market and labor market, firms can invest in (i) productivity-increasing technology, (ii) productivity-increasing law, (iii) power-increasing technology, and (iv) power increasing law. How do the firms choose where to invest?

Firms have a certain amount of resources, *R*, which they allocate between the different investments. Let $\bar{R}^{PM} = (R^{PM}_{TPy}, R^{PM}_{LPy}, R^{PM}_{TPr}, R^{PM}_{LPr})$ denote the firms' vector of investments related to the product market, and let $\sum \bar{R}^{PM} = R^{PM}_{TPy} + R^{PM}_{LPy} + R^{PM}_{TPr} + R^{PM}_{LPr}$ denote the sum of these investments. Similarly, let $\bar{R}^{LM} = (R^{LM}_{TPy}, R^{LM}_{LPy}, R^{LM}_{TPr}, R^{LM}_{LPr})$ denote the firm's vector of investments related to the labor market, and let $\sum \bar{R}^{LM} = R^{LM}_{TPy} + R^{LM}_{LPy} + R^{LM}_{TPr} + R^{LM}_{LPr}$ denote the sum of these investments. Let $\bar{R} = (\bar{R}^{PM}, \bar{R}^{LM})$ denote the overall investment vector. We have: $R = \sum \bar{R}^{PM} + \sum \bar{R}^{LM}$. The resource constraint, *R*, is a key element that links the product and labor markets. The total amount of investment resources, *R*, is a function of the firms' joint surplus in the product and labor markets, $\Pi^{PM}_S + \Pi^{LM}_D$, namely: $R = R(\Pi^{PM}_S + \Pi^{LM}_D)$. Specifically, from $\Pi^{PM}_S + \Pi^{LM}_D$, a certain amount, *R*, is allocated between the different investments.[60] The "conversion function" $R(\Pi^{PM}_S + \Pi^{LM}_D)$, which "converts" surplus into resources that can be used to invest, plays an important role. For example, the firms' conversion function will likely be more "efficient"–in the sense of converting more surplus into resources for investment–than the conversion functions of consumers and workers.[61]

The firm allocates *R* between the different investment options based on their relative productivity, i.e., how much they increase $\Pi^{PM}_S + \Pi^{LM}_D$. The different investment options operate through productivity and power. Specifically, we have: $\Pi^{PM}_S(Py^{PM}, Pr^{PM})$, where $Py^{PM} = Py^{PM}(R^{PM}_{TPy}, \lambda^{PM}_{Py}(R^{PM}_{LPy}, CR^{PM}_{LPy}); CR^{PM}_{TPy})$ and $Pr^{PM} = Pr^{PM}(R^{PM}_{TPr}, \lambda^{PM}_{Pr}(R^{PM}_{LPr}, CR^{PM}_{LPr}); CR^{PM}_{TPr})$; and $\Pi^{LM}_D(Py^{LM}, Pr^{LM})$, where $Py^{LM} = Py^{LM}(R^{LM}_{TPy}, \lambda^{LM}_{Py}(R^{LM}_{LPy}, WR^{LM}_{LPy}); WR^{LM}_{TPy})$ and $Pr^{LM} = Pr^{LM}(R^{LM}_{TPr}, \lambda^{LM}_{Pr}(R^{LM}_{LPr}, WR^{LM}_{LPr}); WR^{LM}_{TPr})$. We recognize that "productivity" is used two different ways–(1) to describe investments that shift supply and demand curves in the product and labor markets, productivity-increasing investments; and (2) to describe the extent by which any investment, productivity-increasing investments or power-increasing investments, increases the

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[60] The amount *R* can be derived by comparing the marginal benefit of investments to the marginal benefit that shareholders and managers gain from alternative uses of the $\Pi^{PM}_S + \Pi^{LM}_D$ funds. The surplus, $\Pi^{PM}_S + \Pi^{LM}_D$, goes, first and foremost, to the firms' shareholders, whereas the investment decisions are made by the firms' managers. Our analysis abstracts from the agency problems between shareholders and managers.

[61] The conversion function can be contested and can be influenced by legal investments. For example, firms may seek a first amendment ruling that allows them to spend money on political contributions anonymously (citizen united), thus increasing the efficiency of their conversion function.

aggregate surplus, $\Pi_S^{PM} + \Pi_D^{LM}$. We trust that the different meanings will be clear from the context.

Firms choose investment levels by solving the following optimization problem:

$$\max_{\bar{R}} \Pi_S^{PM}(\bar{R}^{PM}) + \Pi_D^{LM}(\bar{R}^{LM})$$

$$\text{s.t. } R_{TPy}^{PM} + R_{LPy}^{PM} + R_{TPr}^{PM} + R_{LPr}^{PM} + R_{TPy}^{LM} + R_{LPy}^{LM} + R_{TPr}^{LM} + R_{LPr}^{LM} \leq R$$

To solve this optimization problem, firms compare the marginal productivity of the different investment options: If the problem has an interior solution $\bar{R}^*$, then the marginal productivity of the different investment options, at this solution point, will be equalized:

$$\frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{TPy}^{PM}} = \frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{LPy}^{PM}} = \frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{TPr}^{PM}} = \frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{LPr}^{PM}}$$

$$\frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{TPy}^{PM}} = \frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{LPy}^{PM}} = \frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{TPr}^{PM}} = \frac{d\Pi_S^{PM}(\bar{R}^*)}{dR_{LPr}^{PM}}$$

$$= \frac{d\Pi_D^{LM}(\bar{R}^*)}{dR_{TPy}^{LM}} = \frac{d\Pi_D^{LM}(\bar{R}^*)}{dR_{LPy}^{LM}} = \frac{d\Pi_D^{LM}(\bar{R}^*)}{dR_{TPr}^{LM}} = \frac{d\Pi_D^{LM}(\bar{R}^*)}{dR_{LPr}^{LM}}$$

The different investments affect firms' surplus through "intermediate" constructs–productivity and power. For legal investments, there is a preliminary step–the law–that mediates between the investment and the two primary constructs. The joint surplus, from both the product and labor markets, enters as an input into the "conversion" function, $R(\Pi_S^{PM} + \Pi_D^{LM})$, which determines the resources that will be available for investment in the next period. The different effects are summarized in Figure 3.

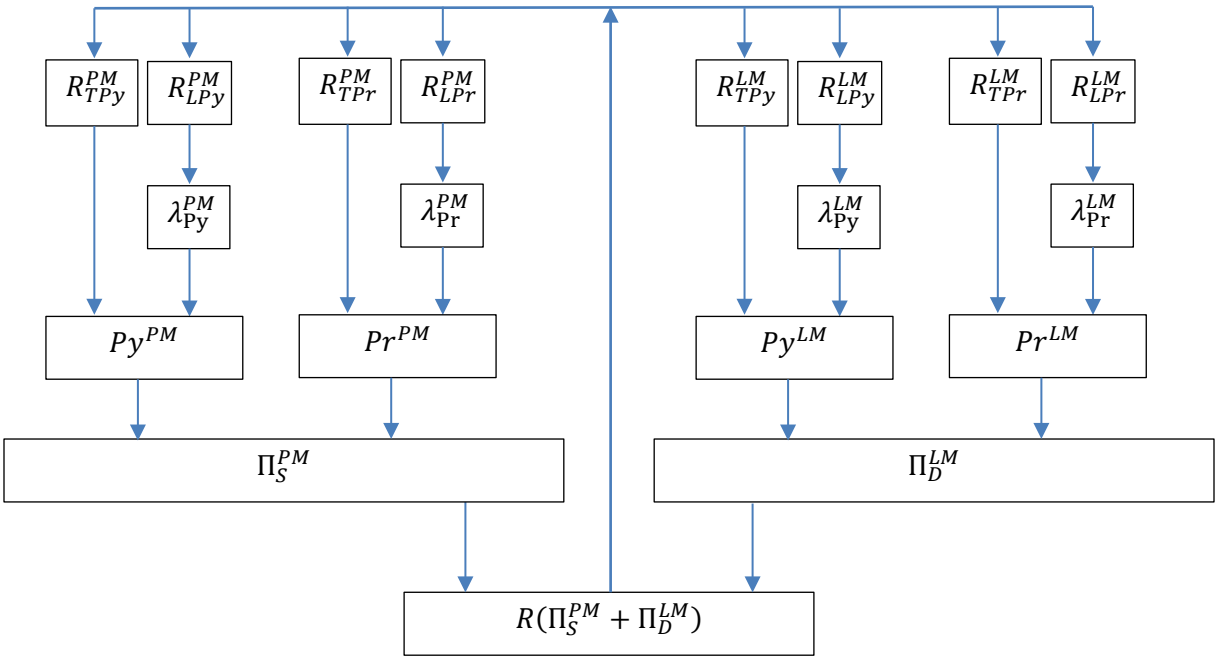

Figure 3: Firms' Investments, Surplus and Resources

2. The Consumers' Optimization Problem. — The structure of consumers' optimization problem is similar to that of the firms' optimization problem, except that firms operate across the product market and the labor market, whereas consumers operate only in the product market. Consumers have a certain amount of resources, *CR*, which they allocate between the different investments. Let $\overline{CR} = \overline{CR}^{PM} = (CR_{TPy}^{PM}, CR_{LPy}^{PM}, CR_{TPr}^{PM}, CR_{LPr}^{PM})$ denote the consumers' vector of investments, and let $CR = CR_{TPy}^{PM} + CR_{LPy}^{PM} + CR_{TPr}^{PM} + CR_{LPr}^{PM}$ denote the sum of these investments. The total amount of investment resources, *CR*, is a function of the consumers' surplus, Π_D^{PM}, namely: $CR = CR(\Pi_D^{PM})$.

More realistically, think of NGOs with resources *CR* that allocate these resources between the different investments. Consumers contribute to these NGOs (e.g., donate to or buy membership in Consumers Union) and so the NGOs' resources, *CR*, are a function of the consumers' surplus, Π_D^{PM}. More recently, these formalized NGOs have been complemented and sometimes supplemented by online mobilization, such as consumer boycotts or lobbying campaigns. The consumers' "conversion function" $CR(\Pi_D^{PM})$,

which operates through NGOs or online campaigns, is probably not very efficient. [62]

Consumers choose investment levels by solving the following optimization problem:

$$\max_{\overline{CR}} \Pi_D^{PM}(\overline{CR})$$

$$\text{s.t. } CR_{TPy}^{PM} + CR_{LPy}^{PM} + CR_{TPr}^{PM} + CR_{LPr}^{PM} \leq CR$$

As with the firms' optimization problem, consumers solve their optimization problem by comparing the marginal productivity of the different investment options.

3. The Workers' Optimization Problem. — The structure of workers' optimization problem is also similar to that of the firms' optimization problem, except that firms operate across the product market and the labor market, whereas workers operate only in the labor market. Workers have a certain amount of resources, *WR*, which they allocate between the different investments. Let $\overline{WR} = \overline{WR}^{LM} = (WR_{TPy}^{LM}, WR_{LPy}^{LM}, WR_{TPr}^{LM}, WR_{LPr}^{LM})$ denote the workers' vector of investments, and let $WR = WR_{TPy}^{LM} + WR_{LPy}^{LM} + WR_{TPr}^{LM} + WR_{LPr}^{LM}$ denote the sum of these investments. The total amount of investment resources, *WR*, is a function of the workers' surplus, Π_S^{LM}, namely: $WR = WR(\Pi_S^{LM})$.

More realistically, think of unions with resources *WR* that allocate these resources between the different investments. Workers contribute to the unions and so the unions' resources, *WR*, are a function of the workers' surplus, Π_S^{LM}. The efficiency of the workers' "conversion function" $WR(\Pi_S^{LM})$, depends on union participation and union coverage. In countries like Denmark or Sweden, with 67% or 70% membership and 80% or 88% coverage,[63] respectively, the conversion function is likely highly efficient. In the United States, with a 10.3% membership rate and 11.7% coverage rate,[64] the conversion function is likely quite inefficient. The efficiency of workers' conversion function is thus the product of victories or

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[62] A first obvious limitation on the efficiency of NGOs' conversion function is free riding: many consumers obtain surplus from well-crafted policy interventions, but do not contribute to the NGOs that fight for these benefits. Because they are underfunded relative to the overall benefits of well-functioning consumer-side investment, they are often outgunned by better-funded firms' lobbying efforts. Online mobilization is often leaderful (or leaderless), and it is difficult to focus its energies on the most effective interventions, as opposed to those campaigns easiest to explain and excite participants around. Because NGOs often pursue a broader range of policies than consumer surplus maximization, some effort is aimed at achieving more symbolic than directly economic benefits. Finally, NGOs are often funded by foundations, and their metrics for success must align with those of program officers at the foundations who, in turn, are rarely single-mindedly focused on increasing consumer surplus.

[63] Sweden / Countries / National Industrial Relations / Home–WORKER PARTICIPATION.eu, https://www.worker-participation.eu/National-Industrial-Relations/Countries/Sweden (last visited Jul 31, 2020); Denmark / Countries / National Industrial Relations / Home–WORKER PARTICIPATION.eu, https://www.worker-participation.eu/National-Industrial-Relations/Countries/Denmark (last visited Jul 31, 2020).

[64] The number of workers represented by a union held steady in 2019, while union membership fell, ECONOMIC POLICY INSTITUTE, https://www.epi.org/publication/2019-union-membership-data/ (last visited Jul 31, 2020).

losses in prior rounds of investment — as firms and unions invest to decrease/increase membership and coverage, and hence conversion efficiency in future rounds.[65] Even with high participation and conversion rates, only a small fraction of workers' surplus goes to the union, e.g., through union fees, further limiting the efficiency of the workers' conversion function.

Workers choose investment levels by solving the following optimization problem:

$$\max_{\overline{WR}} \Pi_S^{LM}(\overline{WR})$$

$$\text{s.t. } WR_{TPy}^{LM} + WR_{LPy}^{LM} + WR_{TPr}^{LM} + WR_{LPr}^{LM} \leq WR$$

As with the previous optimization problems, workers solve their optimization problem by comparing the marginal productivity of the different investment options.

4. Workers and Consumers. — As noted above, our first-cut analysis drew a sharp distinction between consumers who operate (as buyers) in the product market, and workers who operate (as suppliers) in the labor market. We justified this analysis by invoking the real-world, institutional separation between consumer organizations and labor unions and the divergent incentives of these institutions.[66] But, of course, there is a significant overlap between consumers and workers. Many consumers are also workers. The optimization problems should be revised to reflect this observation. If the preceding analysis assumed a sharp distinction between consumers and workers, we now briefly consider, just to fix ideas, the other polar case where all consumers are workers and all workers are consumers. In this polar case, we have just two parties (or groups of parties): firms and consumers-workers (CWs). Like firms, CWs operate in both the product market and the labor market. The structure of CWs' optimization problem would thus be very similar to the structure of the firms' optimization problem (in Section 1 above).

5. Interactions between the Different Optimization Problems. — The different parties, firms, consumers and workers, interact strategically with one another, such that the optimization problem of one party affects the optimization problem of another. These interactions give rise to multiple equilibria.

Focusing on the product market, consider the strategic interaction between firms' investments and consumers' investments. We can derive the firms' reaction function $R(CR)$ and the consumers' reaction function

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[65] JACOB S. HACKER & PAUL PIERSON, WINNER-TAKE-ALL POLITICS: HOW WASHINGTON MADE THE RICH RICHER-AND TURNED ITS BACK ON THE MIDDLE CLASS (1st Simon & Schuster hardcover ed ed. 2010) (describing how early victories by anti-labor firms' investment in the late 1970s, combined with strong Reagan support in the early 1980s, reduced labor union participation and thus reduced the efficiency of unions in later rounds).

[66] *See supra* Section II.C.

$CR(R)$. We can think of the strategic interaction between the overall investments of firms, R, and the overall investments of consumers, CR. But, in many applications, it would be more realistic to think about a certain category of investment by firms and by consumers. For example, we would consider firms' power-increasing legal investments, R_{LPr}^{PM}, and consumers' power-increasing legal investments, CR_{LPr}^{PM}. A larger investment by consumers can increase the productivity of the firms' investment and thus result in a larger investment by firms. Or a larger investment by consumers can decrease the productivity of the firms' investment and thus result in a smaller investment by firms. And, the firms' investment can have a similar effect on consumers' investments.

To illustrate the possibility of multiple equilibria, assume that a larger legal investment by consumers would lead to a larger legal investment by firms ($dR_{LPr}^{PM}/dCR_{LPr}^{PM} > 0$) and that a larger legal investment by firms would lead to a larger legal investment by consumers ($dCR_{LPr}^{PM}/dR_{LPr}^{PM} > 0$). In this scenario, we can have a "Low-Low equilibrium" with low investment levels by both firms and consumers. And we can also have a "High-High equilibrium" with high investment levels by both firms and consumers. Or, more likely, given consumers' limited investment budget, the alternative to the Low-Low equilibrium is a "High-Low equilibrium," with high investment levels by firms and investments by consumers that, while perhaps higher than in the Low-Low equilibrium, are still much lower than the firms' investments. Moreover, if the system is in the Low-Low equilibrium, the firms can significantly increase their investment and move the system to the High-Low equilibrium, where firms would enjoy a decisive advantage. Moreover, a large, one-time investment by the firms can alter the strategic relationship between the firms' investments and the consumers' investments. Specifically, a large, one-time legal investment can create such an advantage for the firms that consumers' best response would be to give up and reduce their legal investments to zero, rather than try to counter with their limited budget (switching the sign of consumers' best response function to $dCR_{LPr}^{PM}/dR_{LPr}^{PM} < 0$).

