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Abstract

Digital platforms and application software have changed how people work in a range of industries. Empirical studies of the gig economy have raised concerns about new systems of algorithmic management exercised over workers and how these alter the structural conditions of their work. Drawing on the republican literature, we offer a theoretical account of algorithmic domination and a framework for understanding how it can be applied to ride hail and food delivery services in the on-demand economy. We argue that certain algorithms can facilitate new relationships of domination by sustaining a socio-technical system in which the owners and managers of a company dominate workers. This analysis has implications for the growing use of algorithms throughout the gig economy and broader labor market.

Keywords

freedom, domination, republicanism, gig economy, algorithmic domination

Algorithmic decision-making is increasingly deployed in a variety of important contexts from criminal justice and policing to credit scoring and healthcare (Kitchin, 2017). The proliferation of algorithms throughout society has led to the growth of a large body of literature in science and technology studies, legal studies, computer science, sociology, geography and media studies, among others (Beer, 2017; Striphas, 2015; Ziewitz,

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2016). Corresponding to this growth in the use of algorithms has been an explosion of app-mediated platform labor (Graham et al., 2017). In the UK, the number of adults who undertook tasks obtained through a digital platform doubled from 2016 to 2019 (Huws 2020: 4). This has also resulted in the rapid spread of digital management practices throughout different parts of the workforce.

Algorithms are employed because they promise to make processes more efficient, accurate, and unbiased. However, an emerging critical literature has called into question the idea that algorithms can evade human bias in decision making. There is a range of evidence suggesting that algorithms can often reproduce and exacerbate structural inequalities, injustices, and forms of unfreedom, rather than alleviate them (Benjamin, 2019; Noble, 2018; O'Neil, 2016). Recent discussions of *algorithmic injustice* have contributed to calls for greater attention to questions of fairness and accountability including issues of procedural fairness and more substantive approaches focused on interventions into decision outcomes and their social impact (Janssen and Kuk, 2016; Pasquale, 2015; Zimmerman et al., 2020).

While questions of algorithmic injustice have received widespread consideration, political philosophers have so far paid less attention to the question of how algorithms impact our freedom. In this article, we develop the concept of *algorithmic domination* to address these concerns and provide an account of the dominating effects of algorithms used as tools of worker control. Algorithmic domination can occur in a variety of different domains, but we focus here on the role of algorithms as a tool by companies to manage contract workers involved in app-work in the gig economy (Duggan et al., 2020).

Consider the following examples. Amazon warehouse employees report working under constant surveillance with timed toilet breaks and just nine seconds to process a package (Selby, 2017). Uber drivers must work during peak periods to chase 'surge pricing,' often earning less than the minimum wage. A hidden army of 'microworkers' labor on platforms such as Amazon Mechanical Turk and Clickworker, receiving as little as US\$2–3 an hour for monotonous piece-rate tasks with no employment benefits or protections (Jones, 2021). What these examples have begun to point to is the potential negative impact of the deployment of algorithms in the gig economy and other sectors impacted by the introduction of digital technology (Rosenblat and Stark, 2016).

For contractors of companies such as Uber and Deliveroo, the tasks, time to complete, rate of pay, and delivery route can all be automatically assigned through the protocols of the company's software. Within such socio-technical systems, it can appear as if workers are no longer instructed by a human manager but by an automated computer algorithm. This raises the question of whether certain precarious workers could be said to be governed – and perhaps even dominated – by a non-human computer system. Does a company's ability to nudge, incentivize, manipulate, and control workers' behavior through algorithmic management constitute an objectionable form of uncontrolled power?

We argue that algorithmic domination occurs when an individual is subjected to an uncontrolled power, the operations of which are determined by an algorithm. The particular case study we focus on in this article is gig workers in the food delivery and ride hail sectors, but the concept of algorithmic domination can, in principle, be applied much more broadly to other workers in the gig economy and in standard employment contracts

where algorithms are also employed to manage workers (Huws, 2020). In the case of the gig economy, we argue that the use of this software for managing workers facilitates a power structure and social relationship of domination between bosses and workers. Algorithms are deployed by bosses as part of a broader socio-technical system designed and implemented in order to create and sustain a specific regime of labor control (Kitchin, 2017; Lee et al., 2015). Our analysis emphasizes that beneath the appearance of automatic decision making and neutral service delivery lies the recognizable exercise of social power. These systems can increase the capacity for bosses to dominate workers by providing new tools for them to exercise uncontrolled power and weaken the ability of workers to organize and resist. This is not a radically new form of power, but an augmentation of existing capacities and their formalization in new socio-technical systems that embed certain patterns of labor management and work relationships as the new normal.

Understanding how these forms of algorithmic domination operate in practice is important due to how tech companies often employ the language of worker flexibility, freedom, and autonomy as key benefits of their business models. Revealing the sham behind their claims of self-entrepreneurship and empowerment helps us understand the realities of work in the platform economy (Ahsan, 2020). Technology companies claim their algorithmic forms of management offer greater freedom. However, if we are right, what they can enable is the increased domination of workers.

