Generalized Disruption: Society, Work, and Property Rights in the Age of AI

Martin Beraja and Noam Yuchtman*

January 14th, 2025

Abstract

Disruptive innovations are understood as those that threaten incumbent firms. When it comes to Artificial Intelligence (AI), however, its broad applicability means that disruption will not just stop at product markets; the technology has the potential for generalized disruption across multiple domains. This chapter begins by exploring two domains that have received some attention already. First, the socio-political sphere, with implications for civil rights and privacy. Second, labor markets, with implications for adjustment policies and workplace regulation. We then identify a new domain that has heretofore been overlooked: the disruption of property rights over contestable inputs. The resources that many AI applications rely on — online content for generative AI or urban space for autonomous vehicles — are becoming valuable and contested inputs, as property rights are often ill established. Conflict over these resources is expected going forward; clearer property rights and usage frameworks will thus have to be established via litigation and regulation. These multiple domains of disruption can interact with one another, generating both opportunities and challenges for academics and policymakers.

*Beraja: UC Berkeley and NBER. Email: maberaja@berkeley.edu. Yuchtman: Oxford and CEPR. Email: noam.yuchtman@economics.ox.ac.uk. We thank the participants at the NBER conference on AI and political economy; especially our discussant Chiara Farronato. Helpful and much appreciated suggestions, critiques and encouragement were provided by Avi Goldfarb, Shengwu Li, Sendhil Mullainathan, Steve Tadelis, and Jean Tirole. The authors have no conflict of interest, financial or otherwise, related to this study.

1 Introduction

Disruptive innovations are traditionally understood as those that threaten the rents — and even the existence — of incumbent firms (Christensen, 2015; Aghion, Akcigit, and Howitt, 2014). As a general-purpose technology, Artificial Intelligence (AI) will likely disrupt multiple industries; from digital services to healthcare, finance and even manufacturing (Agrawal, Gans, and Goldfarb, 2022). However, the broad applicability of AI means that disruption will not just stop at product markets. The technology has the potential for generalized disruption across multiple domains, much like electricity transformed many aspects of society in the 20th century (Gordon, 2016).

In this chapter, we begin by discussing disruption in two domains that have received some attention already: the socio-political sphere and labor markets. For example, facial recognition surveillance tools are already challenging civil rights (Beraja et al., 2023b) and large language models are likely to impact workers in many jobs (Eloundou et al., 2023). We then identify a new domain that has heretofore been overlooked: the disruption of property rights over contestable inputs. That is, the resources that AI applications rely on — online content for generative AI, urban airspace for drones, genetic material for personalized medicine — are becoming valuable and contested inputs as rules and rights are often ill established.

The general-purpose nature of AI, therefore, means that the technology will not just be a driver of progress; it will be a generalized disruptive innovation that will demand new policies and regulation, especially as AI's influence extends into areas where laws are unclear or property rights are not well defined. In the socio-political-sphere, concerns regarding citizen surveillance can lead to bans of AI technology in cities (Beraja, Yang, and Yuchtman, 2023), and misinformation in the media can result in restrictions on algorithms and content moderation (Müller et al., 2023). In labor markets, worker displacement provides a rationale for expanding social insurance or slowing down AI-based automation (Beraja and Zorzi, 2024), and workplace monitoring justifies regulations to shield employees from excessive surveillance and a loss of autonomy. Lastly, as contestable resources like data or public space become valuable for AI applications, clearer property rights and usage frameworks will need to be established via litigation and regulation. These could include reforming intellectual property laws and definitions of fair-use for online data, creating public repositories where individuals contribute genetic or biometric data subject to strong privacy protections, and designing zoning laws and auctions to allocate public space and electromagnetic spectrum for drones and other autonomous vehicles.

Importantly, the multiple ways that AI may disrupt economic, social and political life may not act independently of one another. We close this chapter with a discussion of possible interactions among the various domains of disruption; a possibility with important policy implications, presenting both opportunities and challenges.

2 The Disruption of the Socio-Political Sphere

In this section, we discuss how several AI-powered technologies might disrupt social interactions and political institutions. We consider, in turn, the development of technologies that will affect state capacity, the functioning of democratic institutions, social capital, and warfare.

2.1 State Capacity

Many dimensions of state capacity can be enhanced by AI technology, from bureaucratic decision-making, to law-enforcement, to traffic regulation, to national defense (U.S. Congress, 2024). Governments have already installed "smart city" surveillance technologies, automated border control systems in airports, and are using algorithms to estimate tax liabilities. An AI-supported state, however, may have ambiguous consequences for societal well-being.

2.1.1 Citizen surveillance

Smart city technologies — comprised of surveillance cameras and associated algorithms that allocate public security, traffic, environmental, and public health resources — have been introduced by dozens of countries around the world. These technologies have the potential to inform and streamline a range of public services by collecting information and processing and responding to it intelligently in real time. For example, traffic regulation can improve with real-time monitoring, reducing commuting costs, lowering auto emissions, and allowing ambulances (and other public vehicles) to travel quickly.

While such surveillance capacity has the potential to improve state services and citizen well-being, it can also be used for purposes of political repression and social control — indeed, Beraja et al. (2023a) find that Chinese police procure surveillance AI technology and cameras following episodes of unrest and that such procurement makes unrest less likely to arise. Beraja et al. (2023b) find that weak democracies and autocracies import

smart city AI technologies from China *precisely* in years when they experience domestic political unrest.

Concerns regarding government misuse of surveillance technology as well as a more general citizen demand for privacy has led to resistance to the introduction of facial recognition technology in parts of the US. Resistance to the use of AI-powered surveillance technology can be seen in San Francisco's ban of police use of facial recognition AI technology in 2019 (BBC News, 2019a). As AI enhances the capacity of the state, its impact on welfare is likely to be heterogeneous, and will depend fundamentally on the objectives of those who control the state.

2.1.2 Bureaucratic bias

AI can also support bureaucratic decision-making, potentially reducing human error or bias. Such bias has been documented in, among others, lending (Atkins, Cook, and Seamans, 2022), healthcare (Angerer, Waibel, and Stummer, 2019), and judicial decision-making (Dobbie, Hull, and Arnold, 2022).