B. Insights and Outcomes

The analysis of the parties' optimization problems generates new insights and explains outcomes in the real world:

1. Marginal productivity of investment options and the allocation of resources. — A party will choose investment option A over investment option B when the marginal productivity of A is larger.[67] The young Google and Facebook invested mainly in productivity-increasing technology, because these investments were more attractive, in terms of marginal productivity, than power-increasing investments. For the more mature Google and Facebook, the marginal productivity of power-increasing legal investments was

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[67] The analysis in Section A goes further and suggests that, in an interior equilibrium, the marginal productivity of different investment options would be identical (or similar).

larger, so they shifted more resources to these investments. In the home broadband market, firms made power-increasing legal investments–to create or maintain market power; they also made productivity-increasing technology investments–rolling out more fiber-optic infrastructure. In Europe, the marginal-productivity of power-increasing legal investments was smaller, and firms focused on productivity-increasing technology investments. In the US, the marginal productivity of power-increasing legal investments was higher and broadband providers focused on these investments, rather than on creating better fiber-optic infrastructure.[68]

2. Strategic investments. — "Strategic" investments, in the game-theoretic sense, are investment choices by one party that depend on the investment choices of another party. Our analysis showed how the marginal productivity of an investment option depends, among other things, on the investment choices of other parties. Therefore, investments, in our framework, are strategic. For example, if consumer groups invest little or nothing in lobbying, then a small lobbying investment by firms will yield a large payoff in terms of power-increasing laws. On the other hand, if consumer groups invest substantial resources in lobbying, then firms will need to invest much more to secure the same power-increasing laws. In the net neutrality debates, the legal battles between broadband providers who opposed net neutrality and consumer groups (and their allies) who supported net neutrality exhibited such strategic investments: round after round, the parties escalated their power-increasing legal investments to counter the other side's power-increasing legal investments.[69] The operating systems and browser wars, from the late 1980s to the early 2000s, provide another example: Microsoft, the dominant player in the market, invested heavily in power-increasing investments (in law, technology and misperceptions). On the other side, consumers–through class action lawsuits and through government action–countered with their own power-increasing legal investments. And through development and adoption of open-source alternatives, like Linux to replace Windows, Apache to replace Microsoft Server, Firefox to replace Internet Explorer, and Python to replace Active X, consumers and competing developers also made their own power-increasing technological investments.[70]

3. Multiple equilibria and tipping points. — In some cases, investment decisions are not marginal. For example, firms might make a large, one-time investment that would create such an advantage vis-à-vis consumers' or workers' that these parties would find it futile to invest in counter measures (or these parties would simply exhaust their more-limited resources). This is central to the story of the rise of business lobbying in the

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[68] *See* Section VII.A. below.

[69] *See* Section VII.B. below.

[70] *See* Section VII.C. below. *See also* YOCHAI BENKLER, THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM, Chapter 11 (2006).

1970s.[71] Also, in the home broadband and net neutrality contexts, the substantial power-increasing investments by broadband providers were arguably designed to overwhelm the counter-investment capabilities of consumers and their allies.[72]

C. Welfare

While the analysis in this Article is largely descriptive, it produces several important normative results. From a social welfare perspective, the main question has to do with the relationship between the private and social value that is created by different investments. Some investments increase the investing party's surplus as well as overall social welfare. (When our social welfare function gives weight to distributional equity, an increase in overall social welfare implies that the investment does not raise significant distributional concerns.) Other investments are privately beneficial but reduce overall social welfare. These are the investments that we should be especially concerned about (either because they reduce the overall surplus or because they raise distributional concerns). To be clear, when talking about good v. bad investments, we are not characterizing an investment category–productivity-increasing technology investments, power-increasing legal investments, etc. — as good or bad. Rather we are saying that within the investment category, the investment level is socially optimal (good) or socially suboptimal or excessive (bad).

In distinguishing between the good and bad investments, from a social welfare perspective, we start with our basic productivity v. power distinction. Productivity-increasing investments–both investments in technology and legal investments–create both a private and social benefit. Consider the example of investments in technology that increase productivity and allow the same amount of labor to produce more goods at a lower cost, thus increasing both the firm's surplus and the surplus of consumers and workers.[73] This is the easy case. The productivity-increasing technology investment is a good investment.

The welfare effects of power-increasing investments–both investments in technology and legal investments–are subtler and more interesting: These investments increase the surplus enjoyed by the investing party, and have ambiguous effects on the overall surplus. Consider Figure 1, from Section II.A.: In the $\tilde{p} > p_c$ range, a power increasing investment by firms re-

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[71] Jacob Hacker & Paul Pierson, *Winner-Take-All Politics: Public Policy, Political Organization, and the Precipitous Rise of Top Incomes in the United States*, 38 POL & SOC'Y. 152, 172, 176 (2010).

[72] *See* Sections VII.A. and VII.B. below.

[73] Higher productivity does not always translate into greater welfare. For example, shifting production abroad can increase productivity yet reduce overall welfare, if the resulting local unemployment and its negative social spillovers are high. (Welfare may thus be reduced for the relevant political unit, if not globally.) The reduction in overall welfare might be caused by a reduction in surplus, when we count labor market surplus. It might also be caused by increased wealth disparity, if the social welfare function reflects distributional concerns.

duces the overall surplus (and tilts the outcome in a distributionally regressive way), whereas a power-increasing investment by consumers increases the overall surplus (by bringing the market closer to the perfect-competition benchmark). And the opposite is true in the $\tilde{p} < p_c$ range.

Generalizing, if we define the perfect competition ideal as the equal-power, or no-power, benchmark, then any power-increasing investment that takes us further away from this benchmark is welfare reducing, and any power-increasing investment that brings us closer to this benchmark is welfare increasing. This static account should be supplemented by a dynamic account of innovation and growth. Perfect competition is usually not dynamically efficient. Some degree of market power is needed to support welfare-enhancing investments, especially growth-inducing investments in innovation (such investments might not be made in a perfectly competitive market, since the firm would not be able to recoup the investment). Patents are designed to achieve temporary market power for innovating firms that meet certain legal criteria. More generally, neo-Schumpeterian innovation economics and endogenous growth theory all depend on some mechanism that creates market power in the present to support innovation and growth over time. But even if some degree of market power is socially desirable, there is still a real concern that firms' power-increasing investments will be excessive. In this dynamic account, the normative benchmark–the socially optimal, welfare-maximizing power allocation–differs from the normative benchmark in the static account (i.e., from the perfect-competition benchmark). And yet, as before, firms might exceed this normative benchmark. Power-increasing investments might be privately optimal, but not socially optimal.[74]

The identification of welfare-reducing, power-increasing investments should inform policymakers. For example, in the 2000s, several courts considered provisions of the Digital Millennium Copyright Act (DMCA) that prohibited circumvention of copyright-protecting encryption. Several companies, making items as diverse as laser printer toner cartridges to garage openers, introduced minimal encryption into the software they used to control their product. These companies argued that producers of competing compatible products (like garage door openers, ink cartridges, or servers hosting distinctive worlds on multiplayer game platforms) violated the DMCA by circumventing the encryption. Courts had to decide whether cir-

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[74] In several of the case studies discussed below, firms' power-increasing investments likely exceeded the socially-optimal level. *See infra* Section VII. The social welfare loss may depend on the circumstances: In one country or market, firms may find it privately optimal to invest in law or technologies that allow them to deploy less skilled labor, or labor that has not developed firm-specific know-how, in order to reduce labor costs and to decrease the risk of labor organization. These privately-optimal investments might reduce firms' ability to innovate over time, leading to a social welfare loss. In another country or another market, similar investments by firms may not be privately optimal, e.g., because of laws that require firms to invest in labor development and productivity (- laws that are the result of prior legal investments by workers). Here, social welfare will be higher.

cumvention of the encryption was an independent violation of the copyright law, regardless of whether the underlying use of the copyrighted software violated copyright law. Our analysis would have urged courts to examine the nature of the investment in encryption by the plaintiff companies. If this investment was a welfare-reducing, power-increasing investment that increased entry barriers, then our analysis would support those courts that refused to prohibit circumvention as a standalone violation.[75] Similarly, our analysis offers support for the result in the Microsoft antitrust case (discussed in Part VII below), in which the court focused its findings of violations on actions the company took to leverage its monopoly on the desktop to new technical areas (web browsing and applications)–actions that could be characterized, in our framework, as welfare-reducing, power-increasing investments. Or consider California's passage of AB-5 in 2019,[76] which substantially expanded the set of workers who were deemed "employees" for purposes of bargaining and employment law protections, partly in response to the emergence of the gig economy (which we discuss in our case study of Uber in Part VII) and partly in response to concerns with a whole range of business practices often described as the "fissuring" of the workplace.[77] To the extent that these practices are welfare-reducing, power-increasing investments, a law that reduces the return to such investments is justified under our framework. Finally, the use of non-standard interfaces by leading incumbents (such as Apple) and some patterns of algorithmic promotion or price discrimination might also deserve legal scrutiny, to the extent that they are designed to increase power, rather than productivity.

The welfare-reducing effect of power-related investments can multiply over time. Specifically, if firms succeed in increasing their power in Period 1, they will enjoy greater profits, and will be able to use these profits to fund additional power-increasing investments in Period 2. The Period 2 investments will increase firms' profits in Period 2, and they will be able to use these profits to fund additional power-increasing investments in Period 3. Etc.

Power-increasing investments can also constitute a deadweight loss. Consider, for example, a potentially power-affecting law. If neither firms nor consumers invest in lobbying, a neutral version of the law would pass–one

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[75] Compare: *Lexmark International, Inc. vs. Static Control Components, Inc.* 387 F.3d 522 (2004) (in particular Judge Merrit's concurring opinion seeking a more expansive holding "that in the future companies like Lexmark cannot use the DMCA in conjunction with copyright law to create monopolies of manufacturer goods for themselves") and *The Chamberlain Group, Inc. v. Skylink Technologies, Inc.,* 381 F.3d 1178 (Fed. Cir. 2004) (Federal circuit holding garage door opening software unprotected and naked circumvention without copyright violation insufficient to sustain an action under the DMCA) to *MDY Industries, LLC v. Blizzard Entertainment, Inc and Vivendi Games, Inc.*, 629 F.3d 928 (9th Cir. 2010) (rejecting the Federal Circuit and 6th Circuit's approach and finding an independent violation based on circumvention).

[76] AB-5 Worker status: employees and independent contractors, (09.18.19). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB5

[77] David Weil, The fissured workplace: why work became so bad for so many and what can be done to improve it (2014).

that does not change the power balance between firms and consumers. This zero-investment outcome, however, might not be an equilibrium. Rather, we might have an equilibrium, where both sides invest substantial amounts of money in lobbying, the investments balance each other out, and the neutral version of the law still passes. The lobbying investments, on both sides, are wasteful. (Of course, the equilibrium may feature greater investments by firms and the resulting law may increase the relative power of firms. Still, there may be deadweight loss, if the same law would pass with lower investments by both firms and consumers.)

IV. EXTENSION: (MIS)PERCEPTIONS

Our basic model focused on productivity and power and on investments–in technology and law–that affect productivity and power. We now add another element, (mis)perceptions, which plays a central role in many real-world applications and interacts with productivity and power in interesting ways.

A. Product Market

In the standard framework (as shown in Figure 1), the demand curve represents consumers' willingness to pay (WTP) assuming that consumers accurately perceive the benefits of the product. But this accurate-perceptions assumption is often unrealistic. Therefore, we introduce the perceived demand curve, $\widehat{D}$, which represents WTP measures that are affected by misperceptions.[78] To illustrate, Figure 4 adds a perceived demand curve to the standard framework.

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[78] Compare: Oren Bar-Gill, *Algorithmic Price Discrimination When Demand Is a Function of Both Preferences and (Mis)Perceptions*, 86 UNIV. CHI. L. REV. 217 (2019). In theory, firms can also misperceive costs, resulting in a perceived supply curve.

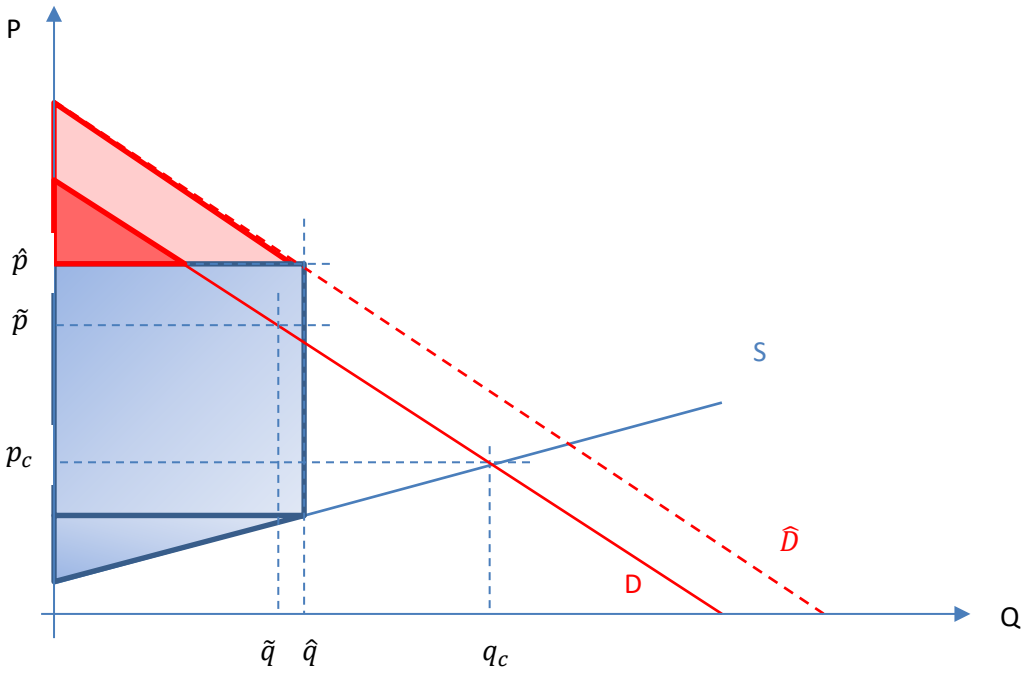

Figure 4: Supply-and-Demand Framework with Misperceived Demand

In Figure 4, the perceived demand curve, $\widehat{D}$, is above the preference-based, accurate-perceptions demand curve, *D*, implying that consumers overestimate the benefits from the product. The higher demand results in a higher price, $\hat{p}$. And the higher price translates into a larger suppliers' surplus, Π_S^{PM}. On the consumers' side, there is a larger perceived surplus, $\widehat{\Pi}_D^{PM}$, represented by the large pink triangle, but the actual surplus, Π_D^{PM}, is smaller, and it is represented by the small red triangle.

We define a variable M^{PM} that represents misperceptions in the product market. An increase in M^{PM} represents an increase in consumers' misperceptions (i.e., perceptions that are further away from perfectly accurate perceptions), and a decrease in M^{PM} represents a decrease in consumers' misperceptions (i.e., perceptions that are closer to perfectly accurate perceptions). A higher M^{PM} means a larger suppliers' surplus and a smaller consumers' surplus; the effect on the overall surplus is ambiguous:

$\frac{d\Pi_S^{PM}}{dM^{PM}} > 0$ and $\frac{d\Pi_D^{PM}}{dM^{PM}} < 0$; and the sign of $\frac{d\Pi^{PM}}{dM^{PM}}$ is ambiguous.

We focus on the common situation, where the perceived demand curve, $\widehat{D}$, is above the preference-based, accurate-perceptions demand curve, *D*, as in Figure 4.[79]

1. Investing in (Mis)perception. — Firms invest R_M^{PM} in creating or maintaining (mis)perceptions, among consumers, about the benefits of the product. Indeed, a major goal of the multi-billion-dollar advertising industry is to create demand-inflating misperceptions.[80] (Mis)perceptions, M^{PM}, are affected by firms' and consumers' investments. Since greater consumer misperceptions, i.e., a larger M^{PM}, benefit firms (and a smaller M^{PM} benefits consumers), firms' misperception-increasing investments, R_M^{PM}, increase M^{PM}:

$$\frac{dM^{PM}}{dR_M^{PM}} > 0;$$

and consumers' misperception-decreasing investments, CR_M^{PM}, decrease M^{PM}:

$$\frac{dM^{PM}}{dCR_M^{PM}} < 0.$$

(Note that M^{PM} can be negative, representing misperceptions that favor consumers.)

2. (Mis)perception and Law. — Law can affect (mis)perceptions. Here we start with consumers' investments, CR_{LM}^{PM}, in laws that reduce misperception. Consumer protection laws, especially anti-deception laws and disclosure or transparency rules, target misperception. Food safety laws, nonwaivable warranties (merchantability, habitability) and tort law (especially products liability law) play a similar role–consumers have certain expectations about the products that they purchase and these laws ensure that these expectations are met.[81] Firms spend resources, R_{LM}^{PM}, promoting laws that create or maintain misperception. A primary example are laws that give consumers a false sense of security, like notice-and-consent privacy laws, or seemingly potent consumer protection laws coupled with limited enforcement.[82]

Misperceptions are affected by legal investments. Firms' legal investment, R_{LM}^{PM}, and consumers' legal investment, CR_{LM}^{PM}, produce a law $\lambda_M^{PM}(R_{LM}^{PM}, CR_{LM}^{PM})$. We assume that a larger λ_M^{PM} increases consumers' misperceptions, M^{PM}, i.e.,

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[79] Firms have a strong incentive to invest in such demand-inflating misperceptions. *See* Bar-Gill, id. The analysis can be extended to consider the alternative case, where $\widehat{D}$ is below *D*.

[80] *See* Bar-Gill, *supra* note 78 . Certain product designs can also create misperceptions. Similarly, a complex pricing structure can lead consumers to underestimate the total price of the product. *See* BAR-GILL, *supra* note 15, at 68–74, 186–188, (describing examples from consumer credit and cellular services markets).

[81] Although these laws may also be seen as imposing a minimum quality requirement–see Part II above. Other mandatory rules, like limits on credit card and mortgage fees/pricing, reduces misperception, but might also reduce quality for some consumers.