Algorithmic domination can give rise to distinctive relationships between bosses and workers mediated through digital technology. Workers taking commands generated by an algorithm may have less room to negotiate specific aspects of their work schedule and may be subject to more stringent and demanding forms of workplace control. The affordances of the new technology increase computational asymmetries between bosses and workers and allow the former to intervene at a more minute level in ways that are not feasible if required to be undertaken by a human supervisor. Algorithmic domination is also distinctive in adopting new systems of gamification and incentive schemes administered through software that has been specifically designed to induce certain responses from workers.

This article proceeds as follows. First, we draw on the writings of labor and socialist republicans to identify how workers are subjected to distinct forms of domination in the capitalist workplace. We then put this literature into conversation with an emerging body of empirical studies of algorithmic management to show how republican theories of non-domination can address cases of work in the gig economy involving systems of algorithmic management. In the following section, we define algorithmic domination and explain how it could be applied to case studies in the food delivery and ride hail sectors. We then argue that the dominating aspect of algorithms in the workplace is not intrinsic to the technology itself, but is part of the power relations established within capitalist enterprises. As a result, we briefly examine an alternative possibility of algorithms utilized by platform co-operatives, which we argue could potentially involve a non-dominating use of algorithms in work processes. Finally, we conclude by establishing a framework for how algorithmic domination could be applied to other cases.

Republicanism in the gig economy

The term ‘gig economy’ has emerged in the past decade to describes new forms of ‘on-demand’ work in which independent contractors receive short-term tasks from companies (De Stefano, 2016). Gig workers have no permanent employment contracts and receive none of the traditional benefits of a minimum wage, guaranteed hours, holiday and sick pay and job security (Woodcock and Graham, 2019). Gig work enables companies to employ labor only when they need it, at particular moments when specific tasks are available to complete. This lowers labor costs for the company, but increases the precarity of workers, particularly those in low-skill occupations. Uber and Lyft drivers stand out as the paradigmatic example of a new generation of gig workers, but the category of gig worker also includes contractors, freelancers and highly-paid professionals (Schor, 2020). The gig economy is growing rapidly, with one estimate that at its current rate of growth it will encompass more than 50% of the US workforce by 2027 (Pofeldt, 2017).

Debates within political philosophy about the nature of work and its impact on worker freedom have been based on the model of the full-time, permanent worker who receives protections in labor law, a minimum wage and standard terms of an employment contract (Anderson, 2017; Bieber and Moggia, 2021). The trend towards gig work raises new questions of how these changes affect working conditions and what kinds of protections are required to secure workers against dominating relationships in these new institutional arrangements.

Our analysis builds on the diagnoses of capitalist domination developed by the early labor republicans (Gourevitch, 2015) and contemporary republican theorists (Breen, 2015; González-Ricoy, 2014; Hsieh, 2008; O’Shea, 2018, 2019; White, 2011). Although they agree on defining freedom as non-domination, there is some variety in how they define non-domination itself. In this article, we define domination as being subject to uncontrolled power.¹ On this view, A is dominated by B if and only if B can interfere with A’s choices in ways that A cannot control. Such powers of interference include removing options altogether, as well imposing penalties on certain options – e.g. imposing a penalty on option Z, thus changing A’s choice-set from X, Y, and Z to X, Y, and Z-minus (Pettit, 2012: 51). Importantly, B interfering with an option in this way is an exercise of domination even if it doesn’t stop A from choosing it. This is because ‘my intervention in penalizing and replacing the option, however slight it may be, denies you the unrestricted choice between X, Y and Z’ and therefore ‘replaces it with a choice between X, Y and Z-minus’ (Pettit, 2012: 51–2). Penalties may be greater or smaller, but any penalty imposed upon Z changes the choice from Z to one of Z-minus and therefore constitutes an instance of interference.

Some republican thinkers have long recognized that capitalist economic relations involve particular forms of domination, that is, particular forms of uncontrolled power to which workers are subjected. For instance, early labor republicans argued that capitalist workers are subjected to three distinct, yet related, kinds of domination (Gourevitch, 2015: 106–16). First, workers are subject to structural domination, due to the fact that the structure of capitalist property relations mean that they are forced to work for some (but not any one particular) capitalist in order to secure food, clothes, shelter, and other

necessities.² Second, the power imbalance this implies between workers and capitalists results in workers being dominated in the writing of the labor contract, because it means that bosses have the power to determine the labor contract in ways that workers cannot control. Third and finally, workers are dominated during the labor process, because during this process they are subjected to the uncontrolled power of bosses who can decide, for example, which tasks are performed, assess their performance, and determine when and how to reward or punish workers.³

Contemporary labor and socialist republicans recognize that in capitalist labor processes bosses dominate and control workers, and have explored the forms of power that bosses have over workers in significant detail (Gourevitch, 2015; O'Shea, 2018, 2019; Cf. Taylor, 2013).⁴ They include owners and higher-up managers having the power to make decisions about long-term investment and employment conditions. Furthermore – and more important for our purposes here – managers have powers of (a) monopolizing, controlling, and when useful providing, information to workers; (b) deciding which tasks are performed, who they are performed by, and how; and (c) assessing workers' performance and rewarding (e.g. by increasing wages or promotions) and sanctioning or punishing them (e.g. by firing them) accordingly. Under contemporary capitalism, bosses have the power to make decisions with regard to (a)–(c) without workers being able to control them in any meaningful way, powers which are legally enshrined and protected by the state and accordingly backed up by the threat of violence. Importantly, these powers are held and exercised by individual managers, who hold them by virtue of their position within the social institution of the firm and who make individual decisions about (a)–(c) directly. Finally, this holds regardless of whether e.g. higher pay rates or better working conditions than others: higher wages and better conditions do not necessarily either entail or generate the removal of relations of domination (Lovett, 2010).