Yet, it is not obvious that algorithms will succeed in undoing human biases — algorithms can improve on human performance, but whether they will do so depends on choices made by humans (e.g., the training data used) and algorithms can generate unintended harmful consequences without transparency (Kleinberg et al., 2018; Christian, 2021). As with surveillance technology, the AI-empowered bureaucracy can enhance citizen well-being, but this is not guaranteed. Monitoring of AI technology's performance and efforts at AI transparency and accountability are now being pursued by civil society groups and legislators (Bains, 2024).

2.2 Democracy and Media Consumption

Perhaps the most profound effect of AI on liberal democracies today is its impact on citizens' media consumption and thus their information sets and beliefs.[1] Social media is an increasingly important source of political news, and both news articles and political ads are algorithmically targeted toward viewers. This can create information bubbles and expose individuals to "fake news," for example, increasingly persuasive "deep fakes" in which AI produces realistic looking and sounding — but fabricated — content. While evidence is ambiguous regarding the impact of social media exposure on political atti-

[1]Concerns about the impact of AI on functioning of liberal democracy are discussed in Acemoglu (2021) and Tirole (2021).

tudes and voting behaviour (Allcott and Gentzkow, 2017; Allcott et al., 2024; Fujiwara, Müller, and Schwarz, 2024), there exists evidence that users engage with "toxic" content (Beknazar-Yuzbashev et al., 2022) and that extreme content can generate extreme political views and even acts of hate in the real world (Müller and Schwarz, 2021). Efforts to regulate speech are challenging in liberal democracies, but some suggestive evidence exists that social media content regulation may in fact moderate political discourse (Müller and Schwarz, 2023).

2.3 Social Capital

AI has the potential to build social networks by improving matching across a range of platforms (from social media, to dating, to service provision). However, such matching might also produce polarisation, bubbles of like-minded individuals, and crowd-out activity in the real world, where social interaction and the production of public goods remain paramount.

The use of AI algorithms in social media like instagram has become so effective that scholars have begun to describe it as an "addiction" or as a "trap" (Allcott, Gentzkow, and Song, 2022; Bursztyn et al., 2023). Evidence suggests that the development of networks online is characterised by homophily, it crowds out social interaction offline, and it erodes social cohesion (Enikolopov et al., 2024). Algorithms' success at capturing social media users' attention — while surely generating some consumer surplus — generates a range of negative externalities.

Concerns about self-control challenges, especially among children, as well as an understanding that reducing social media exposure may require *coordinated* behaviour, has produced a range of public, civil society, and private sector responses. In the UK, the Online Safety Bill, passed in 2024, aims to regulate online content with the aim of protecting children from various forms of potentially harmful content (BBC News, 2023). Civil society, in the form of parents' groups (e.g., "Smartphone Free Childhood, has mobilised to coordinate commitment to delay smart phone access for children.[2] Finally, entrepreneurs, notably economist Leonardo Bursztyn, have developed coordinated commitment devices to reduce time spent online.[3]

[2]See `https://smartphonefreechildhood.co.uk`, accessed January 10, 2025.
[3]Bursztyn has developed the "NOMO" app (The Chicago Maroon, 2024).

2.4 Warfare

Potential military applications of AI include cyberwarfare as well as the use of AI in autonomous warfare, using drones. Concern about the potential dual use of frontier AI technology — both hardware and software — has led to restrictions on exports of the technology. The US currently restricts exports of AI technology and frontier microchips used to develop AI (e.g., to China) to preserve its lead in the AI arms race.[4] While this may have geopolitical benefits, it may also reduce the rate of technological progress in the field as international collaboration breaks down.

3 The Disruption of Labor Markets

In this section, we discuss how several AI-powered technologies will likely disrupt labor markets. We consider two technologies that will automate jobs and displace workers: autonomous vehicles and generative AI. We then analyze AI-based workplace monitoring technologies and its impact on worker well-being. Finally, and more speculatively, we describe how virtual worlds may lead to lower labor force participation.

3.1 Autonomous Vehicles and Driver Displacement

Autonomous vehicles represent a transformative shift in transportation by using machine learning, advanced sensor technology, and vast data processing capabilities to operate without human intervention. Unlike traditional vehicles requiring drivers, autonomous systems rely on sophisticated algorithms, particularly in perception and decision-making, to navigate complex environments. Leading companies such as Tesla, Waymo, and Cruise are at the forefront, testing self-driving cars and trucks on public roads, with some already being used for limited commercial purposes.

Transportation and delivery services are a major sector of employment of middle to low income workers in the U.S. So far, these services require extensive human input for tasks like navigation, logistics management, and customer interactions. However, autonomous vehicles offer the potential for continuous, round-the-clock operations, rendering certain roles less essential. As self-driving technology continues to advance, long-haul

[4]Justifying this policy, Assistant Secretary of Commerce for Export Administration, Thea D. Rozman Kendler, states, "The PRC's [People's Republic of China's] Military-Civil Fusion strategy presents a significant risk that advanced node semiconductors will be used in military applications that threaten the security of the United States, as well as the security of our allies and partners." See U.S. Department of Commerce (2024).

truck drivers, delivery drivers, and taxi operators face heightened vulnerability to job displacement, particularly those whose tasks are routine and repetitive.

Recent studies underscore the significant impact autonomous vehicles could have on employment in transportation and delivery services. A report by the U.S. Department of commerce estimates that about 15 million workers could be impacted to varying degrees (U.S. Department of Commerce, 2017). This represents about one in nine workers. Motor vehicle operators, in particular, are about one-third of these workers; they are predominately male, older, less educated, and compensated less than the typical worker. A more conservative study finds that autonomous trucks could replace as many as 294,000 long-distance drivers (Viscelli, 2018). Anecdotally, companies like Uber and Lyft are already experimenting with autonomous fleets for ride-sharing. For example, Uber has partnered with Waymo to offer self-driving cars in Austin and Atlanta (The Wall Street Journal, 2024), and Lyft has announced partnerships with Mobileye and May Mobility to deploy autonomous vehicles on its platform (The Verge, 2024b). In the logistics sector, Amazon's Prime Air program has received FAA approval to operate delivery drones beyond the visual line of sight (The Verge, 2024a). Likewise, UPS has gained FAA clearance for its delivery drones to conduct longer-range flights (Verge, 2023).