[82] Compare: Oren Bar-Gill and Kevin E. Davis, "(Mis)perceptions of Law in Consumer Markets," 19 *American Law and Economics Review* 245 (2017).

$$\frac{dM^{PM}}{d\lambda_M^{PM}} > 0.$$

With respect to misperception-affecting laws, the interests of firms and consumers are diametrically opposed: firms seeks to increase λ_M^{PM} and consumers seek to reduce λ_M^{PM}, i.e.,

$$\frac{d\lambda_M^{PM}}{dR_{LM}^{PM}} > 0 \text{ and } \frac{d\lambda_M^{PM}}{dCR_{LM}^{PM}} < 0.$$

3. (Mis)perception and Surplus. — In some cases, parties invest in (mis)perceptions–including investments in laws that affect (mis)perceptions–because (mis)perceptions directly affect surplus. We focus on (mis)perceptions that shift the perceived demand curve up. If consumers overestimate the benefits from a product, then demand for the product will increase. A higher perceived benefit also allows suppliers to charge higher prices, thus increasing the suppliers' surplus. Therefore, firms will invest in creating misperceptions–drawing a wedge between consumers' WTP for the product (WTP that is inflated by the misperception) and what the product is actually worth to consumers (ideal, preference-based value). The tobacco industry's investments in obfuscating the carcinogenic and other adverse health effects of smoking cigarettes are a classic example of an industry investing in creating misperceptions to keep demand for its product artificially high.[83] Similarly, Purdue Pharma's campaign to promote OxyContin as a treatment for long term chronic pain hid the addiction risks associated with it.[84] Most advertising, including the common design that touts the benefits of the product in large, enticing images and buries the required adverse disclosures in the smallest print legally permissible, creates some level of misperception.

4. (Mis)perception and Power. —In some cases, parties invest in (mis)perceptions–including investments in laws that affect (mis)perceptions–because (mis)perceptions affect power. For example, the market power of a lender increases, if consumers mistakenly think that no other lender will offer them a loan.

Figure 5 depicts our extended framework of analysis, with (mis)perceptions.

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[83] NAOMI ORESKES & ERIK M. CONWAY, MERCHANTS OF DOUBT: HOW A HANDFUL OF SCIENTISTS OBSCURED THE TRUTH ON ISSUES FROM TOBACCO SMOKE TO GLOBAL WARMING (Paperback edition ed. 2011).

[84] Government Accountability Office, *OxyContin Abuse and Diversion and Efforts to Address the Problem*, Dec 2003, *https://www.gao.gov/new.items/d04110.pdf*; Julia Lurie, Unsealed Documents etc., Mother Jones, *https://www.motherjones.com/crime-justice/2019/08/unsealed-documents-show-how-purdue-pharma-created-a-pain-movement/*; Ronald Hirsch, The Opioid Epidemic: Its' Time to Place Blame Where it Belongs, Mo. Med Mar-Apr 2017 114(2) 82–83, 90. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6140023/*; Jonathan Marks, *Lessons from Corporate Influence in the Opioid Epidemic: Toward a Norm of Separation*, J. Bioethic Inq. July 13 2020, *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7357445/*; Sarah DeWeert, Tracing the US Opioid Crisis to its roots, Nature, 9/11/2019, *https://www.nature.com/articles/d41586–019–02686–2*. ; also see *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5993682/*.

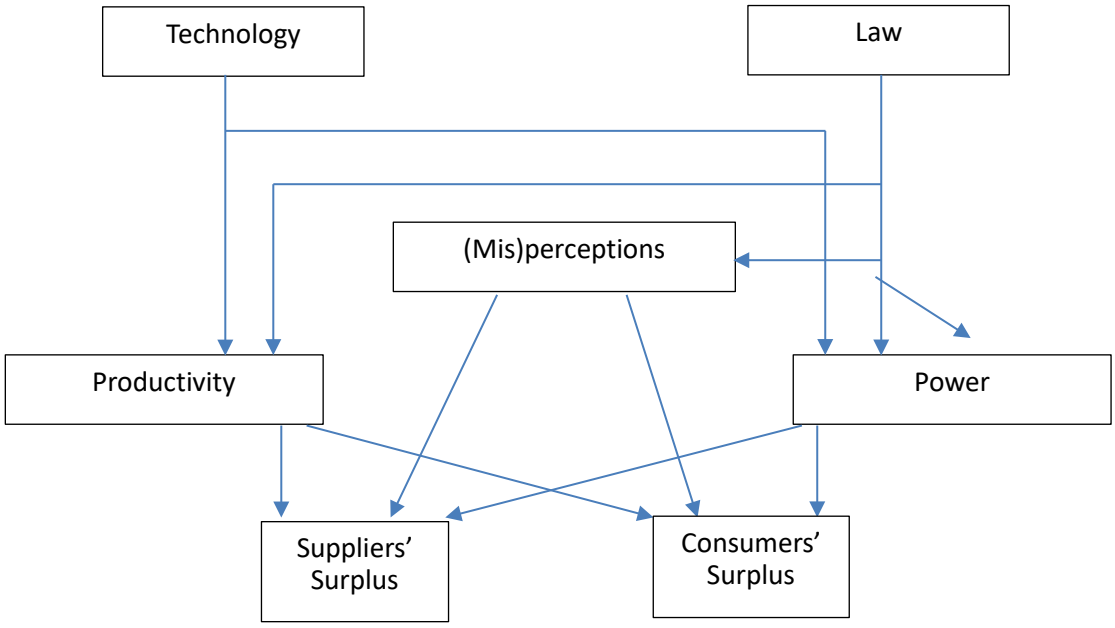

Figure 5: Framework of Analysis

B. Labor Market

(Mis)perceptions can be added to the labor market analysis, as they were added to the product market analysis.

1. Investing in (Mis)perception. — Firms invest R_M^{LM} in creating or maintaining (mis)perceptions. For example, firms hire "union avoidance consultants" who come in whenever there is a union drive and try to persuade workers to vote against unionization. These "union avoidance consultants" try to create misperceptions in employees that individual contracts and competition are better than union contracts, whereas data suggests that unionized workers get higher wages, and unionized work sites have better health and safety records.[85] On the other side, workers invest WR_M^{LM} to reduce misperceptions. For example, unions invest in studies showing that improved wages and workplace conditions increase worker productivity.

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[85] New York Committee for Occupational Safety and Health, *Deadly Skyline: An Annual Report on Construction Fatalities in New York State*, January 2017. http://nycosh.org/wp-content/uploads/2017/01/DeadlySkyline2017_NYS-ConstructionFatalitiesReport_final_NYCOSH_May.pdf; Harry Miller, Tara Hill, Kris Mason, and John S. Gaal, "An Analysis of Safety Culture & Safety Training: Comparing the Impact of Union, Non-Union, and Right to Work Construction Venues," *Online Journal for Workforce Education and Development* vol. 6, no. 2 (2013); Alison D. Morantz, "Coal Mine Safety: Do Unions Make a Difference?" *ILR Review* vol. 66, no. 1 (January 2013), 88–116 (unionization associated with a 14 to 32 percent drop in traumatic injuries and a 29 to 83 percent drop in fatalities in coal mines).

More generally, if firms underestimate the productivity of workers, or underestimate the benefit–to firms–of investing in their workforce, workers would invest in reducing such misperceptions. Unions may also invest in creating misperceptions, e.g., resulting in firms' overestimation of the benefit from investing in their workforce.

(Mis)perceptions, M^{LM}, are affected by firms' and workers' investments. Since greater misperceptions by workers, i.e., a larger M^{LM}, benefit firms (and a smaller M^{LM} benefits workers), firms' misperception-increasing investments, R_M^{LM}, increase M^{LM}:

$$\frac{dM^{LM}}{dR_M^{LM}} > 0;$$

and workers' misperception-decreasing investments, WR_M^{LM}, decrease M^{LM}:

$$\frac{dM^{LM}}{dWR_M^{LM}} < 0.$$

(Note that M^{LM} can be negative, representing misperceptions that favor workers.)

2. (Mis)perception and Law. — Firms spend resources, R_{LM}^{LM}, promoting laws that create or maintain misperception. For example, firms promote laws that allow them to prohibiting union organizers from coming into the factory or to require workers' attendance at antiunion "training" sessions. Workers invest, WR_{LM}^{LM}, in laws that reduce misperception. For example, unions (alongside foundations and some firms) support a dedicated policy institute to study the impact of trade, labor, or minimum wage laws.[86]

Misperceptions are affected by legal investments. Firms' legal investment, R_{LM}^{LM}, and workers' legal investment, WR_{LM}^{LM}, produce a law $\lambda_M^{LM}(R_{LM}^{LM}, WR_{LM}^{LM})$. We assume that a larger λ_M^{LM} increases workers' misperceptions, M^{LM}, i.e.,

$$\frac{dM^{LM}}{d\lambda_M^{LM}} > 0.$$

With respect to misperception-affecting laws, the interests of firms and workers are diametrically opposed: firms seeks to increase λ_M^{LM} and workers seek to reduce λ_M^{LM}, i.e.,

$$\frac{d\lambda_M^{LM}}{dR_{LM}^{LM}} > 0 \text{ and } \frac{d\lambda_M^{LM}}{dWR_{LM}^{LM}} < 0.$$

3. (Mis)perception and Surplus. — In some cases, parties invest in (mis)perceptions–including investments in laws that affect (mis)perceptions–because (mis)perceptions directly affect surplus. If workers overestimate the non-wage benefits from working for a firm, then supply of labor will increase. A higher benefit from working also allows firms to pay lower

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[86] Funder acknowledgments and disclosure principles, ECONOMIC POLICY INSTITUTE , https://www.epi.org/about/funder-acknowledgments-and-disclosure-principles/ (last visited Aug 2, 2020).

wages, thus increasing the firms' surplus. Therefore, firms will invest in creating misperceptions–drawing a wedge between workers' willingness-to-accept (WTA) for their labor (WTA that is reduced by the misperception) and the true benefit from the job or position (ideal, preference-based value). The benefit, to firms, of maintaining worker misperception is evident from their reluctance to disclose the wage and non-wage terms of employment. For example, firms often fight against such disclosure requirements when they are presented as conditions for certain government contracts.[87]

4. (Mis)perception and Power. — In some cases, parties invest in (mis)perceptions–including investments in laws that affect (mis)perceptions–because (mis)perceptions affect power. The preceding examples of firms' anti-union investments are also relevant here. And, on the workers' side, unions may invest in creating misperceptions, e.g., about how long workers can hold out in a strike.

C. Investments, Outcomes and Welfare

The parties' optimization problems need to be adjusted to incorporate possible investment in (mis)perception. A graphic representation of the firms' optimization problem–an adjusted version of Figure 3–is presented in Figure 6 below. The main adjustment, in the (mis)perception extension, is the addition of another set of investment opportunities–direct investments in misperception and investments in laws that affect misperception.

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[87] Kate Aronoff, *Elon Musk Thinks His Treatment of Workers Is a "Trade Secret" | The New Republic*, THE NEW REPUBLIC, 2020, https://newrepublic.com/article/159180/elon-musk-california-labor-law-green-jobs (last visited Sep 8, 2020).

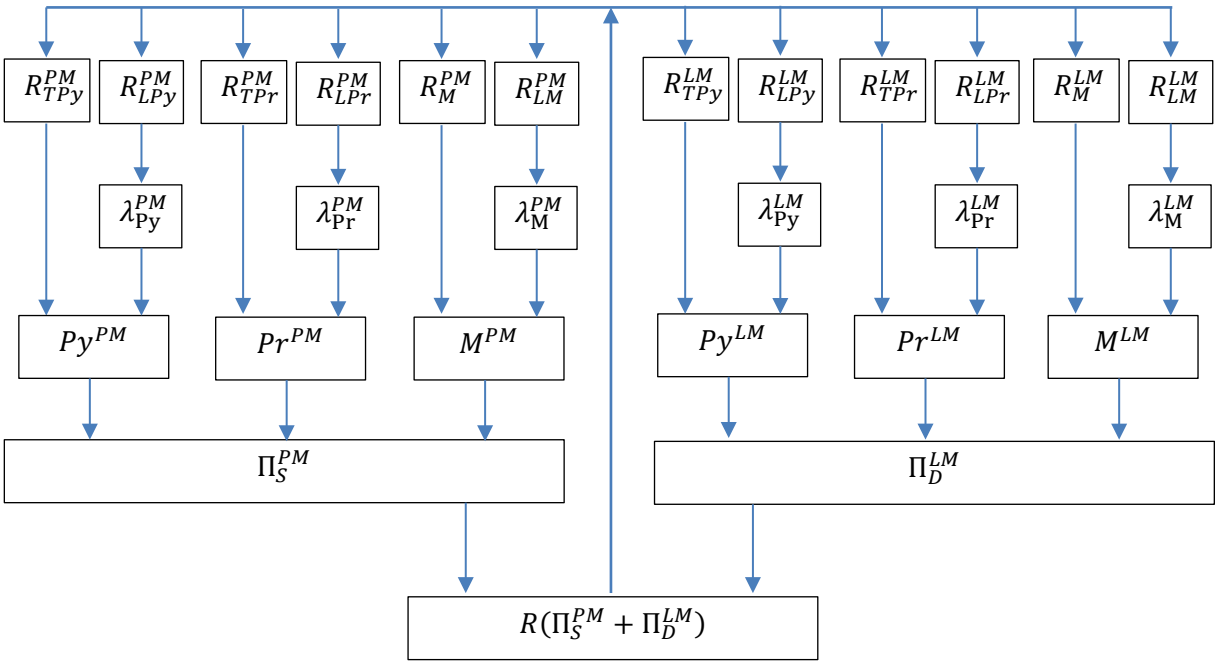

Figure 6: Firms' Investments, Surplus and Resources

Welfare. Generally, misperception is welfare-reducing. Therefore, investments that increase the level of misperception are welfare-reducing, and investments that reduce the level of misperception are welfare-increasing. But there is an important qualification: When firms enjoy market power, implying high prices and small, sub-optimal quantities, demand-inflating misperceptions can be efficient, as they may reduce the monopoly deadweight loss by inducing some consumers who would not have bought at the monopoly price to do so.[88] But, even in this case, misperceptions may be socially harmful, if the firm can engage in price discrimination and increase prices for consumers who overestimate the benefit from the firm's product. The distributional effect–harming consumers and benefiting firms–might outweigh the efficiency benefit.

V. EXTENSION: IDEOLOGY

The (mis)perceptions studied in Part IV capture a category of beliefs that can be strategically induced by firms, consumers, and workers to influence surplus, directly or through power. Here, we explore a different category of beliefs, values, or ways of looking at the world, which has been variously

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[88] *See* Bar-Gill, *supra* note 78, at 15–22.

called conventional wisdom,[89] frame,[90] habitus,[91] or ideology.[92] We will use the term "ideology," and abstract from the (major) differences in emphasis and mechanisms among these very different sociological expositions. By "ideology" we mean to capture the basic idea that in any society, most people take certain broadly held beliefs, ideas, or values for granted. In some cases, there are important pockets of resistance to this ideology, yet the ideology describes at least those beliefs and values taken for granted among the politically and economically dominant groups in society. In a neo-classical economic framework, ideology straddles the line between beliefs and preferences.

A classic example is the ideology of racial hierarchy that pervaded the legal enslavement of millions of Black Americans as the core workforce of the United States' leading export industry in the 19^{th} century. As W.E.B. Du Bois argued, and extensively documented, this ideology wasn't "just there," but was enforced and reinforced precisely to normalize and sustain a practice that, absent this frame or ideology, would have been unsustainable in a country formally dedicated to the principle of equality.[93] Few will doubt that that ideology continues to play a central role in the United States to this day,[94] and in Part VI we return to one important function that it plays when integrated into our framework. Another important example concerns battles over whether there are, or aren't, masculine vs. feminine traits (e.g., aggressive v. docile, competitive v. cooperative) and capabilities (e.g., math, physical strength) and, correspondingly, whether there is, or isn't such a thing as "women's work." Battles over women in combat positions in the military or as CEOs, have long been central arenas of conflict over sex and gender discrimination, including wage and career ladder expectations and differentials.

But "ideology," as we define it, encompasses more than these fundamental, grand, society-shaping beliefs. Consider the tobacco industry. The industry invested in creating and sustaining misperceptions–funding research that muddied the waters with regard to the carcinogenic effects of smoking tobacco. The same companies also invested in supporting the idea of personal freedom and evoking a general cultural resistance to the "nanny state." These were, in our terms, investments in "ideology." In the area of corporate governance, a major question is what do corporate boards and CEOs maximize or what should they maximize. Should they focus only on maximizing shareholder value, or should they adopt a broader objective

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89 JOHN KENNETH GALBRAITH, THE AFFLUENT SOCIETY (40th anniversary ed ed. 1998).

90 ERVING GOFFMAN, FRAME ANALYSIS: AN ESSAY ON THE ORGANIZATION OF EXPERIENCE (Northeastern University Press ed ed. 1986).