In this article, we seek to show how republican theories of non-domination should treat cases of work in the gig economy in which workers are classified as independent contractors and their work processes are often governed by a system of algorithmic management.

Algorithmic management in the gig economy

Tech companies such as Uber and Deliveroo project an image of their companies as enablers of greater freedom and autonomy for consumers and workers alike (Lee et al., 2015; Möhlmann and Zalmanson, 2017). They promise 'flexible employment' in which workers can 'work where you want, when you want, and set your own schedule' (Rosenblat and Stark, 2016: 3763). Their marketing literature promotes an ideal of freedom, entrepreneurship, and flexibility enabled through an app-based platform (Ahsan, 2020: 22). Unlike a traditional employer/employee relationship, they argue, drivers can decide on a minute-by-minute basis whether to supply their labor, allowing them more flexibility in scheduling other activities around their work (Chen et al., 2019).

Uber even denies that it is a transportation company and prefers to keep itself at arm's length from its fleet of drivers. It refers to these independent contractors as 'partner-drivers'

or ‘customers’ of their software, which implies less direct control over their activities in comparison to a more traditional employment contract (Uber, 2020). Drivers have little direct contact with company representatives. Only a handful of human managers oversee thousands of drivers on a global scale (Lee et al., 2015). Based on the rhetorical invocations of their marketing and the terms of their contracts with their partners, companies claim that workers in the on-demand ride hail and food delivery industries are more autonomous and less subjected to relationships of domination than in other forms of work (Ahsan, 2020: 22).

However, we argue that this Silicon Valley mythology around the gig or ‘sharing’ economy is designed to mask a darker reality of the lived experience of workers. We can understand it as one of the ‘legitimizing myths’ companies offer to hide their domination and justify their position of power (Thompson, 2018: 12). Empirical studies of the past five years have begun to demonstrate that through their software, tech companies exercise significant levels of uncontrolled power over their workers (Griesbach et al., 2019; Möhlmann et al., 2021; Wu et al., 2019; Rosenblat and Stark, 2016; Shapiro, 2020; van Doorn, 2020a). There are aspects of this form of work which do offer some degree of autonomy and flexibility. Workers in these studies report enjoying the ability to log on at their convenience and work for as long as they like. But this freedom needs to be understood in relation to the broader system in which it is embedded and the soft forms of control that companies can exercise to control work schedules and shift durations.

Rather than view this software as a neutral communicative device that enables and supports greater freedom, these studies have shown that it reinforces power structures that institute a specific regime of labor control. In platform labor, algorithms take up roles that ‘correspond to decisional, informational, and evaluation roles of human managers in organizations’ (Lee et al., 2015: 1604). As such, the roles and actions that managers would otherwise carry out on the corporation’s behalf are instead discharged by automated algorithms. Accordingly, empirical researchers ‘call software algorithms that assume managerial functions and surrounding institutional devices that support algorithms in practice *algorithmic management*’ (Lee et al., 2015: 1603).

Algorithmic management has been defined as ‘oversight, governance and control practices conducted by software algorithms over many remote workers’ which is ‘characterized by continuously tracking and evaluating worker behavior and performance, as well as automatic implementation of algorithmic decisions’ (Möhlmann and Zalmanson, 2017: 4). In one of the earliest studies, Rosenblat and Stark (2016) found that that ‘the information and power asymmetries produced by the Uber application are fundamental to its ability to structure control over its workers’ (Rosenblat and Stark, 2016: 3758). Similarly, Griesbach and colleagues studied food delivery platform workers in New York City, reporting that the market mechanisms of the app could only be made sense of ‘within the context of technical control systems that shape and constrain workers’ choices’ (Griesbach et al., 2019: 5). Van Doorn (2020b) emphasized that features like dynamic pricing algorithms should not be considered simply as market devices, but are in fact ‘an integral part of the technical control systems that shape the very market mechanisms through which workers’ strategic choices are constrained.’ In

many cases, the level of direct control, scope of uncontrolled power, and degree of asymmetry in knowledge and computational capacities exceeds that of certain standard employer/employee relationships, i.e. workers with permanent, full-time contracts paid an annual salary. These new practices of control establish a conflict between workers' desire for freedom and a digital system designed to manage a flexible workforce.

In the next section, we will examine how these empirical studies can assist with the development of a concept of algorithmic domination with respect to (a)–(c) discussed above, namely monopolizing and controlling information; deciding on tasks to be performed, who by, and how; and assessing workers' performance and rewarding or punishing it accordingly.