The potential displacement of workers due to autonomous vehicles has sparked a debate about policy responses (Phillips, 2023). Some policymakers propose implementing a "robot tax," drawing from economic rationales to slow down automation technologies more generally (Guerreiro, Rebelo, and Teles, 2022; Beraja and Zorzi, 2024). Indeed, the state of Nevada has already imposed an excise tax on the use of a dispatch center, software application, or other digital means by an autonomous vehicle network company to connect a passenger to a fully autonomous vehicle for transportation services (Legislature, 2022). Others advocate for enhancing worker retraining and education initiatives to facilitate transitions into new roles. For example, the U.S. Department of Transportation has emphasized the importance of workforce development programs to prepare employees for emerging opportunities in the evolving transportation sector (Groshen et al., 2018).

3.2 Generative AI and White-Collar Job Displacement

Generative AI refers to a category of artificial intelligence that creates new content by mimicking patterns from large datasets. Unlike traditional algorithms that simply process or classify data, generative AI models can produce original outputs, including text, images, code, and even complex simulations. These models are trained on massive datasets

and leverage architectures like transformers to understand and generate human-like content. Firms such as OpenAI, Google DeepMind, and Anthropic have pioneered developments in generative AI, particularly through models like GPT-4, BERT, and other advanced language models.

The technology is increasingly seen as a disruptive force in the labor market, particularly for workers performing cognitive-intensive tasks. Traditionally, automation has affected manual labor, but generative AI's capabilities are more likely to impact white-collar jobs involving data analysis, writing, and creative design such as those in marketing, journalism, legal research, and even software development. While these tools can augment human work by speeding up repetitive tasks and aiding creativity, they also pose a risk of job displacement. Employees performing repetitive cognitive tasks — such as copywriters, customer service agents, and junior analysts — are particularly vulnerable.

Recent work provides evidence of generative AI's disruptive impact on the labor market. For instance, a 2024 report by McKinsey estimated that up to 30% of hours currently worked across the U.S. economy could be automated by 2030, a trend accelerated by generative AI (McKinsey, 2024). In the media industry, platforms like Medium have experienced a surge in AI-generated content, leading to challenges in maintaining content quality and impacting opportunities for human writers (Wired, 2024). Similarly, in customer service, companies are increasingly adopting AI-driven chatbots and virtual assistants, reducing the need for human agents and altering the employment landscape in this sector (Time Magazine, 2024). Beyond these examples, the best systematic evidence to date comes from Eloundou et al. (2023). The paper finds that large language models (LLMs) like ChatGPT could impact up to 80% of the U.S. workforce, with 19% of workers potentially seeing over half of their tasks affected. This widespread influence spans all wage levels and sectors, positioning LLMs as a general-purpose technology that can automate jobs in cognitive-intensive occupations.

As is the case for autonomous vehicles, the rise of generative AI has resulted in calls for slowing down its adoption and offering worker retraining. For instance, the UK government has already introduced a national retraining scheme to support workers whose jobs may become obsolete due to AI, offering assistance in finding new careers or gaining additional skills (BBC News, 2019b). Some, like pioneering AI developer Geoffrey Hinton, have gone as far as arguing for the need of Universal Basic Income to provide a stronger financial safety net for displaced workers (BBC News, 2024).

That said, a key distinction between generative AI and autonomous vehicles — as

well as with manufacturing automation from industrial robots in the past (Acemoglu and Restrepo, 2022) — is the type of workers more likely to be displaced. Workers in high-paying cognitive-intensive jobs in the case of generative AI and workers in middle-to-low income routine-intensive jobs in the case of autonomous vehicles or industrial robots. This implies that economic rationales for policy intervention are weaker in the case of generative AI than they are for autonomous vehicles or they were for industrial robots (Beraja and Zorzi, 2024). However, political pressure for policy interventions might be even greater in this case given the higher levels of skill and greater *de facto* political power of highly-paid workers.

3.3 Workplace Monitoring and Worker Well-being

The application of AI as a monitoring technology in the workplace can transform employer-employee dynamics. AI-driven monitoring tools use algorithms to track employees' activities, assess performance metrics, and provide real-time feedback. For example, Amazon has deployed the Associate Development and Performance Tracker (ADAPT), an AI system that monitors worker productivity in their warehouses and can automatically fire them (Ye, 2022). The use of AI for monitoring is not limited to manual labor though; it extends to white-collar jobs where it can, for instance, track online activity for hiring and performance evaluation (Dattner et al., 2019).

These systems are designed to optimize efficiency but also raise questions about the impact of monitoring on workers. Research has shown that constant surveillance can negatively impact workers' well-being and feelings of autonomy, linking it to increased stress and anxiety as well as leading employees to feel distrusted (Ball et al., 2021). In particular, monitoring with technology has been found to be associated with negative mental health outcomes (American Psychological Association, 2023). Moreover, concerns about data privacy and the potential for misuse add further complexity to the use of AI surveillance. That said, AI-powered monitoring could also lead to improvements in worker well-being by identifying factors causing dissatisfaction and providing targeted interventions to enhance job satisfaction and retention. For example, IBM's artificial intelligence has been shown to predict with 95% accuracy which employees are likely to quit (CNBC, 2019).

Policymakers are advocating for stringent regulations to shield employees from excessive surveillance, proposing laws that restrict the methods and timing of workplace monitoring. For instance, New York City enacted a law in July 2023 requiring employers to conduct independent bias audits of their automated tools used in hiring and promotions

(The Week, 2023). Others emphasize the necessity for transparency, urging companies to inform employees about the extent and purpose of monitoring practices. In various regions, unions and advocacy groups have championed the "right to disconnect," aiming to protect workers from incessant monitoring and preserve work-life balance (UNI Global Union, 2023). These discussions highlight the importance of a balanced approach to AI-driven workplace monitoring, one that upholds employee well-being and privacy while allowing efficiency improvements.