91 PIERRE BOURDIEU, THE LOGIC OF PRACTICE (Reprinted ed. 2008).

92 Marx and Engels, The German Ideology (1846; 1932); Antonio Gramsci, Prison Notebooks

93 DU BOIS, *supra* note 28; Hall, *supra* note 28; Fields, *supra* note 28.

94 Fields, *supra* note 28; KAREN E. FIELDS & BARBARA JEANNE FIELDS, RACECRAFT: THE SOUL OF INEQUALITY IN AMERICAN LIFE (2014).

function that also accounts for the interests of employees and other stakeholders? In the United States, it has been argued that the preferences of boards and CEOs changed circa 1970-1980, when the broader objective function was replaced with a narrower one focused on shareholder value, in part due to influential interventions by Milton Friedman and Michael Jensen.[95] Some authors analyzing the shift in this period, such as Holmstrom and Kaplan or Khurana, have described it as a change in "social norms."[96] To the extent that such a preference-change occurred, as a basic shift in the common sense shared by members of the professional and managerial class, it is an example of an ideology shift. Moving on to tax: Firms funding Grover Norquist's Americans for Tax Reform are not only engaged in a discrete lobbying effort; they are also investing in ideology–in a broader framing of public debates about taxation. Similarly, when the Ford Foundation, as part of its strategy to battle inequality, including racial prejudice, and unfairness in the economy, invests in independent cinematographic documentary as a genre, it is explicitly and self-consciously investing in shaping ideology, in the sense we use the term here.[97]

Investments in ideology can affect both power and productivity. These investments enter into our framework in the same way as the previously discussed investment categories (i.e., investments in technology, law and (mis)perceptions). For example, a firm will choose to invest in ideology when the marginal return from this investment is higher than the marginal return from other available investments. Still, investments in ideology have two unique features. First, the effects of investments in ideology or often spread over long periods of time and they are more diffuse. One implication is that investments in ideology can influence the marginal return from other power-increasing or productivity-increasing investments. For example, with a general anti-tax ideology in place, firms can expect a higher return to a subsequent legal investment aimed at a specific tax reform proposal. The second unique feature of ideology investment concerns the normative, welfare assessment of these investments. Ideology, as we defined it, straddles the line between beliefs and preferences. To the extent that investments in ideology change preferences, a welfare economics assessment becomes ill-

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[95] Milton Friedman, *The Social Responsibility of Business*, New York Times Magazine, Sept. 13, 1970 (describing "[t]he businessmen" who claim that "business has a 'social conscience' and takes seriously its responsibilities for providing employment, eliminating discrimination, [or] avoiding pollution" as "preaching pure and unadulterated socialism.")

[96] BENGT HOLMSTROM & STEVEN N. KAPLAN, *Corporate Governance and Merger Activity in the US: Making Sense of the 1980s and 1990s* (2001), http://www.nber.org/papers/w8220 (last visited Jul 13, 2016); RAKESH KHURANA, SEARCHING FOR A CORPORATE SAVIOR: THE IRRATIONAL QUEST FOR CHARISMATIC CEOS (2002).

[97] Focus where the need is greatest and the intervention most strategic, THE STATE OF SIE REPORT (2019), https://thestateofsie.com/cara-mertes-justfilms-strategic-nonfiction-storytelling-narratives-transform-history/ (last visited Aug 2, 2020).

defined.[98] Of course, this does not preclude an analysis of the positive, behavioral effects of investments in ideology.

A. Product Market

Firms invest not only in creating discrete misperceptions, but also in general frames or ideology that increases the value of their products to consumers, shifting the demand curve up. Firms often invest in shaping tastes and preferences and in associating their brand with these tastes and preferences. Examples of such investments in ideology include Nike's *Just Do it*, Apple's *Think Different*, and Philip Morris's *Marlboro Man*.[99] These investments in ideology are similar to investments in misperceptions, in the sense that they shift the demand curve upward.[100] And yet the welfare analysis is more complicated. From a neo-classical economics perspective, the distinction between changing perceptions and changing preferences is critical. If a product is worth $100 to a consumer, but she mistakenly thinks that it is worth $200 (a misperception), then the harm to the consumer is clear, e.g., when she pays $150 for the product. On the other hand, if the seller genuinely changed the consumer's preferences, such that she now really values the product at $200, then it is more difficult to conclude that the consumer was harmed by paying $150 for the product. Straddling the line between perceptions and preferences, it can be challenging to evaluate the welfare effects of investments in ideology.

Firms invest in ideology to enhance the return to future legal investments–both productivity-increasing and power-increasing legal investments–and to expand the scope of power-increasing technology investments. In the 1970s, ITT and U.S. Steel funded Henry Manne's *Pareto in the Pines* program, a training program for judges and other legal professionals that promoted a particularly pro-market, anti-regulation line of law and economics. The goal was to shift the frame through which judges and law makers saw legal questions.[101] The funders were particularly interested in shifting judges' perceptions about antitrust, but the effect was much broader. And the investments paid off. Analyzing the effects of these investments, Ash, Chen and Naidu find that judges who participated in this program rendered systematically more pro-business verdicts and tended to

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[98] Welfare economics is based on a maximization of a given preference profile. *See, e.g.*, ANDREU MAS-COLLEL, MICHAEL WHINSTON & JERRY GREEN, MICROECONOMIC THEORY, Chapter 22, p. 831–38.

[99] Firms then also invest in law to protect these kinds of investment in ideology. For example, in the 1990s firms successfully expanded the trademark protection afforded "famous" brands to cover not only consumer confusion — the original focus of trademark law — to cover "dilution" as well, where "dilution" was specifically focused on nonconfusing uses, where users knew exactly that they were not buying a famous brand product, but where the sale of cheaper products (fake Gucci bags) diluted the expressive value of consuming the brand.

[100] As compared to investments in misperceptions, investments in ideology are usually longer term and riskier. But where successful, they can have massive consequences over sustained periods.

[101] STEVEN MICHAEL TELES, THE RISE OF THE CONSERVATIVE LEGAL MOVEMENT: THE BATTLE FOR CONTROL OF THE LAW (2008) chapter 4, 6, on ITT, p. 125.

rule against regulatory and tax agencies more often.[102] With more sympathetic legislators, regulators and judges, the return to firms' legal investments–lobbying investments and litigation investments–increases. Moreover, when lawmakers are more likely to approve power-increasing technology investments, firms can be expected to shift resources to these investments and away from productivity-increasing investments.[103]

B. Labor Market

Cotton textile manufacturing was the carrier industry of the first Industrial Revolution. In Britain, by 1850 "cotton yarn and cloth accounted for 40 percent of all British exports."[104] In New England, cotton mills were the leading sector that underwrote industrialization and the emerging factory system.[105] Raw cotton to feed this industry was raised by enslaved Black workers in the antebellum South.[106] The number of enslaved Black workers swelled from fewer than 700,000 in the first decennial census in 1790 to about four million on the eve of the Civil War.[107] As W.E.B. Du Bois put it, as slave labor became foundational to both Southern cotton and Northern industrial development, race hierarchy was developed as a justificatory framework to keep the Black worker "bent at the bottom of a growing pyramid of commerce and industry."[108] Race was (and remains) an ideology in the sense we use it here. This ideology allowed the dominant white majority to reconcile the incongruity between a system of violent coercive labor extraction and the attestations of political equality in the US Constitution.

In addition, the ideology of racial hierarchy was central in undermining the development of a labor movement in the United States, both in the South, and later elsewhere in the country, as white workers were led to believe that their interests were fundamentally misaligned with those of Black workers who were framed, in the prevailing ideology, as inhabiting an inferior caste.[109] Some of the strongest support for the Taft-Hartley Act's prohibition on closed shop agreements and permission for states to pass

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[102] Eliott Ash, Daniel Chen & Souresh Naidu, *Ideas Have Consequences: The Impact of Law and Economics on American Justice*, http://elliottash.com/wp-content/uploads/2019/03/ash-chen-naidu-2019–03–20.pdf (last visited Apr 24, 2019).

[103] Khan and Vaheesan, *supra* note 3.Khan and Vaheesan, *supra* note 2.

[104] CHRISTOPHER FREEMAN & LUC SOETE, THE ECONOMICS OF INDUSTRIAL INNOVATION 52 (3rd ed ed. 1997).

[105] Irwin Douglas & Peter Temin, *The antebellum tariff on cotton textiles revisited*, 61 J. ECON. HIST. 777–798 (2001).

[106] SVEN BEKCERT, EMPIRE OF COTTON (numbers here from the Atlantic piece; find page numbers in the book) (cotton raised by enslaved Black workers reached 61 percent of the value of all U.S. exports in the 1850s and made up 77 percent of raw cotton consumed by British industry, and a higher portion of raw cotton elsewhere in European textile production centers).

[107] UNITED STATES CENSUS BUREAU, HISTORICAL STATISTICS OF THE UNITED STATES, 1790–1970, p. A1–118, Series A. 91–104 fn 1 ("Total slave population: 1790–697,681 … 1860–3,953,760"). *https://www2.census.gov/library/publications/1975/compendia/hist_stats_colonial-1970/hist_stats_colonial-1970p1-chA.pdf?#*

[108] *Id.*, at 5.

[109] DU BOIS, *supra* note 28; Fields, *supra* note 28.

"right-to-work" laws was driven by racist Southern resistance to Black and white workers being members of the same union.[110] Race has since been harnessed as a labor market ideology throughout American history. The sustained attack on welfare framed in terms of helping racialized recipients (Reagan's "Welfare Queen") was useful in reducing the generosity of welfare programs and increasing precarity and dependence on selling labor, thereby increasing the competition among workers and reducing their ability to negotiate better terms for lack of a livable alternative.[111]

We are not asserting, and cannot assert that all racism in America is a result of investments by firms aimed to shape ideology in the labor market. Rather, we assert that firms (and initially, plantation owners) invested in extending and leveraging racist ideology to obtain benefits in labor markets. In particular, this ideology undermined coordinated action by unions, divided by anti-Black racism. It also created a steady, atavistic status-driven downward pressure on expectations and alternatives for Black workers who then offered a steady flow of depressed-wages workers to compete with white workers.

But, as with product markets, investments in ideology need not be at this broad, epoch-making level, but can be more focused. For example, in 2006 the Center for Union Facts ran an ad campaign that "directly targeted the entire labor movement"–a campaign designed to shift population-scale attitudes towards unions and thus shift power in the labor market.[112]

And, as with product markets, firms invest in creating broad cultural campaigns to shift the taste of one or another class of workers towards certain forms of employment. In the 1950s and 1960s, the temporary work companies, like Kelly's Girls or Manpower, invested heavily in campaigns intended to glorify the liberating potential of temp work for housewives.[113] This strategy had the benefit of recruiting a new segment into the labor force that was conditioned by background patriarchal social conventions to expect and accept lower wages and less commitment. It also enabled the industry to circumvent resistance from unions as they developed

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[110] The Racist Roots of Right to Work, , AFSCME , https://www.afscme.org/blog/the-racist-roots-of-right-to-work (last visited Aug 3, 2020). [find better citation sources]

[111] MARTIN GILENS, WHY AMERICANS HATE WELFARE: RACE, MEDIA, AND THE POLITICS OF ANTIPOVERTY POLICY, chapter 8, p. 175–78 (1999); JOE SOSS, RICHARD FORDING & SANFORD SCHRAM, DISCIPLINING THE POOR: NEOLIBERAL PATERNALISM AND THE PERSISTENT POWER OF RACE, chapter 5, 134–38 (2011); Karl Ove Moene & Michael Wallerstein, *Inequality, social insurance, and redistribution,* 95 AM. POL'Y. SCI. REV. 859–74 (2001).

[112] Kris Maher, *Anti-Union Group Takes Message to the Airwaves*, WALL STREET JOURNAL, May 19, 2006, https://www.wsj.com/articles/SB114799623004157251 (last visited Aug 3, 2020). ("In the past, employers often have run ads against specific unions during labor disputes or to counter union claims during organizing drives. Some groups have run ads around an issue such as the requirement in many states that unionized employers' new hires join a union. But labor experts say they can't recall another ad campaign that so directly targeted the entire labor movement.") The Center for Union Facts was funded by "companies, foundations and individuals" that the organization's founder, a long time lobbyist for the food, tobacco, and alcohol industries, would not disclose. Id

[113] ERIN ELIZABETH HATTON, THE TEMP ECONOMY: FROM KELLY GIRLS TO PERMATEMPS IN POSTWAR AMERICA (2011).

a strong market niche in "women's work" that did not threaten the male worker oriented union movement. By the 2010s, as gig work and platform mediated work became more prominent, the pitch shifted toward a general selling of "free agency" as an affirming choice for young people to pursue their own diverse career paths and be their own boss. Kelly's Services (no longer Kelly Girls), for example, published and promoted a glowing report on *Free Agents: How "knowledge workers" are redefining the workplace*, reframing precarious and temporary workers as "microentrepreneurs."[114] The 1950s-60s campaigns and the 2010s campaigns shared the same goal: to promote particular kinds of work structures that offers fewer legal protections (independent contractor rather than employee), and where worker coordination and collective action are substantially harder to organize.

VI. Labor Market with Social Status-Subordination

The labor market analysis of ideology directs us toward a broader and more basic extension of our analysis of power and productivity: the use and abuse of status-subordinated labor. A stable feature of most major industrial transformations since the first Industrial Revolution has been the central role that some form of status-subordinated group of workers played both as low-waged work and as a relatively weak source of labor that could not resist new organizational routines or methods of production that better-organized workers refused to undertake. Women and children made up the majority of the workforce in the transition to the factory system in the first wave of industrialization in Britain, as did young American women in New England, until they too started to organize and were replaced by immigrant women.[115] Irish, and later Southern and Eastern Europeans immigrants, Catholics and Jews, were a major source of status-subordinated labor into the new, non-craft models adopted in the third wave of industrialization in the 1890s to 1930s. Mass production after the exclusion of these immigrants in the 1920s recruited Black workers from the South in what would come to be known as the Great Migration. Immigrants and women were central to the transition to services in the 1970s, and guest workers to some major European coordinated market economies at the same time.[116]

In our model, we can explain this phenomenon readily by introducing two kinds of labor, exogenously determined to be of high and low status.

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[114] Jocelyn Lincoln & Megan M Raftery, *Free Agents: how "knowledge workers" are redefining the workplace* (2011), http://fwlstagingbucket.s3-website-ap-southeast-1.amazonaws.com/assets/multimediams/media/Kelly-OCG-Free-Agents-How-Knowledge-Workers-are-Redefining-the-Workplace.pdf.

[115] Berg, *supra* note 18; Claudia Goldin & Kenneth Sokoloff, *Women, Children, and Industrialization in the Early Republic: Evidence from the Manufacturing Censuses* w0795 (1981), http://www.nber.org/papers/w0795.pdf (last visited May 30, 2020); Barbara M. Wertheimer, We were there :the story of working women in America / (1st ed. ed. c1977.), http://hdl.handle.net/2027/mdp.39015005481695.

[116] Yochai Benkler, Law and Political Economy in Market Societies, (forthcoming; on file with author) [This is a placeholder which we will drop if I don't finish that paper in time.]

We anchor this in Weber's distinction between class (distinctions of hierarchy based on economic relations, or position one occupies in the economy, such as worker or manager, owner or worker) and "status", which is by definition a hierarchical relation not anchored in economic relations.[117] Status-subordinated workers are those who, through social mechanisms outside of economic relations have fewer alternatives to engage in compensated work, lack access to social insurance, or otherwise are habituated by social conventions or forced by threat of violence to assume and accept lower wages and worse work conditions than higher status workers. Historically, Black workers in America and other workers in western countries–ethnic and religious minorities, women, children and immigrants–are the most common and stable sources of status subordination in market societies.

Firms will invest in law and technology that enable them to replace high-status with status-subordinated workers where the gains, in terms of the firms' share of labor market surplus, outweigh productivity losses, if any, associated with adopting the technology or legal arrangement that enables the displacement. The case study we report in Section VII.D. below, of the configuration of self-acting spinning mules in Lancashire and Glasgow, is a quintessential case. Concerted action by firms focused on developing technology (the self-acting mule) that could be deployed by women. The labor conflict over the configuration of the mules, resulted in substantial displacement of men by women in Glasgow, but not in Lancashire. That shift generated a sustained depression of wages in Glasgow, as compared to Lancashire, over the following half century. Similarly, exclusion of sectors like domestic work (mostly Black women and other women of color) and agriculture (mostly Black and migrant workers) from coverage of minimum wage and other employment laws enabled employers to continue to leverage the status subordination of labor in those sectors.[118] Free trade rules that insist on investor protection but not on labor minimal standards similarly leverages heterogeneity in the labor market in willingness to accept low wages and poor conditions in status-subordinated classes of workers in developing nations.[119] Finally, strict quotas on immigration coupled with lax enforcement can provide a steady flow of undocumented workers that put wage pressure on the low end of the market and provide a pool of workers

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117 Max Weber, *Class, Status, Party*, *in* FROM MAX WEBER: ESSAYS IN SOCIOLOGY 180–195 (1991).

118 IRA KATZNELSON, WHEN AFFIRMATIVE ACTION WAS WHITE: AN UNTOLD HISTORY OF RACIAL INEQUALITY IN TWENTIETH-CENTURY AMERICA (2005).

119 This analysis can explain the phenomenon of dualized labor markets in strong social democracies like Germany: In the core economic sectors (particularly the export industrial sector), firms and unions representing high-status workers are coordinated, resulting in strong labor protections and high wages. Outside these core economic sectors, low-status workers provide inputs to the core industries as well as products and services the high-status workers in their role as consumers; and receive low wages and weak labor protections.

who are unable to enforce whatever employment law protections are in place.[120]

In our model, one form of power-seeking investment are legal and technological investments aimed to replace high-status with low status workers. One path is all about power. Assume that workers have the same productivity, irrespective of their status. In that case, status-subordinated workers will produce at the same level of productivity but accept lower wages because of status-determined expectations that put downward pressure on their willingness to accept, or because legal and social restrictions limit their labor market alternatives. A different path directly trades off productivity for power. For examples, we might posit that, because of public policies and social exclusion, status-subordinated workers will have access to less education or suffer higher likelihood of stress at home that will undermine their ability to work at the same productivity as high-status workers. Here, a firm employing status-subordinated workers will be trading off power for productivity, accepting the lower productivity of status-subordinated workers in exchange for the higher profits from the depressed wages these employees are willing to accept because of their status.[121]

VII. CASE STUDIES

Throughout the preceding Parts, as we laid out the model, we offered multiple examples from the real-world behavior of firms, consumers and workers. These were, however, discrete examples. In this Part, we present several, broader case studies that demonstrate the usefulness of our theoretical framework.

A. Home Broadband

There is no need to belabor the importance of high-speed internet access in today's connected world. The availability of such high-speed internet at a reasonable price has a large effect on the welfare of individuals. And, yet, the US has fallen behind in the provision of this basic service. According to OECD broadband statistics, in 2019 the United States was 18th of 36 among OECD-ranked countries in number of home broadband subscriptions per 100 inhabitants, had the second highest prices for high speed home

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120 Mishel, Schmitt, and Shierholz, *supra* note 15.