Algorithmic domination

We define algorithmic domination such that an individual is subject to algorithmic domination if and only if they are subjected to a dominating power, the operations of which are (either in part or in whole) determined directly by an algorithm. To be determined directly, we mean that an algorithm provides instructions to those subject to it without the necessity of an intermediate human agency playing a role in interpretation and decision-making. Computer systems may have human overseers who can intervene to help optimize the service, but algorithmic domination entails the possibility that judgments can be made, commands can be determined, and communications can be automatically sent to workers without human intervention.⁵

In this article, we discuss one particular example of algorithmic domination – the domination experienced by on-demand workers in the gig economy. In this instance, algorithmic domination enables the exercise of a form of social power – a system of control in which one set of agents controls another. Algorithms form part of human designed and directed socio-technical systems and should thus not be considered as neutral technical devices (Kitchin, 2017). Quite the contrary: both the nature and operation of algorithms in human affairs are designed and implemented by human beings rooted in and responding to their social and political context. The use of algorithms modifies a structural power relationship between workers and bosses and relies on a broader context of employment law, property relations and capitalist economic production.

Our understanding of algorithmic domination in the gig economy therefore emphasizes the social relationship and structural power inequalities at the heart of the system. It is an interpersonal account of domination in which bosses possess a robust capacity to interfere with workers through the operation of a system of algorithmic management. As Gädeke (2020: 211) persuasively argues, a relationship of interpersonal domination is never simply dyadic because it is structurally constituted by legal rules, social norms, and peripheral agents who help enforce and reproduce the structural power relationship between the dominator and the dominated. Bosses' domination of workers relies on technology, social relationships and economic institutions to facilitate and co-ordinate their exercise of power. The owners and managers of a company co-ordinate through shared beliefs and joint intentions to employ a particular system of labor management to ensure workers carry out specific tasks in prescribed ways. In this sense, the owners

and managers operate as a group agent of domination exercising their power over workers (List and Pettit, 2011: 19–41). When we speak of “bosses” in this article, we thus refer broadly to how both owners and managers act on behalf of the corporation.

There could be cases of algorithmic domination that include impersonal automated systems that dominate subjects – such as a fictitious legislator who organizes a dominating regime through a series of automata and dies soon after (Blunt, 2015: 17–18). This is a case of algorithmic domination, because the automata, operating according to algorithms, subject people to an uncontrolled power, the operations of which are determined directly by an algorithm. For the purposes of this article, however, we wish to remain agnostic about the broader question of whether *only* agents can dominate (and not impersonal systems or ideologies). We focus squarely on the uses of algorithms in the workplace, where we can clearly identify the owners and managers as the agents of domination. As the sophistication of algorithms develops, it may be the case that these systems require little to no human intervention at all. If this were the case, we argue this type of domination is still best conceived through the lens of agent-on-agent domination because the morally relevant moment is when the bosses choose to implement such a system and continue to sustain and reproduce it.

In our account, we could say that when workers sign contracts to operate by the terms of agreement of tech companies and are granted access to the application software they enter into a dominating power relation with the company. The socio-technical system establishes a structure of domination that enables potential interference and in which workers’ choice sets are routinely altered. We follow Lovett (2010: 97) in noting that even if one particular company had slightly higher rates of pay or less onerous times for delivery, there would still be a structure of a dominating power relationship between workers and bosses. This is why we should be skeptical of voluntary pledges by tech companies to ‘do better’ because self-regulation by the powerful is an insufficient means to remove relations of domination.

The use of algorithms in the gig economy modifies an already-existing structural power relationship between workers and bosses. As under more familiar forms of capitalist labor, in the gig economy the power to make decisions over workers in areas (a)–(c) discussed above ultimately reside in the firm, recognized and protected by prevailing property relations and the legal framework that maintains and enforces them. The major difference lies in how this power is delegated and exercised. Instead of being delegated only to individual managers who make decisions about (a)–(c), the power is delegated to and exercised by a particular combination of digital algorithms and human overseers. The precise role of the human overseer(s) varies, typically emphasizing overseeing the algorithm and problem-solving when things go wrong or need tweaking.

This relationship of domination is further exacerbated by the many power inequalities built into the architecture of the platform and the broader political and legal systems within which they are based. Workers’ vulnerability to bosses is shaped by tech companies’ ability to exploit loopholes in national labor laws to deny contractors employment rights which would entitle them to holiday and sick pay, a minimum wage and protection against unfair treatment and dismissal. Workers also face knowledge, data, and computational inequalities in relation to bosses, without the extensive computer science skills

and equipment that the company deploys to manage its operations (Shapiro, 2020: 173). Workers in the platform economy also usually consist of people from migrant backgrounds and other marginalized communities with less access to other more secure forms of employment (van Doorn et al., 2020). The techniques of algorithmic management employed by the companies are used to help the company leverage their existing advantages and resources to exercise greater levels of control over their workers, which we will now examine in more detail.