3.4 Virtual Worlds and Labor Supply

Virtual worlds, immersive digital environments where users can interact and create experiences in real-time, are becoming increasingly popular with advancements in AI-powered Virtual Reality technologies. Unlike traditional digital platforms, these worlds may in the future offer more engaging, highly interactive experiences that can simulate or even surpass real-world environments. Companies such as Meta, Epic Games, and Microsoft are investing heavily in these technologies, aiming to create virtual spaces where users can work, socialize, and entertain themselves, often referred to collectively as the "metaverse."

The rise of virtual worlds presents a unique impact on labor markets, as these immersive environments have the potential to draw users away from traditional work settings. Unlike autonomous vehicles or generative AI, which may directly displace jobs, virtual worlds influence labor participation indirectly by providing compelling alternatives to physical-world employment. Immersive virtual environments could lower real-world engagement and even reduce workforce participation by offering users a psychologically fulfilling escape from economic pressures and job responsibilities. Over time, the attraction of these digital spaces could lead to a gradual but notable decline in labor force participation, especially among younger generations more open to digital and remote lifestyles.

Early evidence hints at the social and economic allure of virtual worlds as an alternative to traditional labor market participation. Aguiar et al. (2021) have shown that immersive gaming, a precursor to the virtual world experience, is associated with a reduction in labor force participation among young adults. Furthermore, the economic opportunities within virtual worlds — such as virtual real estate, digital product sales, and paid interactions — allow users to earn income within these spaces, potentially decreasing the incentive to participate in traditional labor markets. For instance, platforms like Decentraland and Roblox enable users to monetize virtual assets, creating an economy within

the virtual world itself.

While virtual worlds are still in their infancy, the potential shift away from traditional labor markets could prove as transformative as the shift from traditional retail to e-commerce. Just as e-commerce reshaped consumer behavior and the retail landscape, virtual worlds could similarly redefine workforce engagement, drawing individuals into immersive digital economies and reducing traditional labor market participation. Potential conflicts in regulatory and labor law are likely to arise too, particularly regarding labor classification and taxation in digital economies. Policymakers may need to address whether economic activities in virtual worlds should be regulated as traditional employment, and how to protect workers' rights in a digital context, especially if these environments become primary sources of income for significant segments of the population.

4 The Disruption of Property Rights over Inputs

In this section, we discuss how novel AI applications will make previously overlooked resources valuable, leading to conflict and contestation regarding property rights over these inputs. We begin with conflicts over the use of online data in the case of generative AI and digital advertising, and then consider other forms of data like genetic data for personalized medicine or biometrics for emotion recognition. We then describe how drones and other autonomous vehicles can lead to contestation over space and spectrum; inputs that can become congested. Lastly, and more speculatively, we discuss AI-powered technologies that might result in conflicts over biological or waste materials.

4.1 Online Data

4.1.1 Generative AI and Online Content

Generative AI companies identified online content (text and images) as a valuable input for training their models. The boundaries around online content ownership and its use had been only loosely defined before the advent of these tools. As such, generative AI has elevated text and image data to a fiercely contested input, sparking major legal disputes.

For instance, OpenAI's ChatGPT was trained on vast amounts of text from books, websites, and other written sources, enabling it to produce responses to a variety of user prompts. The New York Times (NYT) has recently taken legal action against OpenAI, alleging unauthorized use of its articles in training ChatGPT. The core of the complaint

is that OpenAI knowingly scraped NYT articles without obtaining a license, violating copyright law. The lawsuit claims that, when users prompt ChatGPT, the AI could generate outputs that closely mimic NYT articles — sometimes outright inventing them — or produce exact copies — what is known as "regurgitation" — thus misleading users and infringing on the newspaper's intellectual property rights. For example, the lawsuit states that:

> "165. On information and belief, Defendants' infringing conduct alleged herein was and continues to be willful and carried out with full knowledge of The Times's rights in the copyrighted works. As a direct result of their conduct, Defendants have wrongfully profited from copyrighted works that they do not own."
>
> The New York Times Company v. OpenAI, Inc., et. al. District Court of Southern New York, 2023.

OpenAI argues that the New York Times lawsuit lacks merit. For instance, OpenAI asserts that their use of publicly available internet data, including from news sources, is protected by the "fair use" doctrine. This doctrine allows limited use of copyrighted material for purposes like research and education. Moreover, they address concerns about "regurgitation" explaining that these occurrences are unintentional and rare, and that efforts are made to minimize them.[5]

Similarly, Getty Images has filed a lawsuit against Stability AI, the company behind the tool Stable Diffusion. The tool is designed to generate high-quality images from user text prompts, making it a popular choice for AI-generated art. It was trained on a massive dataset of images and text descriptions, sourced from publicly available online platforms such as image hosting websites, art communities, and social media. Getty alleges that Stability AI unlawfully scraped a vast number of their images, resulting in the unauthorized reproduction and potential modification of copyrighted material. The lawsuit also claims that Stability AI's actions were conducted with knowledge of the infringement. For example, the lawsuit states that:

> "58. Upon information and belief, Stability AI has knowingly removed Getty Images' watermarks from some images in the course of its copying as part of its infringing scheme. At the same time, however, as discussed above, the Stable Diffusion model frequently generates output bearing a modified version

[5]See `https://openai.com/index/openai-and-journalism/` for these and other counterarguments.

of the Getty Images watermark, even when that output is not bona fide Getty Images' content and is well below Getty Images' quality standards."

Getty Images Inc. v. Stability AI, Inc. District Court of Delaware, 2023.

These cases illustrate generative AI's disruption of input markets where property rights related to their use were not clearly defined beforehand, leading to contestation. Arguably, the companies are banking on the expectation that courts and regulatory bodies would endorse their extensive data usage practices without explicit permissions. The evolution of the AI industry might change significantly if the legal framework were to enforce stringent protections for online content as intellectual property going forward.

4.1.2 Digital Advertising and User Data

Digital advertising platforms have identified user data as an invaluable asset for AI-powered targeted advertising. Before the rise of these sophisticated platforms, the boundaries around user data ownership and its monetization were relatively undefined. As the platforms began harnessing data and AI algorithms to serve hyper-targeted ads, they transformed personal data into a highly contested resource, raising profound privacy and ethical concerns.