121 Productivity is not always related to status. There can be low-productivity workers and high-productivity workers with similar status. But then we would expect that wages will approximate productivity, such that shifting from high-productivity to low-productivity workers would not increase the firm's profits–firms that switch to low-productivity workers benefit from the lower wages but incur a corresponding loss from the lower productivity. When the lower-productivity workers are also of lower status, the reduction in wages dominates the reduction in productivity and the firm's profits increase.

broadband, and was eighth in average speeds.[122] We use our analytical framework to explain this disappointing state of affairs.

We distinguish between two types of firms: (1) Firms that own infrastructure (hereinafter "infrastructure owners" or IOs)–the wires that run from the major servers to consumers' homes and carry the data. These include telephone wires, coaxial cable and optical fiber. (2) Firms that do not own infrastructure (hereinafter "non-infrastructure owners" or NIOs), but purchase access to this infrastructure, and can thus offer broadband services to consumers, and compete with the IOs. Building infrastructure involves very high startup costs, creating a barrier to entry into broadband services markets. Until about 2000, when most home Internet was dial-up and could use common carriage over telephone lines, NIOs like America Online were the dominant Internet providers. After 2000, the introduction of DSL over phone wires and cable broadband over cable made broadband access possible. Neither cable nor DSL fell clearly under historic common carriage rules that made dial-up NIOs possible, and most countries were faced with a regulatory choice. Since IOs have no reason to support NIO competitors, the viability of NIOs depended on regulatory action that would guarantee their access to the IOs' infrastructure even after the broadband transition. This cluster of "open access" policies was contemplated and adopted in the mid-1990s. But while "open access" policies continue to apply outside the United States (in other OECD countries), they were largely abandoned in the United States in 2001-2002.[123]

In both the US and Europe, the original IOs were the local telephone companies and the cable companies. Local telephone and cable companies competed with each other in areas where each had infrastructure already in place, but were aligned in their fight against the NIOs. In the US, from the late 1990s and until 2005, the IOs made substantial power-increasing legal investments to thwart the NIOs; and the NIOs made power-increasing investments to secure their ability to compete. From 2001-2005 the two major potential entrants into the home broadband markets using open access policies were the two major long-distance companies, AT&T and MCI. The incumbent local telephone companies litigated during the latter 1990s to delay and contain adoption of open access. Then, in the early 2000s, they lobbied for a change of policy once an FCC more ideologically reticent to actively regulate telecommunications markets was appointed by George W. Bush. In 2001-2002, as a result of the IOs' efforts, the FCC abandoned open access. Instead, the FCC adopted a theory that competition between a single incumbent telephone company and a single incumbent cable company was enough to drive innovation while maintaining sufficient pricing

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[122] OECD Broadband Statistics, December 2019, *https://www.oecd.org/sti/broadband/broadband-statistics*. [**Note that as for the speed & price–the mentioned number is correct as for 2017, rather than 2019: *See* *https://www.oecd.org/sti/broadband/5.2_Akamai--average-speed.xlsx* & *https://www.oecd.org/sti/broadband/4.10.FBB-High_2017.xls*, respectively].

[123] YOCHAI BENKLER ET AL., *Next Generation Connectivity: A Review of broadband Internet transitions and policy from around the world* (2010).

power to provide the financial wherewithal to support investment in infrastructure. In the 2000s, both IOs and NIOs funded economic studies that supported their position–that open access decreased or increased penetration and investment, depending on the funder.[124] The funding of such studies can be conceptualized as misperception-increasing investments. When the FCC abandoned open access, the NIOs challenged the FCC's decision in the courts. In 2005, the IOs won the last iteration of this battle, when the Supreme Court upheld the FCC rule as a permissible, if not entirely reasonable, interpretation of the agency's statute.[125] And so only the IOs remain, and competition suffers from the dearth of broadband providers. In nearly half the country, high speed broadband is a monopoly market, and in 30% of the country even mid-tier speeds are only provided by a single provider. Competition among more than two providers is a rarity in high speed, and available to only 25% of the country for mid-tier speeds.[126]

In Europe, the legal and regulatory battles between the IOs and the NIOs played out differently. These countries established regulatory structures that proved more resilient to IOs' power-increasing legal investments. Open access policies withstood the IOs' challenges, and NIOs entered the market and successfully competed with the IOs. This competition explains the significantly lower broadband prices and the larger number of broadband subscriptions in many European countries.

The remaining question is about quality, and here we shift to the relationship between power-increasing investments and productivity-increasing investments. More specifically, how regulators' containment of power-increasing investments drove firms towards productivity-increasing investments. IOs invest in improving their infrastructure–to allow for faster internet speeds. The major investment challenge is presented by the civil engineering costs associated with digging new trenches and placing ducts as near as possible, or all the way, to the individual apartment or home. Costs increase as the construction moves from arteries to capillaries. All broadband networks combine fiber optics (which is the highest capacity and the sole technology used in the core of the Internet) with more or less copper that is already in the ground or through the walls of a building. The current and future upgrade paths are determined by how far out to the edges of the network the broadband provider uses optical fiber, and whether and how much of the network (from the neighborhood, the curb,

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124 Benkler et al, Broadband Report, at 90–136 (reviewing the literature as of 2009, including sources of funding).

125 *National Cable & Telecommunications Ass'n v. Brand X Internet Services*, 545 U.S. 967 (2005).

126 According to the FCC, only 12.5% of American households had available to them more than 2 providers of broadband at over 100 Mbps, 54% had 2 or more providers, and 90% had 1 provider or more. *See* https://broadbandmap.fcc.gov/#/area-comparison?version=jun2019&tech=acfw&speed=25_3&searchtype=county, removing satellite which nominally competes everywhere but actually has almost no adoption.

These numbers improved to 25%, 70%, and 95%, respectively, for lower speeds between 25 and 100 Mbps, generally provided by DSL services.

the building, the apartment home) is provided using copper ("twisted pair" for telephone, and "coaxial cable," for cable).

Fiber-to-the-home (FTTH) systems refers to system where IOs have pulled optical fibers all the way to the point where they connect to the home's Internet gateway. Combined fiber and twisted pair (telephone wire), or DSL service, has the lowest capacity and is the most sensitive to distance from the home (that is, speed decreases most as the distance from the fiber optic connection increases). Hybrid fiber-coaxial (the cable used by cable companies) is designed to carry large amounts of data (video) downstream to the home, but is harder to use for upstream capacity (high definition video conferencing; high speed gaming) than FTTH, and has a theoretically lower peak capacity in the long term (at present, coaxial cable is understood to have capacity on the order of 10Gbps, as opposed to fiber's hundreds of Tbps). In addition, cable is a shared medium in a neighborhood, typically experiencing slowdowns at peak usage periods, while both twisted pair and fiber are dedicated to each subscriber.

This higher quality (speed, capacity) of FTTH comes at a steep price. In the United States, the civil engineering costs of installing fiber to the home infrastructure costs 5-10 times more than the cost of upgrading cable infrastructure to reach 100Mbps. As was the case with the first broadband transition, the United States started among the top few countries in FTTH penetration, largely on early investments by Verizon in FiOS and several municipal utilities extending service to fiber, but has fallen behind in the past decade relative to many European countries. In the absence of any infrastructure-sharing regulation, competitors over DSL largely withered away in the US. And the two primary non-cable broadband providers, AT&T and Verizon, decided not to invest in creating or upgrading fiber networks and focused on the mobile market, becoming wireless companies.[127]

By contrast, in Europe, the open access obligations permitted several NIO entrants to compete successfully with IOs. Other regulatory interventions in Europe also encouraged investment in fiber: Specific obligations to share infrastructure inside the building, that were imposed symmetrically both on incumbents and on entrants, but with either complete or partial

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[127] Regulation in the wireless market required IOs (companies that have acquired spectrum) to sell wholesale services to NIOs or Mobile Virtual Network Operators (MVNOs). And the highly concentrated mobile data market, made entry to that market especially attractive. AT&T has about 14 million home broadband subscribers, as compared to 165 million wireless. *See* 2019 Annual Report, *https://investors.att.com/~/media/Files/A/ATT-IR/financial-reports/annual-reports/2019/complete-2019-annual-report.pdf* (p. 18–19). Verizon has about 6.5 million home broadband subscribers, of which 5.7 are FiOS (FTTH), as compared to 95 million wireless subscribers. *See https://www.verizon.com/about/sites/default/files/2019-Verizon-Annual-Report.pdf* (p 15). By comparison, Comcast and Charter, the two largest cable home broadband providers, each the sole cable broadband provider in its own geographic region, have about 25 million home broadband subscribers each. *See https://www.cmcsa.com/static-files/d3de7993-a16b-42bf-bebd-a45b938dcbfc* (Comcast annual report, page 40); *https://ir.charter.com/static-files/b453964b-6b96–4fb8-aebc-91cec0fda968* (Charter annual report, page 10).

exclusions for new fiber infrastructure,[128] drove both the incumbent IOs and the NIOs to compete by investing in more fiber to the building.[129] In addition, wireless companies started investing in fiber so that they could compete in the market for bundles (bundles of home wired telephone, video, wired broadband, and wireless service).[130]

This case study focuses on the product market. The main parties are firms who compete amongst themselves. These firms make power-increasing legal investments (to create or maintain monopoly power) and productivity-increasing technology investments (to create or improve infrastructure). Consumers play an indirect role. Governments who are imperfect representatives of consumers invest in their regulatory structure to resist lobbying by firms. We can view these as (indirect) power-increasing legal investments.

Turning to welfare: Our analytical framework suggests that investments that take the market further away from the socially optimal benchmark are welfare reducing and that investments that bring the market closer to this benchmark are welfare enhancing. From this perspective, firms' investments in thwarting "open access" is welfare reducing: They were vying for market power so that they could extract short-term rents, not to support long-term innovation. And investments by governments–to establish a regulatory structure that can resist firms' power-increasing legal investments–is welfare enhancing. The welfare implications of the interaction between power-increasing investments and productivity-increasing investments are even more important. In the United States home broadband market, firms focused on power-increasing legal investments that limited the number of viable competitors and secured near-monopoly positions for incumbent IOs. These incumbents felt no need to make expensive productivity-increasing investments in FTTH. By contrast, in Europe, regulators have been able to muster the political power to mute the efficiency of the IOs' power-seeking legal investments. Thus, IOs and their NIO competitors have been forced

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[128] In some countries, like Spain, IOs have to share their ducts, but not the cable capacity in it, requiring entrants to pull their own fiber through the ducts and providing some return on the long term civil engineering costs of digging the trenches and placing the ducts to the IOs.

[129] In Spain, aggressive duct-sharing obligations has led to the most spectacular FTTH as share of broadband service growth in the past decade. *See* Frias, Zoraida; Pérez Martínez, Jorge (2016): FTTH Unbundling: The Spanish Regulation in Retrospect, 27th European Regional Conference of the International Telecommunications Society (ITS): "The Evolution of the North-South Telecommunications Divide: The Role for Europe", Cambridge, United Kingdom, 7th-9th September, 2016, International Telecommunications Society (ITS), Calgary;

[130] This is partly due to the higher level of competition over wireless, introduced partly by wholesale obligations that enabled the emergence of MVNOs. In France, the two leading NIOs, SFR and Free, invested in building out their own fiber infrastructure in high density urban areas. In addition, in low-density areas with limited competition, the regulator allowed firms to cooperate and spread the costs of the core fiber infrastructure (e.g., SFR and France Telecom cooperated in this way). Bourreau, Marc; Grzybowski, Lukasz; Hasbi, Maude (2018) : Unbundling the Incumbent and Entry into Fiber: Evidence from France, CESifo Working Paper, No. 7006, Center for Economic Studies and Ifo Institute (CESifo), Munich

to focus on productivity-increasing investments — primarily, in the last decade, investing in more FTTH infrastructure. With the large effect of FTTH investments on long-term productivity and growth, the United States has settled on a lower-welfare equilibrium, whereas Europe has been able to reach a higher-welfare equilibrium.

B. Net Neutrality

The net neutrality debate is one of the most important to arise at the intersection of law and technology in recent years. We begin with a brief background on the architecture of the Internet. Early developers of the Internet believed that computation capacity was increasing too rapidly for Internet designers to have a clear sense of what the network will actually be used for. To deal with this uncertainty, they adopted the "end-to-end" design principle: the network needs to be designed to be as simple as possible at its core, and to push all intelligence to its "edges." All the network would need to be able to do is identify a packet and its destination, and deliver it. It should not need to know that the packet is part of a voice communication, a video, an email, or a software program. When a completely new application is developed, no one needs to give it permission or redesign the network to accommodate it; it is left up to the developers of the new application to make sure they can translate whatever they are trying to achieve into the simple packets and addresses that the network can recognize and deliver. It is widely accepted in the Internet engineering community that this architectural feature of the Internet is the core design feature that has made the Internet such an innovation-friendly network.[131]

This core design feature of the Internet–the content-neutral treatment of data packets–removes one source of potential profits for home broadband providers. These firms control the flow of data to the home. To maximize profits, they would like to engage in price discrimination–charging higher prices for higher-value packets or, more realistically, to speeding-up delivery of time-sensitive packets (at the expense of other packets) and charging higher prices for the higher speed. For example, firms could charge more to prioritize a voice package, because voice is a more delay-sensitive application; or they could charge more for a video stream than a software

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[131] It is also widely accepted that this design feature sacrificed static efficiency for growth or dynamic efficiency. There were many instances when some valuable communications, say voice communications, could be improved more efficiently by making changes in the core of the network, rather than forcing all the adaptations to happen at the edges. In the 1990s, this design approach created a divide between "Net-heads" and "Bell-Heads", with the former focused on optimizing the network for innovation and growth, even at the expense of static efficiency, and the latter focused on maximizing static efficiency, even at the expense of making innovation on the network slower and harder. Over the years, there were multiple efforts to introduce standards focusing on static efficiency, e.g., IBM's Token Ring (as opposed to Ethernet), the telecommunications industries preferred Asynchronous Transfer Mode (relative to the Internet Protocol), or proprietary mobile data standards (relative to WiFi). All these efforts failed to keep up with innovation-centric open, neutral protocols. *See* Yochai Benkler, *Open Access and Information Commons*, *in* THE OXFORD HANDBOOK OF LAW AND ECONOMICS, VOL. 2: PRIVATE AND COMMERCIAL LAW (2017).

or data package, again, because delay is more destructive. Or, the broadband providers could charge extra fees to particularly successful companies, like Google or Facebook, thus forcing them to share revenues in exchange for access to home subscribers.

In 1999, the core design feature of the Internet–the content-neutral treatment of data packets–was challenged by new technology. Cisco developed the first "policy routers," designed to displace the end-to-end, content-neutral principle. These routers enabled broadband providers to interject between the end users and the services they are using on the open Internet and distinguish between packets. Broadband providers could now prioritize or slow down certain packets based on "policies" that the firms adopted. They could implement their preferred, price discrimination strategy, also called "paid prioritization" since broadband providers could charge for priority or faster access. Such paid prioritization would increase the profits of broadband providers. It may also increase the profits of larger, incumbent information producers–firms that develop content and other applications–that could exploit paid priority as an entry barrier to small, startup innovators who cannot afford to pay for priority.[132] On the other hand, this newfound power, created by policy routers and paid prioritization, is potentially harmful to smaller information producers providing new applications and content, and to consumers.[133]

What ensued was a two-decade political and legal battle that came to be widely known as the net neutrality debate. Consumer advocate organizations like Free Press, Public Knowledge and the Electronic Frontier Foundation, together with some Internet startups and venture capitalists who backed them, engaged in a mix of litigation and lobbying, aimed at both Congress and the FCC–to create a legal prohibition against using technologies like the policy routers to enable price- and content-discrimination. These power-increasing legal investments were successful. In 2006, the FCC issued a non-binding "net neutrality" policy, and then fined Comcast, under that policy, for impeding usage of BitTorrent. But then broadband providers made some power-increasing legal investments of their own. They appealed the FCC action to the DC Circuit, which overturned the FCC's non-binding "net neutrality" policy. This began a tit-for-tat of power-enhancing legal investments. Consumer organizations lobbied the Obama FCC to pass new net neutrality rules, which the FCC promised to do. Broadband providers made counterinvestments in lobbying. They also invested in misperceptions–funding economic studies on the potential harms from net neutrality

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132 BARBARA VAN SCHEWICK, INTERNET ARCHITECTURE AND INNOVATION (2012).

133 For example, a startup like Skype was in 2003 would be unable to show that its code was a superior solution for voice over Internet, if it had to compete with an incumbent firm with an inferior technology but with the financial wherewithal to acquire prioritization. This may explain why Google, Facebook, and Netflix were supporters of net neutrality in the first rounds of the net neutrality debate, but took more of a back seat in the 2010s, as their size changed the relative benefits and costs they faced from paid prioritization.

to investment and penetration (or, analogizing net neutrality to 'open access,' repurposing existing studies on the adverse effects of 'open access' on investment and penetration). These efforts significantly watered down the regulations that did pass.

The broadband providers then litigated these watered-down rules as inconsistent with the FCC's designation of broadband IOs as information services, which the broadband providers had won as part of their battles over open access (discussed above under home broadband). Given those earlier successes and the precedent they set, the broadband providers again won. The activists continued to lobby, and organized grassroots campaigns, and eventually got the FCC to pass a new net neutrality order that corrected the flaws that led to prior judicial reversals. Specifically, in the new order the FCC asserted more jurisdiction over home broadband providers as common carriers, reversing the position that the Bush FCC took in 2001-2002. This new order was ultimately upheld on appeal in 2016. Broadband providers, however, had the final word: In 2017, they got the Trump FCC to reverse the net neutrality order and permit discrimination among packets.