Algorithmic domination in the gig economy

In this section, we argue that in the gig economy, algorithmic tools help to increase bosses' uncontrolled power over workers of the three kinds we discussed above, namely (a) monopolising, controlling, and when useful providing, information to workers; (b) deciding which tasks are performed, who they are performed by, and how; and (c) assessing workers' performance and rewarding, sanctioning, or punishing them. To this end, we describe how algorithms are employed to increase already-existing information and computational asymmetries between workers and managers (see (a)); increase corporate powers of uncontrolled interference with workers' activities through forms of dynamic pricing that constantly manipulate workers' choice sets in uncontrolled ways (see (b)); and increase the domination involved in assessing and rewarding and punishing performance (see (c)). This analysis will better enable us to understand how workers are dominated under these systems of algorithmic domination.

Information and computational asymmetries

One of the hallmarks of platform labor is the profound increase in asymmetries of information between workers and management (Lehdonvirta, 2018; Rosenblat and Stark, 2016; Wood et al., 2019). Ride hail and food delivery companies deliberately withhold key information from workers as part of a system of labor control. In this way, the algorithmic domination involves an increase in (a), i.e. in bosses controlling workers' access to relevant information to their work activities. We consider this restricted access to information as contributing to an overall system of domination, insofar as it further limits workers' choice sets related to how they conduct their work. In many instances, the degree of uncontrolled interference that can be exercised is higher than if these workers were supervised directly by human managers (van Doorn, 2020b; Wood et al., 2019). As such, the corporation's uncontrolled powers of interference are greater and workers are subjected to a higher degree of domination.

First, at most companies surveyed in the literature, the lines of communication between the company and workers are based primarily on one-way systems of communication (Cant, 2019; Lee et al., 2015). The apps enable the company to capture data on every aspect of the work process, but offer extremely limited opportunities for workers to have any avenues to communicate with the company. This lack of communication means that workers are not able to negotiate aspects of their work contract or have any discussion with management over how they perform their tasks.

In the case of Uber, key information related to potential trips is withheld in a manner that impacts on a drivers' ability to choose whether to accept requests for rides (Rosenblat and Stark, 2016: 3762). In Rosenblat and Stark's study, the driver was told the passenger's average rating from previous trips, but they were not informed about the passenger's destination. This means the driver had little meaningful ability to decide whether or not they could decline the booking based on the inconvenience of the location or length of trip which might be too long, too short, or result in the driver being left in an undesirable location.

Second, workers are often hindered from even knowing whether, and to what extent, it's a human being or an algorithm making the decisions they're commanded to carry out, as well as how those decisions are made. This lack of a direct line of communication to management results in there being no opportunity for bosses to 'make concessions to workers about how work is organized, or make any of the usual compromises you'd expect from a human supervisor' (Cant, 2019: 59). Workers who make enquiries are often first met with a template response or are diverted into automated systems of Q&As that lack a nuanced and contextual understanding of the workers' issues.

Third, the company's investment in software engineers, data analysts and computational programs leads to a large asymmetry between the two parties' capacity to generate insight from the workers' activities (Shapiro, 2020: 173). This is not simply an information asymmetry, but unequal access to the calculative equipment and the data that would enable workers to make meaningful and informed decisions about their work. Without this insight, drivers and riders are left to second guess how the algorithm operates by communicating with each other via WhatsApp and Facebook groups about preferable locations and times to work. The computational power of the company and the workers' lack of access to even their own data provides the company with an enormous advantage to structure work in ways that feel opaque, controlling, and dominating (Cant, 2019; Shapiro, 2020).

Each of these three information and computational asymmetries effectively decreases workers' ability both to understand and contest the decisions that are made over them and decreases their ability to make informed decisions about the work they are offered and its conditions. Conversely, they increase one of the key forms of corporate domination over workers highlighted in the workplace republican literature, namely (a) monopolising, controlling, and when useful providing, information to workers. This calls into question gig economy companies' claims to provide their workers with greater freedom and flexibility. The reality of this type of work, as reported by workers themselves in empirical studies, is that with little data or information made available to them, they face a restricted set of choices in how they can behave within the system (Rosenblat and Stark, 2016: 3777).

We can clearly see that the greater role of algorithms and more restricted communication with human managers often generates harsher conditions for workers in two respects. Firstly, since workers are deprived of so much more information and lines of communication both with each other and with managers compared to the corporation they work for, they have a decreased ability to contest or control decisions in any meaningful way, or contest and control their working lives in light of the conditions they are

subjected to. Secondly, and on the other side of things, since managers are less directly involved with workers, the uncontrolled power exercised over workers is less, and less often, used in ways that ameliorate or compromise with them on the initial commands. While the former increases the degree of domination the workers are subjected to, the latter increases the severity of how that domination is exercised.

Increased capacity for exercising uncontrolled power

The algorithmic technologies employed in the gig economy have increased the number of ways, and frequency with which, workers can be interfered with in ways they cannot control, specifically in the area of deciding which tasks are performed, who they are performed by, and how. Human managers have a number of basic physiological limitations on their ability to interfere with workers, regardless of what they might legally or otherwise get away with. The algorithms used in the gig economy help to modify these abilities, enabling greater degrees of uncontrolled interference over workers. As one Deliveroo driver noted, their ‘total reliance upon the app’ and its one-way commands, meant that ‘we had no independent ability to coordinate the labor process or do things our own way, we had to follow instructions to the letter’ (Cant, 2019: 59).