For example, Google and Facebook collect vast amounts of user data, including browsing habits, location, and social connections, which are used to optimize advertising for individual users. Digital advertising is particularly valuable on these platforms precisely because of the data they can collect on their users, allowing companies to predict behavior and influence decisions. Zuboff (2023) describes it as a "surveillance capitalism" model, where user data is not only harvested but transformed into a commodity to predict and manipulate consumer behavior.

Initial data collection practices by digital advertising companies often lacked transparent user consent (Esteve, 2017). Users were largely unaware that their information was being monetized on such a large scale, and many continue to raise concerns about the extent of surveillance involved in these platforms' ad-targeting processes. The European Union's Digital Markets Act (DMA) and other regulatory efforts have recently sought to rein in the extensive data practices of digital platforms, mandating transparency and stricter data usage guidelines. Nonetheless, disputes persist. High-profile incidents, such as the Cambridge Analytica scandal, highlight the dangers of data leakages and unauthorized data sharing, demonstrating the societal risks and potential damages of AI-powered

digital advertising.[6]

While companies like Google and Facebook assert that their data practices comply with legal standards, regulatory bodies continue to scrutinize their policies. The industry is currently at a crossroads, where clearer data property rights and privacy protections are increasingly being demanded. As regulatory frameworks evolve, the AI-powered digital advertising landscape may be forced to adapt, potentially limiting the unbounded data usage practices that have been foundational to its growth.

4.2 Other Forms of Data

4.2.1 Personalized Medicine and Genetic Data

With the advancement of AI in personalized medicine, genetic data may increasingly become a contested input for training models that predict health outcomes, tailor treatments, or identify disease risks. Companies like 23andMe have amassed extensive genetic databases from millions of customers, which are utilized to enhance personalized medicine and advance biomedical research. For instance, in 2018, 23andMe entered a collaboration with GlaxoSmithKline, granting the pharmaceutical company access to its genetic data to aid in drug discovery and development (Live Science, 2018).

Ownership of genetic data is a pivotal issue in the debate surrounding AI-driven healthcare. Companies typically claim ownership over the aggregated genetic data collected from their customers, often reserving the right to use or share this data with research partners or pharmaceutical firms. In many cases, companies assert control over the data under the terms of service agreements. This lack of transparent consent means that individuals may be unaware that their data is being shared or sold. The debate over ownership brings up complex questions: Should individuals have a proprietary claim over their genetic information, especially as it relates to their unique genetic makeup? Or does the aggregated and anonymized nature of the data shift the ownership to the collector?

In response to these challenges, regulation could treat genetic data as a public good. Public genetic data repositories — where individuals could contribute genetic data for research with stronger privacy protections — could emerge as an alternative to private databases. In the European Union, the GDPR is already impacting how companies collect,

[6]Cambridge Analytica used data harvested from millions of Facebook profiles to influence political campaigns, leading to widespread public outcry and scrutiny of Facebook's data protection policies (The Guardian, 2018).

process, and share genetic data (PHG, 2020), though specific provisions on genetic data ownership are still developing. As AI applications in healthcare expand, property rights over genetic data are likely to become even more contested, with potential implications for both individual privacy and the future landscape of healthcare innovation.

4.2.2 Emotion Recognition AI and Biometrics

Emotion recognition AI can analyze how people react to content, advertisements, or instructions. As these systems become more sophisticated, companies could use gestures, facial expressions, and other biometric signals to tailor products, personalize marketing strategies, or even influence consumer decisions in real-time. In turn, biometric data would become a highly valuable resource.

However, ownership over biometric data is ambiguous, especially in public or semi-private spaces. For example, it is unclear who has the right to capture, analyze, or profit from someone's physical reactions at a live event, in a classroom, or even on public streets. This ambiguity could lead to legal conflicts between individuals, companies, and public entities over rights to access and analyze biometric signals; as well as drive regulators to step in and settle who "owns" the right to one's observable gestures and expressions.

4.2.3 Sports Performance Enhancement and Body Movements

AI applications in sports and physical performance optimization increasingly rely on analyzing athletes' body movements, often captured through motion sensors or video in training facilities, stadiums, and public spaces. These movement patterns are valuable for training AI models that can enhance athletic performance or prevent injuries. Yet, there is ambiguity in ownership rights over movement data in certain settings — particularly when movements are recorded during public events or in shared training spaces.

This ambiguity could lead to contestation, especially if organizations, athletes, or facility owners claim rights over motion data collected in these spaces. For instance, a sports venue might seek to monetize the body movement data of athletes or performers, while athletes themselves could argue that such data belongs to them. To address these issues, legal frameworks might need to define whether motion data captured in public or semi-public spaces is a collective or individual resource, and under what conditions it can be commercialized.

4.2.4 Sound Recognition and Natural Soundscapes

Beyond recent applications to voice recognition, AI-powered sound recognition applications could soon move to natural soundscapes like bird calls, ocean waves, or ambient urban sounds. These soundscapes could thus become valuable resources for training and deploying AI in applications like wildlife conservation, urban planning, and smart city design. However, the rights to capture and analyze these sounds are often undefined, especially in public or communal environments.

For example, if an AI company uses urban noise data collected in a public park to train sound recognition algorithms for commercial applications, questions may arise around who controls access to this ambient soundscape. This could lead to debates over the ownership of public sound environments, with cities potentially asserting control over sound data generated within their limits, or communities demanding consent before companies can collect and commercialize soundscapes. Such regulations could treat ambient sounds as a shared resource, requiring companies to navigate new property rights considerations.

4.3 Congestible Space and Spectrum

4.3.1 Drones and Urban Airspace

As AI advances in areas like aerial surveillance and drone-based delivery, urban airspace will likely become a contested resource, particularly in densely populated cities. Unlike traditional airspace, which is regulated for commercial aviation, low-altitude urban airspace remains largely unregulated or limited to smaller drones with strict restrictions. However, AI's potential to manage fleets of delivery drones, inspection devices, and surveillance equipment has the potential to make this limited airspace highly valuable.