This case study focuses on the product market. The main parties are firms, broadband providers, and consumers. (Information producers also become important, when we consider welfare implications.) Broadband providers make power-increasing legal investments (to create or maintain monopoly power by opposing net neutrality) and power-increasing technology investments (developing technologies, like policy routers, to inspect and discriminate among packets). These two power-increasing investments are complements. Consumers make power-increasing legal investments (to support net neutrality). The legal battles reflect the strategic interaction between power-increasing legal investments by firms and by consumer organizations.

Turning to the welfare implications of these power-increasing investments: We begin with a static welfare analysis. Our analytical framework suggests that investments that take the market further away from the perfect competition benchmark are welfare reducing and that investments that bring the market closer to this benchmark are welfare enhancing. From this perspective, the power-increasing investments by broadband providers were designed to create or maintain market power and are thus welfare reducing, whereas the investments by consumer organizations–to block firms from creating or maintaining market power–are welfare enhancing.[134] From another angle, the investments by both sides were welfare-reducing: The years-long legal battles wasted resources, on both sides, ending at the same point, perhaps, that we would be in without any legal investments.

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[134] As explained in Section ??? above, in some cases the appropriate normative benchmark is not perfect competition; rather allowing firms some degree of market power may maximize welfare, if *supra*-competitive profits are required to support innovation. These dynamic welfare considerations are further discussed below.

This exemplifies the multiple equilibrium problem: an equilibrium with high legal investments by both sides is no better than an equilibrium with low legal investments by both sides, and only wastes resources.

More important, we must consider the relationship between the power-increasing investments and potential productivity-increasing investments. From a static efficiency perspective, the power-increasing investments by the broadband providers have an ambiguous effect on productivity-increasing investments by information producers. An information producer knows that if its productivity-increasing investment produces more value to consumers, the broadband providers would extract a large share of this value through price discrimination. This reduces the information producer's incentives to invest. On the other hand, if broadband providers use their power to prioritize time-sensitive packets and slow-down time-insensitive packets, this may theoretically increase welfare, from a static perspective. It is inefficient to allocate bandwidth in a way that disregards the variable speed requirements of different applications. This neutrality approach reduces the value of time-sensitive content, without increasing the value of time-insensitive content. Therefore, from a static perspective, prioritizing time-sensitive content may increase incentives to invest in such content.

And yet the static efficiency analysis is likely swamped by dynamic considerations. From a dynamic welfare perspective, the main question is how to best promote innovation or, equivalently, how to promote productivity-increasing investments in innovation. Looking narrowly at broadband, we have no direct evidence on relative innovation rates under net neutrality as compared to paid prioritization. But if we adopt a broader perspective, the advantage of open, content-neutral infrastructure becomes clear. In the wireless market, we have direct competition between the closed, proprietary wireless networks of the mobile carriers and the open, spectrum commons, WiFi, 900MHz, Bluetooth and ZigBee. In the 2000s, wireless carriers claimed that smart grid communications, health applications and payment systems would only be developed on their proprietary infrastructure, because only they could assure prioritization of such mission-critical applications. And yet all these market verticals came to be dominated by startup firms that relied on the open spectrum commons.[135] It is also telling that other attempts to create standards that support paid prioritization have all failed. For example, it was thought that latency-sensitive voice communications services require paid prioritization. To facilitate voice communications over the internet, incumbent telecommunications carriers sought to replace the Internet protocol, TCP/IP, with Asynchronous Transfer Mode (ATM) that allowed for paid prioritization. These efforts failed and a small startup,

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[135] Yochai Benkler, *Open wireless vs. licensed spectrum: Evidence from market adoption*, 26 HARV JL TECH 69 (2012).

Skype, solved the latency problem and offered successful voice communications using the open TCP/IP protocol.[136] Skype was later bought by Microsoft, and Skype Business became the basis of Microsoft Teams. Moreover, the entire market in video conferencing, including Zoom, launched in 2013 and transformed by the Covid-19 pandemic, is grounded in robust innovation by small startups using first-come, first-served packet switching, rather than in efforts of highly capitalized broadband incumbents who rely on paid prioritization to assure quality of service. To conclude: There is a real concern that power-increasing investments by broadband providers (to defeat net neutrality) will lead to a significant decrease in productivity-increasing investments by information producers.

C. Microsoft

In the domain of operating systems, Microsoft's actions and the actions of those who challenged Microsoft, illustrate the interaction between different types of power-increasing investments and the effects of these interactions on productivity-increasing investments.

Since the mid-1980s, Microsoft enjoyed a dominant position in the operating system market, with its MS-DOS, and later with its graphical user interface (GUI), Windows (which was initially layered on top of DOS). This dominant position was maintained by powerful network effects. Independent software vendors (ISVs) wanted to write software that is compatible with the most widely used operating system. And this further bolstered Microsoft's dominance, since consumers place a high value on operating systems that support a broad range of software applications. Microsoft thus benefitted from a positive feedback loop: an operating system that had a larger user base could expect more application developers to develop for its system, and the system that had more applications could expect its user base to grow faster.

Then, in 1990, Digital Research, Inc. released DR-DOS 5.0, a competing operating system that was fully compatible with all the applications that ran on MS-DOS, and was considered–in the trade press as well as in internal Microsoft memos–technologically superior to MS-DOS. Its dominance threatened, Microsoft embarked on a range of power-increasing investments.[137] The first was a power-increasing legal investment–a critical change in licensing practices.[138] Microsoft licensed MS-DOS to PC manufac-

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[136] Skype solved the latency problem with innovations in the voice coding-decoding software and integrating it into a virtual network design. *See* Benkler, *supra* note 132. Video streaming is another example of a time-sensitive, or speed-sensitive, information service that would seem to have benefited from paid prioritization. And yet Netflix developed without paid prioritization and has long been a major supporter of net neutrality. [Perhaps also mention the failure of IBM's token ring.]

[137] Caldera, Inc. v. Microsoft Corp., 72 F. Supp. 2d 1295 (D. Utah 1999), , JUSTIA LAW , https://law.justia.com/cases/federal/district-courts/FSupp2/72/1295/2336233/ (last visited Oct 5, 2020).

[138] Competitive Impact Statement : U.S. V. Microsoft Corporation, (2015), https://www.justice.gov/atr/competitive-impact-statement-us-v-microsoft-corporation (last visited Oct 5, 2020).

turers. In order to sell their PCs with MS-DOS preinstalled, Microsoft required that the PC manufacturers pay a fee based on the total number of computers they sold, rather than on the number of MS-DOS installations. Microsoft argued that this was a more accurate calculation of the number of actual MS-DOS instances used, given that many people who bought a PC without an operating system then used pirated copies of MS-DOS (particularly outside the US). In addition, Microsoft forced PC manufacturers to precommit to a number of licenses, and it extended the length of the license to three years, essentially the entire useful lifetime of the computer. In combination, these three licensing requirements ensured that no PC manufacturer would install DR-DOS (unless it was willing to do so on their entire inventory and sell no instances of MS-DOS at all, which few manufacturers were willing to do).

In addition to these power-increasing legal investments, Microsoft invested in power-increasing misperceptions. To deter switching to DR-DOS, Microsoft falsely claimed that a new and improved version of MS-DOS was imminent (a practice that at the time was known as vaporware). In addition, Microsoft fabricated announcements about incompatibilities associated with DR-DOS (in what came to be known as its fear, uncertainty, and doubt (FUD) campaign). Finally, Microsoft introduced elements in its Windows graphical user interface that reported error if it found that the computer was running DR-DOS, even though DR-DOS was technically compatible with Windows.

These power-increasing investments did not go unchallenged. The Department of Justice sued and, in a 1994 consent decree, Microsoft agreed to abandon its anti-competitive licensing practices. And, in a later, private antitrust suit by the successor-in-interest of Digital Research, Microsoft was held liable for the power-increasing misrepresentations.

Later in the 1990s, Microsoft faced another challenge. With emergence of the web browser and scripting languages, in particular Java, ISVs could develop applications that would run through the browser, rather than directly on the operating system.[139] Microsoft responded with power-increasing technology investments: Its Internet Explorer browser and its Active X scripting language (and its version of the Java software development kit) introduced nonstandard elements, so that, once again, software developers who wanted to access Microsoft's large installed base would have to write programming or web content that runs only on Microsoft's operating system or browser. (Alternatively, developers would have to write two versions of each program or application–one version for Microsoft systems and another version that takes advantage of Java and runs on the then-dominant Netscape browser.) Once again, the Department of Justice sued, and won in the District Court in DC. Microsoft appealed and secured a remand.

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[139] Sun Microsystems described the idea behind Java as follows: a software developer could "write once, run everywhere" leaving it to Java to translate between the application and whatever operating system it happened to be running on; or leaving it to the browser to do so.

Meanwhile, the Bush administration took over the Justice Department and, on remand, the Bush Justice Department proposed more lenient remedies. Finally, Microsoft agreed to a settlement, under which it would abandon the core practices underlying the lawsuit (- a settlement opposed by the Attorneys General of nine states and the District of Columbia as too lenient), and the settlement was approved in 2004 by the D.C. Circuit Court of Appeals.

This case study focuses on the product market. The main parties are firms and consumers. Microsoft is, of course, a key player, making power-increasing legal investments (to create or maintain monopoly power through exclusionary licensing practices, and all of the litigation investments), power-increasing technology investments (Windows issuing false error reports when DR-DOS was used and, more importantly, introducing non-standard elements in Explorer and ActiveX), and power-increasing investments in misperceptions (false claims that DR-DOS suffers from incompatibilities and that a new and improved MS-DOS is just around the corner). On the other side, consumers–through government action–made power-increasing legal investments to fight Microsoft's power-increasing investments (in law, technology and misperceptions). Non-firm producers/consumers also made power-increasing technological investments in developing free and open source software–the Apache web server, the Linux operating system, the Firefox browser, Python–which created nonmarket alternatives to the core utilities around which Microsoft was seeking to extend its own market power in desktop operating systems. As in the previous case studies, the power-increasing investments by Microsoft were designed to create or maintain market power and were thus welfare reducing, whereas the investments by consumers and the government to limit Microsoft's market power are welfare enhancing. And, as before, from another perspective, the legal investments by both sides were welfare-reducing, as an equilibrium with high legal investments by both sides is no better than an equilibrium with low legal investments by both sides, and only wastes resources. The technological investments made by free software developers were productivity-increasing, as well as power-increasing.

What were the effects of these power-increasing investments on productivity? Microsoft's power-increasing investments extended its dominance by well over a decade. During this long period, productivity-increasing technology investments by Microsoft's competitors were forestalled–they did not benefit consumers (at least not as much as they could have); and, arguably, significant productivity-increasing technology investments were never made, because potential competitors feared that Microsoft would not let them into the market. On its part, Microsoft preferred to invest in power, rather than in productivity. It's not that Microsoft did not invest in productivity-increasing technology; it did. But it struggled to keep up with its competitors on the productivity and decided to exert power and exclude them from the market. Bottom line: Microsoft's power-increasing investments hindered productivity-increasing technology investments by

other firms (potential disrupters that were excluded from the market). On the other hand, Microsoft's successful containment of competitors in the market may have opened up more room for successful free and open source software development, which opened an entirely new software development paradigm that has since taken a central place in the software innovation ecosystem.

D. Google

In late 2020, Google became the subject of a series of antitrust lawsuits by the U.S. Department of Justice and two separate coalitions of state attorneys general.[140] Unlike with the case of Microsoft, we cannot take these allegations as proven, and so our description of the behaviors in this case study are tentative. The complaint filed by the Justice Department and 11 states (the DoJ Complaint) focused on how Google used power-seeking legal and technological investments to lock in its monopoly over the market in search, and extend that monopoly into new platforms — from mobile phones in the late 2000s to smart speakers, home appliances, and automobiles in the transition to Internet-of-Things (IoT).[141]

Google, founded in 1998, initially presented the quintessential productivity-increasing technological innovation. All prior search engines used algorithms that relied on the text of the stories to determine relevance to a query, on human coding (drastically limiting the number of web pages that could be indexed), or, in the case of Overture, on letting websites bid for placement. The PageRank algorithm on which Google was founded was the first to use network metrics of a story (how often it had been linked, and by which pages) to select among the stories that a text query returned.[142] At the turn of the century, then, Google represented a genuine disruptive innovation into a then-already-full market of search engines, improving speed and relevance of results by comparison to then-available competitors. It reached about 16% of the market in 2002, and overtook Yahoo as the leading search engine around 2005, stabilizing at around 37% of the U.S. market share of searches in 2005 and 2006. Google market share of desktop search continued to grow, surpassing 50% of the market in 2007 and rising to between 63% and 72%, according to different market analysis firms, at the end of 2008.[143] By 2020, the Department of Justice (DoJ)

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140 McKinnon, *supra* note 3.

141 DoJ Complaint, in *United States et al vs. Google LLC*. United States District Court, District of Columbia, Case 1:20-cv-03010. Filed 10/20/20.

142 Yochai Benkler, *Coase's Penguin, or, Linux and "The Nature of the Firm"*, 112 YALE LAW J. 369, 392 (2002).

143 ZDNet Editors, *Search engine market shares in June 2005: Google–36.9%, Yahoo!–30.4%, MSN–15.7%*, ZDNET , https://www.zdnet.com/article/search-engine-market-shares-in-june-2005-google-36–9-yahoo-30–4-msn-15–7/ (last visited Jan 31, 2021); Gerard Manning, *Top Search Engines from 2002 to 2005*, MANNING SEARCH MARKETING (2014), https://www.manningmarketing.com/articles/top-search-engines-2002–2005/ (last visited Jan 31, 2021); Search Market Share 2008: Google Grew, Yahoo

alleged that Google's market share was 90% of all search in the U.S., and 95% of mobile search. Moreover, the DoJ alleged that Google had leveraged its initial large market share through power-seeking investments, both legal and technological, to create and maintain its complete dominance in search. The two state attorneys general suits, in turn, argue that Google used similar means to extend its power into the advertising market, the main source of profits for Google, Facebook, and diverse Internet publishers.

Perhaps the most dramatic allegation in the DoJ Complaint is that Google developed Android, and in particular developed it as an open source application, in order to gain a foothold in, and create bottleneck control over, the mobile search market. Concerned that mobile manufacturers and wireless carriers would leverage their control over the devices and wireless networks to gain control over advertising, the complaint alleges, Google acquired and developed Android as a buffer between device manufacturers and wireless carriers, on the one side and app developers and customers on the other side–a buffer that enabled Google to exercise power over the entire mobile internet architecture.[144] This allegation, if true, implies that one of the most important critical infrastructures of the past decade and a half — the most widely used mobile phone operating system in the world — was in significant part developed as a power-seeking technological innovation.

Once device manufacturers and wireless carriers had sunk significant costs into adopting Android, in part because Google paid them a percentage of the advertising revenue, Google began to shore up its ability to use Android as a control point with legal investments — requiring major carriers to agree, contractually, not to "fork" their version of Android, even though they had the right to do so under the open source licensing that governed the operating system. The company also made additional, power-seeking technological investments — creating specific interfaces and interoperability standards for Google Apps and Apps available through Google Play that only worked with the proprietary, rather than the open source, version of Android (and reinforcing these technological investments with further legal investments by making the proprietary version with its new enhanced extensions available only to signatories of additional contractual lock-in provisions). In addition to these investments, the DoJ complaint alleges that Google made other legal investments to secure its dominant position in search. Most importantly, in exchange for a share of advertising revenue,

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& Microsoft Dropped & Stabilized, , SEARCH ENGINE LAND (2009), https://searchengineland.com/search-market-share-2008-google-grew-yahoo-microsoft-dropped-stabilized-16310 (last visited Jan 31, 2021); Datopian, *Search Engine Market Shares*, DATAHUB , https://datahub.io/rufuspollock/search-engine-market-shares (last visited Jan 31, 2021).*See also https://www.comscore.com/Insights/Press-Releases/2010/12/comScore-Releases-November-2010-US-Search-Engine-Rankings?cs_edgescape_cc=US*; *https://searchengineland.com/nielsen-netratings-august-2007-search-share-puts-google-on-top-microsoft-holding-gains-12243*

144 DoJ Complaint, *supra* note __, at paragraphs 58–65.

Google reached agreements with Apple to make Google search the default search application on Apple phones and tablets–initially as the default on the Safari browser, and more recently as the search engine invoked by other "search access points" (such as Siri, Apple's voice assistant).[145] It reached similar agreements with desktop browser producers, most importantly Mozilla Firefox, and with Amazon for its voice assistant, Alexa.[146]

The two antitrust suits brought by several states, one led by Colorado (the Colorado complaint),[147] the other by Texas (the Texas complaint),[148] repeat some of the same allegations, but primarily add both legal and technological investments in creating power in the advertising market. Both cases allege that Google developed and introduced technology designed to simultaneously provide a tool for advertisers to plan and buy advertising online, and to funnel those advertisers to Google's own advertising platform. The Colorado complaint focuses on SA360, Google's primary search engine marketing tool, purportedly designed to enable marketers to compare the opportunities and costs of advertising across multiple search engines. According to the Colorado complaint, SA360 deliberately favored Google search over competing search engines. For example, both Google and Bing integrate real time data from which advertisers could optimize their bidding for advertising spaces, but SA360 was designed to incorporating real time data from Google's search engine and receive updated data from Bing only four times a day (intentionally denying interoperability to Bing's real-time data stream).[149]. It is difficult to imagine a more direct example of sacrificing the productivity of a technology in order to deploy it in a power-enhancing way.

The Texas complaint alleges that Google's entire advertising auction architecture was designed to give Google the power to control both sides of the online advertising market. The technical infrastructure of this market is comprised of three components: The first is an advertiser management utility used by publishers, such as newspapers, to (i) collate information about users' preferences and communicate it to marketers, and (ii) receive and evaluate bids from marketers for placement of ads next to stories that particular users read. Google Ad Manager plays that role, and covers roughly 90% of the market in ad managing software. The second component is an ad exchange — a real-time bidding market for advertising slots. The third component is a marketing engine that allows marketers to receive information from publishers, calculate what an advertisement in front of this

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145 *See* DoJ Complaint, *supra* note __, at para. 42–47; 78–87.