One particular mechanism through which bosses exercise this uncontrolled power over how tasks are performed and by whom is through systems of dynamic pricing and incentive schemes. Dynamic pricing is a system used by many app-based delivery and ride hail companies that price different jobs dynamically, meaning that the remuneration of workers is altered by algorithms in real-time, without their ability to contest or control whether or how this occurs (Shapiro, 2020: 165). This system of pricing has been introduced gradually into the ride hail and food delivery industry and has come to replace hourly rates and even piece-rate payments in a number of countries.

Dynamic pricing is an important part of a system of labour control because it is designed to keep workers from leaving the platform and to induce them to work at particular periods and to take on particular tasks. Companies are thus not only able to exercise power over *how* workers are controlled during their working time but also to influence *when* workers log on and off. Dynamic pricing and incentive schemes effectively enable companies to alter how many workers are logged on in order to manage fluctuations in demand from consumers. This provides companies with control over this important aspect of maintaining a flexible labour force, which is only paid for specific trips and deliveries rather than time logged onto the app.

As part of the company’s algorithmic management, dynamic pricing can be personalised and used to adapt to the particular workers’ behaviour to manage them more efficiently and discover how best to direct their behaviour. App-based work has been similarly ‘gamified’ so that workers must continually evaluate variable offers and choose to accept certain deals based on estimations of its likely reward (Chen and Horton, 2016: 405). This forces workers into decision-making processes about whether one particular deal is worth it, how long they would need to wait for another to be sent to them and how will their response to an offer affect the offers they will be sent in the future (Calo and Rosenblat, 2017: 1655). Finally, note that dynamic pricing is

not based on responding to existing market demand, but is rather predictive, and often gets things wrong, with many workers expressing ‘frustration and enthusiasm alike for surge pricing because its very dynamism is characteristically fickle and opaque’ (Rosenblat and Stark, 2016: 3766).

Importantly, because algorithms enable the greater interference in workers’ actions and activities, these workers are subjected to increased powers of interference. Recall that A is dominated by B iff B can interfere with A’s choices (e.g. by replacing one options with a less desirable one) in ways that A cannot control and thus that an increase in B’s ability to interfere with A’s choices entails an increase in domination by B of A. If the empirical claim that the algorithms used by platforms enable an increased ability on the part of bosses to interfere with the payoffs of the options available to workers, and that workers cannot control the exercise of thereof, then it follows that workers for these platforms are more dominated.

These powers do not inhere in the algorithms in isolation. Rather, they inhere in the socially produced and reproduced corporate entity – Uber, Deliveroo, etc. – that workers are subjected to. Finally, these are clearly instances of algorithmic domination, because workers in these cases are subjected to an uncontrolled power, the operations of which are determined directly by an algorithm. In this way, the kinds of algorithmic domination seen in the gig economy facilitates greater domination and thus unfreedom of gig workers, specifically with respect to the second kind of managerial domination mentioned above, namely (b) deciding which tasks are performed, who they are performed by, and how.

Assessing performance

Despite their claimed status as autonomous, independent contractors, workers in the gig economy remain subject to the uncontrolled power of consumers and bosses in terms of how they are assessed, rewarded, and punished in various ways (as per (c) above). Indeed, a variety of algorithms help to further increase these forms of domination as well.

First, the algorithms used by many applications like Uber and Deliveroo help to facilitate and increase the degree to which workers are subjected to the uncontrolled power of consumers. In addition to techniques of dynamic pricing to manage labor supply in a changing marketplace, bosses also exercise uncontrolled power over workers in establishing regimes in which they are subject to the arbitrary whims of customers in ways that workers cannot control. Workers experience a decreased ability to contest consumers’ evaluations – much less control them or their consequences – with respect to how their work will be assessed for purposes of rewards and sanctions. The results of this is, as one interviewee put it, ‘you are at the mercy of random people’ (Lee et al., 2015: 1610).

This greater dependency on the whims of consumers has predictable consequences for workers’ experiences of domination and oppression. One study found that ‘[b]eing tracked, evaluated, and judged by each passenger seemed to have a negative psychological impact on drivers who did not have scores near 5’ and that ‘a rating below 4.7 became a source of disappointment, frustration, and fear of losing their jobs’ (Lee

et al., 2015: 1608), quoting one participant who said that '[the rating system] makes you cautious that what you're doing is being judged and rated and if you're rated poorly enough over a period time then eventually the platform could ask you to stop driving for them.' (Lee et al., 2015: 1608).

As they well know, workers are rewarded and punished based on these consumer evaluations in a variety of ways. High acceptance rates and customer ratings may result in being offered a guaranteed hourly pay (as opposed to being paid pure piece rates) or being offered promotions to becoming mentors and recruiters. Low acceptance rates and customer ratings may result in being subject to review and/or being fired ('deactivated'). Here too, these powers are ultimately vested in the corporate entity these workers work for, as exercised by differing, and always opaque, assemblages of algorithms and human managers. Workers have had their accounts deleted by an algorithm without warning and with no right to contest the decision. The ratings system does not simply provide workers with feedback on customers experience, but is a disciplinary process that empowers algorithms to offer both rewards and punishments to workers that are designed to affect how they behave at work.