For example, companies like Alphabet's Wing and Amazon have begun testing drone delivery services, aiming to utilize urban airspace to expedite logistics for customers in metropolitan areas. Amazon, in particular, has lobbied the Federal Aviation Administration (FAA) to secure greater operational flexibility for its delivery drones, focusing on gaining access to airspace that allows for efficient delivery routes in urban settings (Broadband Breakfast, 2023). Recently, the FAA approved Wing drones to use an automatic dependent broadcast inside a major area of Dallas airspace where traditional aircraft are required to continually broadcast their position (Robotics and Automation News, 2024).

The result could be conflicts between various industries (e.g., retail, logistics, and security) vying for airspace usage rights. Cities may introduce "airspace zoning" laws or pri-

oritize certain companies' or public services' access to air corridors based on public need, leading to increased regulation and potentially contested claims over airspace rights.

4.3.2 Delivery Robots and Sidewalk Space

Beyond airspace, ground-level public infrastructure such as roads and sidewalks could also become a contested resource as AI-driven delivery robots become popular. These autonomous systems require dedicated space to operate safely and efficiently, potentially competing with pedestrian traffic, traditional vehicles, and even other autonomous devices.

The competition for road and sidewalk space could lead to debates over prioritizing certain uses, especially in dense urban centers. Local governments may have to regulate these spaces more strictly, setting rules for which companies or types of autonomous devices can access which areas and times. Companies could lobby for priority access to reduce delivery times, while public advocates might push for pedestrian safety and access. The need for clear "public space rights" might spur a new layer of regulation, where companies lease specific areas for operation, similar to traditional utility easements.

4.3.3 Communication Networks and Electromagnetic Spectrum

With the growth of AI-driven devices and autonomous systems — drones, robots, IoT devices, and more — the demand for wireless communication is expected to surge. Traditionally, governments have managed and auctioned off parts of the electromagnetic spectrum to telecom companies. But current allocation frameworks may not adequately address the requirements of these emerging technologies, leading to clashes over the allocation of spectrum resources.

For instance, AI-driven drone delivery systems depend on stable, high-bandwidth communication to operate safely and efficiently in dense urban environments. Companies like Amazon have already begun to lobby for dedicated spectrum allocations to ensure the reliability and safety of drone operations, particularly in areas with congested airspace (Altindex, 2024). These efforts underscore the industry's recognition of the critical role that dedicated spectrum will play.

The regulatory landscape will have to evolve to address these challenges. Governments may have to balance spectrum availability between traditional telecom providers and emerging AI applications, perhaps creating new frameworks to designate "AI-exclusive"

frequency bands. Otherwise, without clearer definitions and rights around spectrum usage, the deployment of next-generation AI technologies may face significant roadblocks.

4.4 Materials

4.4.1 Novel Drugs and Biological Materials

As AI accelerates the search for novel compounds in drug discovery, biological resources from remote ecosystems — like rainforests, coral reefs, or deep-sea environments — could become highly valuable. AI models can analyze genetic sequences from plants, fungi, and microorganisms to identify promising compounds for new drugs. However, the rights over these resources are often poorly defined, particularly in areas that aren't fully mapped, governed by local tribes, or in international waters.

For instance, if an AI model uses samples from organisms collected in an unclaimed deep-sea trench, questions may arise about whether these resources should belong to the global community, be protected as part of natural biodiversity, or be open to commercial exploitation. Similar disputes have already emerged in biotechnology, but AI's ability to exponentially scale these efforts could intensify the debate, with governments potentially intervening to set international standards that clarify access rights.

4.4.2 Recycling and Waste Materials

Traditionally seen as low-value byproducts, materials such as plastic, metals, and organic waste could in the future be repurposed by AI-enhanced recycling systems with unprecedented efficiency. Recycling companies using advanced AI sorting and processing technologies may begin to view waste as a valuable resource, sparking disputes over who holds the rights to these materials. Municipalities, private waste management firms, and recycling businesses could all claim ownership, especially as certain high-value waste streams like e-waste (discarded electronic devices and equipment) gain attention for their reusable components.

The courts may in the future need to clarify who owns valuable waste streams. Further, regulations might establish waste materials as shared resources, where municipalities, private firms, and recycling companies have structured access based on environmental and economic priorities. Moreover, as AI-enhanced recycling often involves processing hazardous materials, new environmental protections may become necessary to manage the risks associated with advanced sorting and repurposing technologies.

5 Conclusions

The general disruption induced by AI technologies has two features that we believe deserve particular attention from both academics and policymakers. First, AI's disruption in contestable input markets has the potential to generate enormous rents for innovators; to result in litigation among competing claimants; and, ultimately, to produce political conflicts to determine how property rights are established and rents are distributed. The political economy of ground-breaking innovation under contested property rights has not received significant attention from academic economists. But it is both of current policy interest (and of more general interest) to understand how innovation occurs when technologies use novel inputs and rules and rights are ill established beforehand.

Second, the generalized nature of AI disruption across multiple domains raises the possibility that disruptions will *interact*. For example, disruption in the labour market might typically produce a public policy response (e.g., implementation of redistribution or retraining programs). But the disruption of political institutions by AI might shape the way public policy responds to the disruption of labour markets. A sanguine perspective is that AI may enhance state capacity to identify individuals with needs and to target retraining and redistribution: disruption on one margin may be mitigated by disruption on another. A more pessimistic view is that the social costs of labour disruption will be compounded by AI's disruption of the functioning of democratic institutions; rather than strengthening the social safety net, labour market disruption may induce political extremism or attempts at political repression, enhanced by AI technology. Likewise, disruption in contestable input markets may prompt AI innovators — or competing stakeholders — to leverage AI's disruptive potential in the media to shape public opinion, influence litigation outcomes, and steer regulatory responses.

AI's disruptive capacity along novel, potentially interacting margins offers both opportunities and risks that policymakers and academics are now working to understand. By preparing for large-scale disruption, we can aim for policies that make such salutary spillovers more likely, and that mitigate the pernicious consequences that we fear.

References

Acemoglu, Daron. 2021. "Harms of AI." Tech. rep., National Bureau of Economic Research.

Acemoglu, Daron and Pascual Restrepo. 2022. "Tasks, automation, and the rise in US wage inequality." *Econometrica* 90 (5):1973–2016.