146 *Id.*, at 48–49.

147 Colorado et al vs. Google LLC, US District Court, District of Columbia, Case Number 1:2020cv03715 (filed December 17, 2020).

148 Texas et al. v. Google LLC, Us District Court, Eastern District of Texas, Case Number 4:2020cv00957; (filed December 16, 2020).

149 The Colorado complaint explicitly clarifies that technically, it is not difficult to achieve interoperability, citing one independent provider of search engine marketing tools that does provide such interoperability with both Bing and Google. Colorado Complaint, para. 152–157.

particular user, at this particular time, is worth, and bid for the ad slot in the ad exchange.[150] For each of the three components, Google's tools hold a dominant position. And, according to the Texas complaint, Google designed each of these tools so that if its product is used in any of the three components (say, a publisher uses Google's ad manager), that component provides an advantage for Google vis-à-vis competitors in each of the other components, primarily by degrading the information flow to, and timeliness of bidding from, competitors' utilities. For example, whereas its own utilities get rich information about users, Google erected technological barriers that limited the data available to competitors. Google also allegedly delays its competitors' bidding and information retrieval so as to hinder their ability to compete in real time ad auctions. Finally, the complaint alleges that Google uses its publisher, advertiser, and exchange products to collect information about competing bids and thus marginally outbid its competitors.

Perhaps the clearest example of a power-increasing technology investment involves "header bidding"–a technology that publishers began to use in 2014. An active bit of code in the publisher's own website directed the users' browser to solicit bids from multiple ad exchanges, not only Google's. By 2016, 70% of publishers were using this technology to circumvent Google's advertising monopoly. In response, Google developed and promoted "Open Bidding" as its own implementation of header bidding. According to the Texas complaint, Google's Open Bidding degraded the key feature of header bidding — the open competition among ad exchanges — and reestablished Google's control. Google also entered into an explicit anticompetitive agreement with Facebook, its largest competitor in advertising, to abandon Facebook's support for header bidding, in exchange for a share of Google's monopoly rents. Finally, Google developed a new standard for loading mobile web pages, Accelerated Mobile Pages (AMP), ostensibly to enable faster loading of publishers' web pages when accessed on mobile devices. In fact, the AMP framework was allegedly designed specifically to be incompatible with the JavaScript code that implemented header bidding.

The allegations in the three lengthy complaints have not yet been tested at trial, nor admitted by Google. The case study, covering product markets, suggests however that one of the most innovative companies in the world, has continuously and extensively made power-seeking legal and technological investments at the very heart of its business. Building on productivity-enhancing innovations early in its lifecycle, the company then shifted much of its focus to a broad range of legal and technological investments that were designed to maintain and expand Google's market power in search and advertising — its core business and its core source of profit.

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[150] Texas Complaint, *supra* note __, paragraphs 32–60.

E. First- and Second- Wave of Industrialization: The Self-Acting Mule and Pneumatic Molding Machines at the McCormick Reaper Plant in Chicago

Cotton manufacturing was Britain's largest export industry in the 19th century, and was the carrier industry of the first wave of industrialization. Central technological choices in this industry were driven by efforts of firms to replace unionized male workers with women and teenagers, who by social convention were paid less and were thought to be a more docile labor force. Both automation of spinning and efforts to configure spinning mules so that they required less physical strength (and were thus more amenable to be worked mostly by women) were power-seeking investments in technological change.

Textile spinning before mechanization in the late 18th century was considered women's work, and provided an important source of income to rural households in general, and to unmarried women and widows in particular.[151] With the introduction of the spinning mule in the 1780s, spinning became men's work, because of the physical strength necessary to operate the mule, and a perception that men have the skill to maintain and repair the mule.[152] By the 1790s male mule spinners in England had organized into craft unions, and by 1810 had become the most powerful craft union in England.[153] Following strikes that decade, firms invested substantial outlay in supporting the development of a "self-acting" mule — a more automated mule. In 1835, in his *Philosophy of Manufactures*, Andrew Ure wrote that the invention of the self-acting mule "would put an end… to the folly of trades unions," asserting that "when capital enlists science to her service, the refractory hand of labour will be taught docility." A year earlier, a factory commissioner wrote of the self-acting mule that "[t]he introduction of this invention will eventually give a death blow to the Spinners' Union."[154] The goal of mechanization was to displace unionized adult men with teenagers and women, whose pay by convention at the time was two thirds to one half that of men,[155] and whom the firms believed were more docile workers less likely to organize.[156]

While the self-acting mule is a crisp example of firms investing in technology in order to increase their power in the labor market, in its place of origin, Lancashire, the self-acting mule was only partially successful at weakening labor. The new machines were tended by "minders," instead of

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151 PINCHBECK, *supra* note 18 at 117; BERG, *supra* note 18. (at loc 2770–2883)

152 BERG, *supra* note 13 (2976); Lazonick, *supra* note 13 at 233; PINCHBECK, *supra* note 13 at 114–117.

153 Lazonick, *supra* note 18 at 233–234.

154 *Id.* at 231–232.

155 *Id.* at 231. ("*the 'effect of substituting the self-acting mule for the common mule, is to discharge the greater part of the men spinners, and to retain adolescents and children*.'"); BERG, *supra* note 18.

156 Lazonick, *supra* note 18; PINCHBECK, *supra* note 18 at 187–188. (quoting from a contemporaneous account the assertion that a firm owner, "finding that the child or woman was a more obedient servant to himself, and equally efficient slave to his machine — was disposed to displace the male adult labourer).

spinners. Initially, these "minders" were older teenage boys rather than adult men, and their wages were not much higher than those of day laborers. But the relatively powerful unions in Lancashire were able to insist that the new mules would be worked by pairs of men, a minder and a cipher, and fought to exclude women spinners.

A second dimension of investment was the configuration of spinning mules, particularly whether they were configured as pairs of large mules that were still physically hard to operate, or rows of smaller mules each of which could be operated with less physical strength. The introduction of water-powered mules in 1790 could have been expected to nullify the perceived advantage of men as spinners from a physical-strength perspective. Rather, the harnessing of water power initially resulted in an increased size of the mules, so that physical strength remained an advantage. Thus, in England, particularly in Lancashire, cotton spinning remained a largely male occupation with well-organized unions.[157] By contrast, in Glasgow, the other major center of cotton mills in Britain, a relatively tight-knit group of merchant industrialists were able to circumvent the unions. After fighting a bitter strike with the unions, the merchants replaced the larger mules with longer rows of smaller mules operated by non-unionized women, and supervised by a male supervisor. This move enabled the Scottish manufacturers to keep wages roughly 20% lower than they were in equivalent plants in Lancashire.[158] In the United States, the Lowell Mills were set up only in the 1820s and, without a generation of male organizing to contend with, they immediately hired girls and young women working rows of smaller mules.[159]

The basic pattern of firms in an industry with a strong craft union turning to mechanization in order to break the union — that is, pursuing technological investment with a prime initial purpose of increasing bargaining power in the labor market rather than increasing productivity — has been documented in other contexts. In the United States, before the late 1880s, cannery owners employed cappers who were highly skilled tin smiths whose job it was to seal the tins, and processors who cooked the produce to prepare it for canning using tacit knowledge passed in close apprenticeship, often in families. Then, in the late 1880s, the cannery owners began to deploy machines that allowed them to replace the skilled cappers and processors, even though these machines did not increase productivity at the time of their introduction.[160]

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157 Lazonick, *supra* note 18 at 234–235.

158 *Id.* at 844–845.; BERG, *supra* note 18 at 2746; PINCHBECK, *supra* note 18.

159 GOLDIN AND SOKOLOFF, *supra* note 116; Lazonick, *supra* note 18.

160 Brown and Philips, *supra* note 48 at 134 ("Both the pressure cooker and the capping machine failed to raise physical labour productivity during the early phases of their adoption. But both of these innovations transferred the locus of control over the production process from the craft workers to the cannery owner. As a result, the relative and absolute wages of processors and cappers declined sharply after the introduction of these innovations.")

Another well-known example was the introduction of pneumatic molding machines in the McCormick Reaper plant.[161] The unique craft skills and effective organizing of the iron molders gave them substantial bargaining power.[162] In 1884, Cyrus McCormick who founded the company died and was replaced by his son. In December of 1884 the younger McCormick decided to cut wages by 10 to 15%, despite showing record profits for 1884 and having secured a price fixing agreement with the company's competitors for the following year (this is pre-Sherman Act). The iron molders union decided to retaliate. Since reaper production was seasonal, peaking in the spring before the harvest season, the union waited out the winter; and then, starting in March, at the beginning of the spring production surge ahead of the summer harvesting season, the union struck the plant. At the end of a violent three-week strike, which cost the company about half its profits for the year, the union prevailed and the wage cuts were completely reversed.[163] Two weeks after the end of the strike, the company spent $500,000, or about one third of its profits in the preceding, record-profit year, to purchase pneumatic molding machines. It then replaced its entire workforce of craft molders with unskilled laborers working the new machines. The new machines produced low-quality castings and required attendance of many common laborers, such that labor costs actually increased. Indeed, after three years McCormick replaced the machines and sued the manufacturer for the machines' poor quality. But the technological investment served its purpose: the iron molders union was defeated and the company's power in the labor market increased. When another strike developed in 1886, the striking unskilled workers were easily replaced. McCormick complemented this power-increasing technology investment with a power-increasing legal investment: They supported Chicago's mayor as he appointed a new, anti-labor police inspector who in 1886 led the Haymarket Massacre, still commemorated annually as May Day, against union protesters fighting for an 8-hour workday.[164]

These case studies focus on the labor market. The main parties are firms and labor unions. The firms make power-increasing technology investments, expanding the pool of possible workers, especially enabling non-union, low-skill or low-status workers who possess weaker bargaining power (and could thus be forced to accept a lower wage and lower share of the total surplus) to compete with the union workers. These investments

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161 Winner, *supra* note 22.

162 OZANNE, *supra* note 51 at 4. (In the McCormick Reaper plant and other Chicago foundries iron molders were already organized enough to mount a strike in 1862, and their wage successes made them among the few workers whose real wages were not eroded by wartime inflation. Throughout the period between 1862 and the Haymarket Massacre in 1886, iron molders continued to be the leading union at the core of labor organizing in McCormick. Other skilled, semi-skilled, and common laborers were not well organized, but the wage victories of the iron molders generally diffused to other workers in the plant in a matter of weeks. This pattern held throughout the period from 1862 to 1886.)

163 *Id.* at 9–18.

164 *Id.* at 20–27.

weaken the unions and thus increase the firms' power in the labor market. What are the welfare effects of these investments? Union workers are harmed, but non-union workers may benefit, at least in the short term (empirical evidence suggests that, in the long term, strong unions increase wages of non-union workers in their sector[165]), and clearly the firms benefit. In terms of overall surplus, our analytical framework points to the pre-investment equilibrium. If labor enjoyed excessive market power, from a social welfare perspective, then firms' power-increasing investments can increase the overall surplus. But if the power of unions was less than socially optimal (or optimal), which is empirically the more likely assumption, then firms' power-increasing investments reduce overall surplus. In some cases, workers, through labor unions, made power-increasing investments to counter the firms' investments. If the firms' investments were welfare-reducing, then the workers' investments were welfare increasing.

F. Labor Platforms: Uber and the (Alleged) Transformation of Work

No firm has more completely embodied both the hopes for, and anxieties about, the transformation of labor markets in the twenty-first century than Uber. Founded in 2009, the company provided its first ride in July of 2010; by January of 2015 Uber, and "uberization," had become synonymous with the transformation of labor markets into app-based labor platforms.[166] Uber's investments and practices are a quintessential example of mixed productivity increasing and power increasing investments across all dimensions of interest–technology, law and policy, misperception, and ideology–and across both the product market and the labor market.

1. Product market, productivity-increasing investments. — The productivity-enhancing attributes of app-based ride-hailing are primarily increasing the supply of rides, particularly during peak demand periods, by harnessing underutilized cars and increasing the supply of drivers to increase the overall supply and lower the price of rides for hire. Because cars offer widespread untapped capital capacity, a platform that lowers transactions

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165 Union decline lowers wages of nonunion workers: The overlooked reason why wages are stuck and inequality is growing, , ECONOMIC POLICY INSTITUTE , https://www.epi.org/publication/union-decline-lowers-wages-of-nonunion-workers-the-overlooked-reason-why-wages-are-stuck-and-inequality-is-growing/ (last visited Oct 5, 2020) (strong unions increase wages of non-union workers in their sector either because non-union employers try to avoid unionization drives by keeping wage differentials relatively low or because benchmarking raises wage expectations and willingness to accept).

166 Marion Maneker, *The "Uberization" of the economy is really about building a better trap for ideas*, QUARTZ , https://qz.com/326569/the-uberization-of-the-economy-is-really-about-building-a-better-trap-for-ideas/ (last visited Aug 12, 2020); Farhad Manjoo, *Uber's Business Model Could Change Your Work*, THE NEW YORK TIMES, January 28, 2015, https://www.nytimes.com/2015/01/29/technology/personaltech/uber-a-rising-business-model.html (last visited Aug 12, 2020); Three Examples of Uberization Done Right, , MARKETINGPROFS , http://www.marketingprofs.com/opinions/2015/26858/three-examples-of-uberization-done-right (last visited Aug 12, 2020).

costs significantly can bring the excess capacity of cars, initially put in service as consumption goods, into the ride-for-hire market.[167] Moreover, the platform reduces transactions costs of entry for drivers into a drive-for-hire market by enabling individuals who have only a few hours available here and there to go on and offline as demand surges and utilize their own leisure time for productive uses, and by providing a trust-mechanism for riders as an alternative to certification and regulation in the taxi market. Finally, the convenience of app-based ride-hailing, as compared to traditional taxi services, provides a real benefit to riders. These basic productivity enhancing aspects of the app-based labor platforms were widely lauded in the first half of the 2010s,[168] and were to a degree responsible for the sense that this model would come to displace significant swaths of the labor market through "uberization" of everything. We note that, from the start, Uber also made significant legal investments, lobbying for regulatory reforms that would allow its entry into a market dominated by taxi companies. To the extent that Uber introduced productivity-increasing technology, legal investments that enabled Uber's entry into the market are also productivity increasing.

Another technology investment involved masking information from the drivers.[169] Uber bills itself as a matching algorithm between drivers and riders, allowing independent contractor "microentrepreneurs" (the drivers) to run a small business (selling rides) to riders. In an efficient matching process, we expect that the platform would provide full information to all parties–to facilitate an optimal match. And yet Uber's driver app hides information about the ride's destination and price, forcing drivers to accept rides blindly and take the risk of unprofitable drives. (Drivers who cancel more than a small proportion of their accepted rides upon discovering that the fare is a losing proposition are removed from the platform.) This feature allows the firm to offer riders assurance that someone will pick them up, even for an unprofitable fare. In the product market, it can be viewed as a productivity-increasing technology investment. However, as we discuss below, while productivity-increasing in the product market, this feature may well be surplus-decreasing in the labor market, as Uber and riders benefit at the expense of drivers.

Uber also engaged in another type of legal investment. Taxi and other car-for-hire services are mostly regulated at the local level in the United

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[167] Cars are produced in consumption packets too large for complete consumption by an individual household so that their purchase as consumption items creates excess capacity — at any given time, there are millions of cars that are parked idly because of the absence of a market to clear the excess capacity. Yochai Benkler, *Sharing Nicely: On Shareable Goods and the Emergence of Sharing as a Modality of Economic Production*, 114 YALE L.J. 273, 281–89 (2004).

[168] ARUN SUNDARARAJAN, THE SHARING ECONOMY: THE END OF EMPLOYMENT AND THE RISE OF CROWD-BASED CAPITALISM (2016).

[169] Alex Rosenblat & Luke Stark, *Algorithmic Labor and Information Asymmetries: A Case Study of Uber's Drivers*, INT. J. COMMUN. VOL 10 2016 (2016), https://ijoc.org/index.php/ijoc/article/view/4892.

States. Municipalities issue taxi medallions and livery license plates and require formal training and safety checks on both vehicles used and drivers employed in either the common carrier (taxis) or private carrier (hired cars) segments. The pronounced purpose of these regulations was to assure both passenger and driver safety and, in the case of the common carriers, rate regulation. From its inception, Uber has invested in changing or circumventing these regulations.[170] It is in principle possible that the existing regulations circa 2010 were precisely efficient in containing fraudulent fares or unsafe vehicles or drivers, and maintaining a sufficient supply of drivers to deal with the variable nature of the demand. In that case, Uber's legal investments would be productivity-reducing. It is more likely, however, that the regulatory frameworks were the result of many prior rounds of lobbying and investments by taxi and car-for-hire companies, drivers, and consumer activists,[171] and that they reflected a political settlement that was not in any meaningful sense economically efficient. Avoidance and repeal of these regulations might therefore have productivity enhancing features, specifically making it easier for drivers to enter the market and increasing the number of vehicles.

2. Product market, power-increasing investments. — As the company was preparing for its initial public offering in 2019, reports made clear that, from the start, Uber operated in order to obtain a monopoly, on the theory that app ride-hailing is a strong network effects market, that the market would ultimately tip, and that the winner would take all.[172] In other words, Uber has clearly operated on the Schumpeterian model of entrepreneurship, seeking creative destruction and domination of the newly emerging market. So far so good. But, disclosures associated with the initial public offerings of both Lyft, its primary competitor in the United States, and Uber itself, show that Uber has been spending billions of dollars of venture cap-

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[170] By one account, compiled in a report issued by two labor NGOs, Uber employed more state-focused lobbyists in 2016 than Amazon, Microsoft, and Walmart combined. Joy Borkholder et al., *How Transportation Network Companies Buy, Bully, and Bamboozle Their Way To Deregulation* 39, 19. The primary achievements were state preemption of municipal car-for-hire regulation, statutory resolution of the status of drivers as independent contractors, rather than employees, or specific exemptions from requirements otherwise imposed on livery services, such as insurance or employment-related taxes. Review, *supra* note 167; Borkholder et al., *id*.