Algorithms and the transformation of work

In the foregoing analysis, we examined how new systems of algorithmic management facilitated relationships of domination in which bosses could exercise uncontrolled power over workers. Corporate promises to 'do better' through self-regulation are implausible solutions for uncontrolled powers for three reasons. First, it hasn't worked in any other major industries with low-paid and oppressed workers. Second, it conflicts with their interests in maintaining a highly exploited workforce they can control and manipulate at will. Third, the corporations choosing to act better voluntarily amounts to a claim about their intentions to *use* their uncontrolled power in better ways, not to actions that would *remove* their uncontrolled power. Since using their powers better neither entails nor necessarily results in removing their uncontrolled powers, this cannot be considered a solution to the structural power imbalances we've discussed here.

However, we do not see the introduction of algorithms into the workplace as leading inevitably towards an algorithmic panopticon in which every aspect of a workers' activities is subject to intense disciplinary control. Current regimes of control are only one of a range of possibilities for the future of work. The algorithms analyzed in this article operate as efficient tools of worker control and profit maximization because that is how they were designed to operate. But technology can be recoded for new purposes, creating new possibilities for how it could facilitate more emancipatory forms of work.

One of the troubling consequences of the rise of corporate platform companies in the on-demand economy has been the widespread view that this type of model is the only way these tools could be used. Under the cover of an ideology of worker flexibility, tech companies have eroded workers' rights to a minimum wage, holiday and sick pay and other employment benefits (Wood et al., 2019). Revealing the bogus nature of these claims of entrepreneurship helps us to better understand the realities of work in the platform economy. As we have argued, the new technical systems enable the exercise

of a form of social power by one set of agents over another. In the case of app-based work, these are modifications to traditional employment relations in ways that reduce the costs and liability of companies for work undertaken on the platform and increase their capacity for surveillance and control. It is possible to design systems in which a different set of power relations exist between the parties involved in app-based work.

Alternative models of organization are already being practiced in the food delivery and ride hail industries. Platform co-operatives offer an alternative vision of how algorithms could be employed to pursue the goal of an emancipatory ideal of co-operative and non-dominating forms of work (Scholz, 2016; Scholz and Schneider, 2016). These are enterprises that are owned and managed by workers, who share the profits of the business, eliminating the role of capitalist bosses as disciplinary agents and exploiters of workers' labor. Platform co-operatives such as the European federation, CoopCycle in the food delivery market and member-owned co-operative, Eva in the ride hail market, provide one type of model for how work could be transformed.⁶

Democratic control by workers presents one possible avenue for how the structure and flow of work processes could be determined by the workers themselves. Software can be designed to maximize worker freedom and autonomy. This enables workers to take advantage of the efficiencies provided by the app without the dominating aspect of the relationship between bosses and workers. CoopCycle has created its own software, for example, that enables members of the federation to manage their deliveries and relationships with restaurants and customers using bespoke software created exclusively for use by co-operative partners. The software has two main components: a user-facing interface that allows customers to order from restaurants' menus and pay through an online payment system; and a dispatch system that uses geolocation data to match couriers with orders as they are entered into the system and calculates routes and estimated times for delivery.

Why should we see this as a superior form of work? To begin with, co-operative members would take home an equal share of the profits of the organization and are therefore not exploited through a system of wage labor. The co-operative does not need to implement piece wages, a dynamic pricing system or any of the rewards and punishments needed to discipline workers in the typical corporate model. Workers can collectively determine standards of acceptable times for delivery and have discussions about what the app should optimize for when assigning tasks to workers. The accumulated data from the company could be used to empower workers and provide them with more detailed information to improve decisions on when to open, how many workers should be working and which aspects of the service could be enhanced. When disciplinary matters do arise within the organization, they can be dealt with through an open and transparent process following procedures known to all workers with appropriate protections and avenues for appeal. We could expect less of a need for them because workers with an equal stake in the organization have a far greater incentive to maintain its reputation and ensure its success.

One concern of critics is what could happen to co-operatives when competing against other firms in a capitalist economy. The argument is that corporate firms will be able to pay lower wages, engage in aggressive marketing campaigns and undercut their

competition. This could potentially result in co-operatives either driven out of business or forced to adopt some of the practices of their rivals. Luxemburg (1990: 146) argued co-operatives ‘are obliged to take toward themselves the role of capitalist entrepreneur – a contradiction that accounts for the failure of production cooperatives, which either become pure capitalist enterprises or, if the workers’ interests continue to predominate, end by dissolving.’ Another concern is that a similar relationship of algorithmic domination could emerge between a class of managers within the co-operative and workers who do not take advantage of the democratic rights available to them. In an organisation in which there is a strong ideology of harmony and mutual co-operation, workers may feel less able to bring up grievances than in a private firm. Without proper democratic participation, managers could attempt to drive up efficiency against at the expense of workers who are not given sufficient opportunity to voice their concerns (Kasmir, 1996: 13). Historical examples of large co-operative enterprises show that these concerns are not decisive in all instances, but the difficulties of co-operatives in competing against larger corporate rivals should also lead to an acknowledgement that some caution is needed in adopting co-operative solution.