Aghion, Philippe, Ufuk Akcigit, and Peter Howitt. 2014. "What do we learn from Schumpeterian growth theory?" In *Handbook of economic growth*, vol. 2. Elsevier, 515–563.

Agrawal, Ajay, Joshua Gans, and Avi Goldfarb. 2022. *Power and prediction: The disruptive economics of artificial intelligence*. Harvard Business Press.

Aguiar, Mark, Mark Bils, Kerwin Kofi Charles, and Erik Hurst. 2021. "Leisure luxuries and the labor supply of young men." *Journal of Political Economy* 129 (2):337–382.

Allcott, Hunt and Matthew Gentzkow. 2017. "Social media and fake news in the 2016 election." *Journal of economic perspectives* 31 (2):211–236.

Allcott, Hunt, Matthew Gentzkow, Winter Mason, Arjun Wilkins, Pablo Barberá, Taylor Brown, Juan Carlos Cisneros, Adriana Crespo-Tenorio, Drew Dimmery, Deen Freelon et al. 2024. "The effects of Facebook and Instagram on the 2020 election: A deactivation experiment." *Proceedings of the National Academy of Sciences* 121 (21):e2321584121.

Allcott, Hunt, Matthew Gentzkow, and Lena Song. 2022. "Digital addiction." *American Economic Review* 112 (7):2424–2463.

Altindex. 2024. "Amazon's Lobbying Push in Q3: Technology, Copyright, and Strategic Influence." *Altindex* URL `https://altindex.com/news/amazon-lobbying-focus`.

American Psychological Association. 2023. "Work in America Survey." URL `https://www.apa.org/pubs/reports/work-in-america/2023-work-america-ai-monitoring`.

Angerer, Silvia, Christian Waibel, and Harald Stummer. 2019. "Discrimination in health care: a field experiment on the impact of patients' socioeconomic status on access to care." *American Journal of Health Economics* 5 (4):407–427.

Atkins, Rachel, Lisa Cook, and Robert Seamans. 2022. "Discrimination in lending? Evidence from the paycheck protection program." *Small Business Economics* :1–23.

Bains, Chiraag. 2024. "The legal doctrine that will be key to preventing AI discrimination." URL `https://www.brookings.edu/articles/the-legal-doctrine-that-will-be-key-to-preventing-ai-discrimination/`.

Ball, Kirstie et al. 2021. "Electronic monitoring and surveillance in the workplace." *European Commission Joint Research Centre* .

BBC News. 2019a. "San Francisco is first US city to ban facial recognition." URL https://www.bbc.co.uk/news/technology-48276660.

———. 2019b. "UK workers who lose jobs to AI will be retrained." URL https://www.bbc.com/news/business-49019390.

———. 2023. "Online Safety Bill: divisive internet rules become law." URL https://www.bbc.co.uk/news/technology-67221691.

———. 2024. "We'll Need Universal Basic Income – AI 'Godfather'." URL https://www.bbc.com/news/articles/cnd607ekl99o.

Beknazar-Yuzbashev, George, Rafael Jiménez Durán, Jesse McCrosky, and Mateusz Stalinski. 2022. "Toxic content and user engagement on social media: Evidence from a field experiment." *Available at SSRN 4307346* .

Beraja, Martin, Andrew Kao, David Y Yang, and Noam Yuchtman. 2023a. "AI-tocracy." *The Quarterly Journal of Economics* 138 (3):1349–1402.

Beraja, Martin, Andrew Kao, David Y. Yang, and Noam Yuchtman. 2023b. "Exporting the Surveillance State via Trade in AI." Working Paper 31676, National Bureau of Economic Research. URL https://www.nber.org/papers/w31676.

Beraja, Martin, David Y. Yang, and Noam Yuchtman. 2023. "Data-intensive Innovation and the State: Evidence from AI Firms in China." *The Review of Economic Studies* 90 (4):1701–1723. URL https://doi.org/10.1093/restud/rdac056.

Beraja, Martin and Nathan Zorzi. 2024. "Inefficient Automation." *The Review of Economic Studies* Forthcoming.

Broadband Breakfast. 2023. "Amazon Asks FCC to Allow Drones in 60-64 GHz Band in Preparation For New Delivery Service." *Broadband Breakfast* URL https://broadbandbreakfast.com/amazon-asks-fcc-to-allow-drones-in-60-64-ghz-band-in-preparation-for-new-delivery-ser

Bursztyn, Leonardo, Benjamin R Handel, Rafael Jimenez, and Christopher Roth. 2023. "When product markets become collective traps: The case of social media." Tech. rep., National Bureau of Economic Research.

Christensen, Clayton M. 2015. *The innovator's dilemma: when new technologies cause great firms to fail*. Harvard Business Review Press.

Christian, Brian. 2021. *The alignment problem: How can machines learn human values?* Atlantic Books.

CNBC. 2019. "IBM artificial intelligence can predict with 95which workers are about to quit their jobs." *CNBC Work* URL `https://www.cnbc.com/2019/04/03/ibm-ai-can-predict-with-95-percent-accuracy-which-employees-will-quit.html`.

Dattner, Ben, Tomas Chamorro-Premuzic, Richard Buchband, and Lucinda Schettler. 2019. "The legal and ethical implications of using AI in hiring." *Harvard Business Review* 25:1–7.

Dobbie, Will, Peter Hull, and David Arnold. 2022. "Measuring Racial Discrimination in Bail Decisions." *American Economic Review* 112 (9).

Eloundou, Tyna, Sam Manning, Pamela Mishkin, and Daniel Rock. 2023. "GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models." Tech. rep., arXiv. org.

Enikolopov, Ruben, Maria Petrova, Gianluca Russo, and David Yanagizawa-Drott. 2024. "Socializing Alone: How Online Homophily Has Undermined Social Cohesion in the US." *Available at SSRN* .

Esteve, Asunción. 2017. "The business of personal data: Google, Facebook, and privacy issues in the EU and the USA." *International Data Privacy Law* 7 (1):36–47.

Fujiwara, Thomas, Karsten Müller, and Carlo Schwarz. 2024. "The effect of social media on elections: Evidence from the united states." *Journal of the European Economic Association* 22 (3):1495–1539.