[171] *See* Dubal's careful study of the regulation and market for chauffer work in San Francisco. Dubal, *supra* note 24.

[172] Shannon Bond, Nicole Bullock & Tim Bradshaw, *Uber aims to maintain heavy spending to keep rivals at bay* (2019), https://www.ft.com/content/8a28ba78–5d09–11e9–9dde-7aedca0a081a (last visited Aug 10, 2020); Kate Conger, *Uber Posts Faster Growth, but Loses $1.1 Billion*, THE NEW YORK TIMES, February 6, 2020, https://www.nytimes.com/2020/02/06/technology/uber-growth-losses.html (last visited Aug 10, 2020); Josh Barro, *Uber's Plan to Lose Money on Every Ride and Make It Up in Volume, Annotated*, INTELLIGENCER (2019), https://nymag.com/intelligencer/2019/04/ubers-plan-to-lose-money-on-each-ride-make-it-up-in-volume.html (last visited Aug 10, 2020); Uber is basically promising investors it will become a monopoly, (2019), https://theweek.com/articles/834836/uber-basically-promising-investors-become-monopoly (last visited Aug 13, 2020).

ital money to price rides consistently below cost in an effort to tip the market.[173] Since its founding, Uber has operated at large losses in the expectation that it would be able to recoup these losses once the market has been effectively monopolized.[174] With its initial public disclosures, it became clear that Uber was spending between two to two-and-a-half times as much on marketing and sales, including "consumer discounts, promotions, refunds, credits and related expenses" as it did on research and development.[175] Because the low prices are not a result of the higher productivity the app enables (or, at least, not only a result of the higher productivity), in our framework these investments that allow Uber to price below cost represent power-seeking investments in the product market. These strategies have, after a decade of operations, failed to monopolize the market, as Lyft and other competitors across the globe have successfully entered and thrived.[176]

Another example of a power-increasing technology investment is "Greyball." This technology, which was integrated into the drivers' app, was designed to help drivers evade local regulatory inspections in municipalities where Uber's operations were considered a violation of local taxi and drive-for-hire regulations.[177] The "Greyball" technology thus increased Uber's power vis-à-vis taxi companies. A final example is "Hell," a technology designed to spy on Lyft's drivers and elicit information–where Lyft drivers were, what fares were they charging–that increased Uber's power vis-à-vis its main competitor, Lyft.[178] Finally, we note that Uber's legal investments to circumvent local licensing, safety, training and insurance regulations, which we described above as potentially productivity-increasing, may also

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[173] Bond, Bullock, and Bradshaw, *supra* note 174; Conger, *supra* note 174; Barro, *supra* note 174. Uber had received over 10 billion dollars in venture and private equity funding from its founding in 2009 to its initial public offering in 2019. *See* Mike Isaac, Michael J. de la Merced & Andrew Ross Sorkin, *How the Promise of a $120 Billion Uber I.P.O. Evaporated*, THE NEW YORK TIMES, May 15, 2019, https://www.nytimes.com/2019/05/15/technology/uber-ipo-price.html (last visited Aug 12, 2020); Mike Isaac & Kate Conger, *Uber, Losing $1.8 Billion a Year, Reveals I.P.O. Filing*, THE NEW YORK TIMES, April 11, 2019, https://www.nytimes.com/2019/04/11/technology/uber-ipo-filing.html (last visited Aug 13, 2020).

[174] Bond, Bullock, and Bradshaw, *supra* note 174; Conger, *supra* note 174; Barro, *supra* note 174.

[175] Trefis Team, *What Are The Key Drivers Of Uber's Expenses & When Can It Break-Even?*, FORBES , https://www.forbes.com/sites/greatspeculations/2019/05/31/what-are-the-key-drivers-of-ubers-expenses-when-can-it-break-even/ (last visited Aug 12, 2020).

[176] Isaac, Merced, and Sorkin, *supra* note 175.; Annie Palmer, *Uber and Lyft close at record lows as investors lose faith in ride-sharing companies*, CNBC (2019), https://www.cnbc.com/2019/09/03/uber-and-lyft-stock-close-at-record-lows-as-investor-skepticism-grows.html (last visited Aug 13, 2020). As a result, Uber's stock has not performed well since its 2019 initial public offering. Indeed, the value of the stock "lost more in nominal dollar terms than any other American initial public offering since 1975" in its first few days on the market. *Id.*

[177] Del Quentin Wilber and Greg Bensinger, *Uber Faces Federal Criminal Probe Over 'Greyball' Software*, WALL STREET JOURNAL, May 7, 2017, https://www.wsj.com/articles/uber-faces-federal-criminal-probe-over-greyball-software-1493948944 (last visited Aug 13, 2020).

[178] O'Brien, Rebecca Davis and Greg Bensinger, *Uber Faces FBI Probe Over Program Targeting Rival Lyft*, WALL STREET JOURNAL, September 8, 2017, *https://www.wsj.com/articles/uber-faces-fbi-probe-overprogram-targeting-rival-lyft-1504872001* (last visited Aug 13, 2020).

be power-increasing. If taxi companies bear the cost of these regulations and Uber does not, Uber enjoys a competitive advantage vis-à-vis the taxi companies.[179]

3. Labor market, productivity-increasing investments. — Some of the investments that we discussed above in the context of the product market increased productivity also in the labor market. Specifically, investments in reducing drivers' costs–by facilitating entry of part-time drivers who could not otherwise offer transportation services and by subsidizing the purchase or lease of vehicles for drivers who do not already own a car–were productivity-increasing. (Although, as we discuss below, Uber also invested in creating misperceptions about the costs and benefits to drivers.)

4. Labor market, power-increasing investments. — From its early days, Uber made power-seeking investments in the labor market to increase its power vis-à-vis drivers. Uber made substantial legal investments, seeking to ensure that its drivers were treated as independent contractors, not as employees. Historically, where drivers were able to organize they succeeded in securing higher wages for taxi drivers as well as private, hired-car drivers.[180] But if drivers are not employees, but rather independent contractors, then they lose labor law protections, and might even be barred from organizing by antitrust laws.

At the same time, labor also invested in litigation to assert the status of employees, rather than independent contractors, and different jurisdictions came down on opposite sides of this question of worker classification.[181] The most recent iteration of the debate is that in 2019, labor won a major victory in California, with the state passing an expansive law covering a

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[179] Uber lobbied heavily in many state legislators to preempt local regulation of "Transportation Network Companies," (a new category of actor intended to separate Uber and Lyft from traditional livery and taxi companies). The Regulatory Review, *Uber and Lyft Lobby Their Way to Deregulation and Preemption | The Regulatory Review* (2018), https://www.theregreview.org/2018/06/28/schriever-uber-lyft-lobby-deregulation-preemption/ (last visited Aug 13, 2020); Borkholder et al., *supra* note 163; Janet Burns, *While Uber Invests In Lobbying And AI, Drivers Are Fighting For Decent Pay*, FORBES , https://www.forbes.com/sites/janetwburns/2018/01/23/while-uber-targets-laws-and-ai-drivers-are-fighting-to-win-fair-pay/ (last visited Aug 13, 2020); Uber, ride-sharing companies spent over $1M lobbying in NYC, https://nypost.com/2018/08/04/ride-sharing-companies-spent-over-1m-lobbying-in-nyc/ (last visited Aug 13, 2020).

[180] Dubal, *supra* note 24.

[181] *Compare* O'Connor v. Uber Technologies, Inc., 82 F. Supp. 3d 1133 (N.D. Cal. 2015) (holding that Uber drivers are presumptively employees), *with* Razak v. Uber Technologies, Inc., No. 16–573 (E.D. Pa. Apr. 11, 2018) (classifying Uber-BLACK drivers as private contractors) [***Note the latter was later reversed by the Third Circuit Court of Appeals ruling in 2020. I didn't find any other two Uber/lift cases which decided in opposite directions]. *See also* Andre Andoyan, *Independent Contractor or Employee: I'm Uber Confused: Why California Should Create an Exception for Uber Drivers and the On-Demand Economy*, 47 GOLDEN GATE U. L. REV. 153 (2017). The legal uncertainty resulted in substantial internal divisions within the labor union movement, with some unions seeking to leverage the independent contractor status as a way of reaching agreements with Uber that would, under normal labor relations law as applicable to employees, be considered illegal company unions, and other unions seeking to litigate and lobby for clearer recognition of employee status and formal union-organizing power. *Id.* at 129–134. *See also* Gali Racabi, *Despite The Binary: Looking for Power outside the Employee Status*, TUL. L. REV. (Forthcoming, 2020), Available at SSRN: https://ssrn.com/abstract=3613652.

much larger range of workers in fissured employment situations (in logistics, hospitality, etc.) and broadening the definition of "employee" substantially from prior law, in ways that therefore included Uber and Lyft drivers.[182] The impact of these legal changes becomes obvious in reports that Uber is seeking to change some of its driver-side app features in California: it is planning to show the fare and enable drivers to reject rides without penalty in order to reduce the likelihood that it will be treated as an employer under the new California law.[183] Uber filed lawsuits challenging the application of the law to its drivers, and has publicly stated that it would support a referendum to reverse the new law.[184] Both the firms and the workers are investing resources in changing law with the specific intent of increasing their respective labor market power vis-à-vis each other.[185]

Uber also made investments in misperceptions. We previously described a feature of Uber's driver app that hid information about the ride's destination and price, forcing drivers to accept rides blindly and take the risk of unprofitable drives. If drivers were perfectly rational and had an accurate assessment of the risks that they were taking, then this feature simply allocated risks to drivers. (If drivers had a sufficient degree of market power, they could demand a higher price for bearing this risk. But it may well be that Uber used its market power to allocate the risk to drivers without any price compensation.) More likely, the technology facilitated the creation of misperceptions among imperfectly rational drivers who underestimated the loss from the blindly-accepted rides. Moreover, Uber made direct investments in creating misperceptions. In advertisements meant to recruit drivers, Uber inflated the wages drivers can expect to earn, and understated the cost to drivers of leasing cars from Uber (for drivers who did not already own a car). In 2017, the company paid 20 million dollars in

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182 Margot Roosevelt, *AB 5 is already changing how Uber works for California drivers and riders*, LOS ANGELES TIMES, February 3, 2020, https://www.latimes.com/business/technology/story/2020–02–03/uber-ab5-driver-app (last visited Aug 13, 2020).

183 Faiz Siddiqui, *Uber's secret project to bolster its case against AB5, California's gig-worker law*, WASHINGTON POST, https://www.washingtonpost.com/technology/2020/01/06/ubers-secret-project-bolster-its-case-against-ab-californias-gig-worker-law/ (last visited Aug 13, 2020); Facebook et al., *New California labor law AB 5 is already changing how businesses treat workers*, LOS ANGELES TIMES (2020), https://www.latimes.com/business/story/2020–02–14/la-fi-california-independent-contractor-small-business-ab5 (last visited Aug 13, 2020).

184 Veena Dubal, *AB5: Regulating the Gig Economy is Good for Workers and Democracy*, LAW AND POLITICAL ECONOMY (2019), https://lpeblog.org/2019/10/03/ab5-regulating-the-gig-economy-is-good-for-workers-and-democracy/ (last visited Aug 13, 2020); Uber, Lyft, Postmates Refuse To Comply With California Gig Economy Law, , NPR.ORG , https://www.npr.org/2020/01/04/793142903/as-california-tries-to-make-contract-workers-employees-industries-push-back (last visited Aug 13, 2020).

185 By one account, compiled in a report issued by two labor NGOs, Uber employed more state-focused lobbyists in 2016 than Amazon, Microsoft, and Walmart combined. Borkholder et al., *supra* note 172 at 19. The primary achievements were state preemption of municipal car-for-hire regulation, statutory resolution of the status of drivers as independent contractors, rather than employees, or specific exemptions from requirements otherwise imposed on livery services, such as insurance or employment-related taxes. Review, *supra* note 167; Borkholder et al., *id*.

settlement of a complaint alleging these practices by the Federal Trade Commission.[186]

Finally, and more generally, Uber invested in creating and maintaining a reputation of an innovative technology company that benefits riders and drivers alike. For example, the firm funded research–by in-house economists and in collaboration with prominent economists in universities–that used Uber's proprietary data to show that the firm is helping riders and drivers. Uber then popularized these findings through mass media.[187] It should be noted that Uber declined to share its proprietary data with more skeptical, unaffiliated economists.[188] These investments may be understood as an investment in ideology, or in the knowledge frame through which regulators, riders, and investors view Uber, so as to make the company's rise seem inevitable, to frame opposition as Luddite opposition to progress, and to overstate the likely long term growth potential of the firm.

VIII. CONCLUSION

The Great Recession ushered in a new era of academic and political criticism of the interaction between markets and politics, focusing on the relationship between productivity and growth on the one hand and inequality and economic insecurity on the other hand. Evidence suggests that the project of liberalization and deregulation that marked American policy since 1980 has had, at best, mixed success. Since the 1980s, industry concentration has risen,[189] markups have increased,[190] and business dynamism and entrepreneurship, measured by firm entry and share of employment in young firms, has declined.[191] At the same time, real median income has

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[186] Janet Burns, *Uber Must Pay $20M For Luring Drivers With Inflated Wage Stats*, FORBES , https://www.forbes.com/sites/janetwburns/2017/01/23/uber-must-pay-20m-for-luring-drivers-with-inflated-wage-stats/ (last visited Aug 13, 2020). The company did not admit wrongdoing as part of the settlement, but did consent to abandon the practices.

[187] Hubert Horan, *Uber's "Academic Research" Program: How to Use Famous Economists to Spread Corporate Narratives*, PRO MARKET (2019), https://promarket.org/2019/12/05/ubers-academic-research-program-how-to-use-famous-economists-to-spread-corporate-narratives/ (last visited Aug 14, 2020).

[188] Luigi Zingales, *Uber and the Sherlock Holmes Principle: How Control of Data Can Lead to Biased Academic Research*, PRO MARKET (2019), https://promarket.org/2019/10/09/uber-and-the-sherlock-holmes-principle-how-control-of-data-can-lead-to-biased-academic-research/ (last visited Aug 14, 2020).

[189] Gustavo Grullon, Yelena Larkin & Roni Michaely, *The Disappearance of Public Firms and the Changing Nature of U.S. Industries*, SSRN ELECTRON. J. (2015), http://www.ssrn.com/abstract=2612047 (last visited Sep 28, 2019).

[190] JAN DE LOECKER & JAN EECKHOUT, *The Rise of Market Power and the Macroeconomic Implications* (2017), http://www.nber.org/papers/w23687.pdf (last visited Sep 24, 2017).

[191] UFUK AKCIGIT & SINA ATES, *What Happened to U.S. Business Dynamism?* (2019), http://www.nber.org/papers/w25756.pdf (last visited Sep 17, 2019); Ryan Decker et al., *The Role of Entrepreneurship in US Job Creation and Economic Dynamism*, 28 J. ECON. PERSPECT. 3–24 (2014); Ian Hathaway, Ennsyte Economics & Robert E Litan, *Declining Business Dynamism in the United States: A Look at States and Metros* 8.

stagnated,[192] while the share of income going to the 1% and the 0.1% skyrocketed,[193] both mediated by declining labor power[194] and a range of other legal and policy changes that have tended to reduce the power and wages of most workers.[195] Economic insecurity has become widespread.[196] At the same time, productivity growth since 1973 has been slower than in the preceding century.[197]

The framework developed in this Article–a framework that explicitly incorporates the interactions between power and productivity–sheds new light on these phenomena. We modeled the behavior of firms, consumers, and workers as a series of strategic investment choices in either productivity or power in product and labor markets, carried out in domains of law, technology, and beliefs. Following the neo-Schumpeterian line of innovation economics, our analysis recognizes that some degree of market power is necessary to promote growth. And, yet, we emphasize that firms' will generally strive to achieve a socially-excessive amount of power. Thus, in our model, the distributional gains created by power-seeking investments (for the investing party), can either facilitate productivity gains, or come at the expense of productivity gains. We then developed extensions to incorporate insights from behavioral economics, related to the strategic management of misperceptions. We concluded with a sketch of how our approach allows for the integration of critical concerns about the roles of ideology and of status subordination, particularly race, gender, and nativity, into a single strategic-interaction framework (without pretending to offer a single, overarching explanation of racism, sexism, or nativism). The power of our analytical framework was demonstrated through a series of detailed case studies.

While we leave the development of specific policy recommendations to future work, we have suggested how our framework can inform ongoing debates in antitrust law, labor and employment law, intellectual property law, and consumer protection law. More generally, this framework — more or less rational actors pursuing their self-interest by making strategic choices that incorporate opportunities for distributional gains as well as productivity gains, in the long term as well as the short term–applies to any area of law that regulates, directly or indirectly, product or labor markets.

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192 LAWRENCE MISHEL ET AL., THE STATE OF WORKING AMERICA (2012).

193 Emmanuel Saez, *Striking it Richer: The Evolution of Top Incomes in the United States (updated with 2012 preliminary estimates)*, BERKELEY UNIV. CALIF. DEP. ECON. WORLD TOP INCOMES DATABASE (2013), http://www.nuevatribuna.es/media/nuevatribuna/files/2013/12/20/saez-ustopincomes-2012.pdf (last visited Apr 24, 2015).

194 Freeman, *supra* note 15; Card, Lemieux, and Riddell, *supra* note 15.

195 Mishel, Schmitt, and Shierholz, *supra* note 15.

196 BOARD OF GOVERNORS OF THE FEDERAL RESERVE, *Report on the Economic Well Being of U.S. Households in 2017* (2018).

197 ROBERT J. GORDON, THE RISE AND FALL OF AMERICAN GROWTH: THE U.S. STANDARD OF LIVING SINCE THE CIVIL WAR (2016). (excepting a brief interlude from 1995–2004).