Gordon, Robert J. 2016. *The Rise and Fall of American Growth: The U.S. Standard of Living Since the Civil War*. Princeton, NJ: Princeton University Press.

Groshen, Erica L., Susan Helper, John Paul MacDuffie, and Charles Carson. 2018. "Preparing U.S. Workers and Employers for an Autonomous Vehicle Future." Tech. rep., U.S. Department of Transportation. URL `https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Groshen-et-al-Report-June-2018-1.pdf`.

Guerreiro, Joao, Sergio Rebelo, and Pedro Teles. 2022. "Should robots be taxed?" *The Review of Economic Studies* 89 (1):279–311.

Kleinberg, Jon, Himabindu Lakkaraju, Jure Leskovec, Jens Ludwig, and Sendhil Mullainathan. 2018. "Human decisions and machine predictions." *The quarterly journal of economics* 133 (1):237–293.

Legislature, Nevada. 2022. "Nevada Revised Statutes § 372B.145 - Excise Tax on Autonomous Vehicle Network Companies." URL https://law.justia.com/codes/nevada/2022/chapter-372b/statute-372b-145/.

Live Science. 2018. "23andMe Is Sharing Its 5 Million Clients' Genetic Data with Drug Giant GlaxoSmithKline." *Live Science* URL https://www.livescience.com/63173-23andme-partnership-glaxosmithkline.html.

McKinsey. 2024. "Generative AI and the Future of Work in America." *Research paper* URL https://www.mckinsey.com/mgi/our-research/generative-ai-and-the-future-of-work-in-america.

Müller, Karsten and Carlo Schwarz. 2021. "Fanning the flames of hate: Social media and hate crime." *Journal of the European Economic Association* 19 (4):2131–2167.

———. 2023. "The Effects of Online Content Moderation: Evidence from President Trump's Account Deletion." *Available at SSRN 4296306* .

PHG. 2020. "The GDPR and Genomic Data." *PHG Foundation Report* .

Phillips, Fisher. 2023. "How Will Employment Policymakers Respond to Autonomous Vehicles?" URL https://www.fisherphillips.com/en/news-insights/autonomous-vehicles-blog-driving-the-future/how-will-employment-policymakers-respond-to-autonomous-vehicles.html.

Robotics and Automation News. 2024. "Google-owned Wing wins FAA authorization for drone deliveries." *Robotics and Automation News* Https://roboticsandautomationnews.com/2024/01/16/wing-wins-faa-authorization-for-drone-deliveries/76638/.

The Chicago Maroon. 2024. "30-Foot Inflatable Dog Promotes NOMO App's Anti-Social Media Challenge." URL https://chicagomaroon.com/44360/news/30-foot-inflatable-dog-promotes-nomo-apps-anti-social-media-challenge/.

The Guardian. 2018. "Revealed: 50 million Facebook profiles harvested for Cambridge Analytica in major data breach." *The Guardian* URL https://www.theguardian.com/news/2018/mar/17/cambridge-analytica-facebook-influence-us-election.

The Verge. 2024a. "Amazon Prime Air Receives FAA Approval for Delivery Drones Beyond Visual Line of Sight." URL https://www.theverge.com/2024/5/30/24167776/amazon-prime-air-delivery-drones-faa-bvlos-approval.

———. 2024b. "Lyft Announces Partnerships with Mobileye and May Mobility for Autonomous Robotaxi Deployment." URL https://www.theverge.com/2024/11/6/24289475/lyft-may-mobility-mobileye-nexar-autonomous-robotaxi?utm_source=chatgpt.com.

The Wall Street Journal. 2024. "Waymo to Offer Self-Driving Cars on Uber in Austin and Atlanta." URL https://www.wsj.com/tech/waymo-to-offer-self-driving-cars-on-uber-in-austin-and-atlanta-ac651aa3?utm_source=chatgpt.com.

The Week. 2023. "New Law in New York City Requires Bias Audits for Workplace AI Monitoring." URL https://theweek.com/tech/workplace-ai-surveillance.

Time Magazine. 2024. "How AI is Changing the Employment Landscape for Workers." URL https://time.com/6990637/ai-employers-workers.

Tirole, Jean. 2021. "Digital dystopia." *American Economic Review* 111 (6):2007–2048.

UNI Global Union. 2023. "New Guide on the Right to Disconnect and Legislative Change." *UNI Guide* URL https://uniglobalunion.org/news/new-uni-guide-winning-the-right-to-disconnect-by-changing-the-law/.

U.S. Congress. 2024. "Bipartisan House Task Force Report on Artificial Intelligence." Tech. rep. URL https://www.speaker.gov/wp-content/uploads/2024/12/AI-Task-Force-Report-FINAL.pdf.

U.S. Department of Commerce. 2017. "The Employment Impact of Autonomous Vehicles." Tech. rep. URL https://www.commerce.gov/data-and-reports/reports/2017/08/employment-impact-autonomous-vehicles.

———. 2024. "Commerce Strengthens Export Controls to Restrict China's Capability to Produce Advanced Semiconductors for Military Applications." Tech. rep. URL https://www.bis.gov/press-release/commerce-strengthens-export-controls-restrict-chinas-capability-produce-advanced.

Verge, The. 2023. "FAA Clears UPS for Long-Range Delivery Drones." URL https://www.theverge.com/2023/9/6/23861764/faa-ups-delivery-drones-amazon-prime-air.

Viscelli, Steve. 2018. "Driverless? Autonomous trucks and the future of the American trucker." *UC Berkeley Center for Labor Research and Education* .

Wired. 2024. "AI-Generated Medium Posts Create Content Moderation Challenges." URL https://www.wired.com/story/ai-generated-medium-posts-content-moderation.

Ye, Alice. 2022. "Amazon's ADAP and it's Harm on Workers." *UC Berkeley Data Science Blog, Behind the Data: Humans and Values* URL https://blogs.ischool.berkeley.edu/w231/2022/03/02/amazons-adapt-and-its-harm-on-workers/.

Zuboff, Shoshana. 2023. "The age of surveillance capitalism." In *Social theory re-wired*. Routledge, 203–213.