There are also other questions of the extent to which worker co-operatives pose a long-term solution to the problem of economic domination. Even if one were to admit that the co-operative model was preferable to the current generation of gig economy firms, it is another question as to whether a co-operative *movement* could bring about a fundamental transformation of the economy and entrench a new set of social relations across society. Any discussion of full economic emancipation would require a much more sophisticated discussion of the conditions of a free economy, the nature of the division of labor, and of whether it’s ultimately compatible with the power of certain kinds of competitive markets.

What these examples do show, however, is the contingent and political nature of the role of algorithms in the workplace and how they can be embedded in different political contexts. We contend that democratic ownership and control of productive assets and equal rights of participation in decision-making over the conditions and processes of work could transform the role of algorithms at work and enable the beginning of a broader discussion about how democratic collectives should control the use of technology in the workplace.

Studying algorithmic domination

To conclude, we would like to suggest other important ways that algorithmic domination could be studied. For example, to make our case we have selected one prominent example that has received a great deal of empirical study: ride hail and food delivery apps. However, there are a variety of different types of app-based work in the gig economy that require more context-specific analyses of how different labor platforms operate. Mateescu and Ticona (2018) rightly observe that there is a gendered bias of the first wave of empirical scholarship which has focused on the male-dominated spheres of the gig economy while paying significantly less attention to domestic and care work platforms in which women make up a majority of the labor force. Their study suggests that

the ‘Uberization’ narrative of a move towards less formal work arrangements is in fact reversed on certain care work platforms. Operating in what was previously an informal economy, care work platforms have attempted to formalize aspects of the process to promote their professionalism and highlight how their services offer added safety and security through formal registration procedures and tax compliance.

Another example of a different type of algorithmic domination in the gig economy is that of ‘microworkers’ on platforms such as Clickworker and Amazon Mechanical Turk (Jones, 2021; Gray and Suri, 2019). These workers undertake tasks that include transcribing audio clips, filling in surveys, cleaning data, labeling photos and translating pieces of writing. Microwork platforms host short tasks for requesters that are posted by a range of different entities from individuals and small start-ups to larger companies such as Google and Microsoft. In these examples, workers only work for each individual requester for a few minutes at a time. The platform acts as an intermediary and takes a cut of each transaction that occurs on the platform. Workers are classified as ‘independent contractors’, but the division of their work into hundreds of micro-tasks requested by as many different contractors complicates the analysis, requiring a separate analysis how algorithmic domination operates in this specific sector. This example has a particular relevance to the subject matter because the workers that undertake these small tasks are often used to train algorithms, on occasion the same ones that will end up managing humans more efficiently (Jones, 2021).

The role of algorithms in society is not limited to the gig economy and is growing rapidly in other sectors. Certain tech companies in the gig economy could be seen as an emerging vanguard of capitalist development, but there are also signs of a much broader shift that we could understand as ‘a new digital Taylorism’ based on ‘the impact of computerization, datafication, platformization, as well as AI in terms of the economic and social consequences of technological change in capitalist societies, and not least the changes in the *vertical division of labor* in production in the modern corporation’ (Panitch and Albo, 2020: xi). As a result, the framework of algorithmic domination may be applicable to a wide variety of other workers including other forms of ‘logged’ labor on digital platforms and the increasing number of workers in standard employment contracts who are also algorithmically managed in relevantly similar ways (Huws, 2020: 7). When workers are (arguably wrongly) classified as independent contractors rather than dependent employees, the forms algorithmic domination will take could be different to the way full-time permanent employees are managed through similar systems. Our analysis has demonstrated that gig workers are particularly vulnerable to these systems because they face additional levels of insecurity and precarity. However, the issues of employment status and regimes of algorithmic management can be separated, leading to questions as to how dominating such regimes would be when applied to full-time permanent employees.

Not only can this analysis be applied to different domains, but we also believe that it could be adapted to a variety of domination phenomena regardless of the specific definition of domination employed. Whether one prefers Pettit’s early definition of non-domination in terms of interest-tracking or the later Pettit’s definition in terms of uncontrolled power, it will remain the case that, so long as an algorithm plays the particular role we highlight

within that dominating relationship, this will count as an instance of algorithmic domination (Pettit, 1997, 2012). It also leaves open the possibility of forms of algorithmic domination that do not rely on inter-personal forms of domination but whether automated systems or impersonal social relations could also be considered potentially dominating such as has been argued by Marxists and anarcho-feminists (Goldman, 2016).

Furthermore, we might also wish to consider ways in which the concept of algorithmic domination could be applied outside of the workplace to various ways in which digital technology surveils, tracks and attempts to change our behavior in our everyday lives. This line of inquiry would turn attention to the many platforms and apps that we rely on for eating, shopping, entertainment and leisure activities, which institute new forms of algorithmic governance. Many of these apps act in ways that have a small and sometimes imperceptible influence over decisions we make, but which in the aggregate could amount to an objectionable form of uncontrolled power. Danaher (2018) applies a conception of “micro-domination” from republican theorist O’Shea (2018) to understand how the many small-scale, arguably trivial attempts to nudge and change our behavior could be considered dominating (see also Lazar-Gillard, 2021). O’Shea originally employs this term to connect discussions in disability studies with republican political theory by arguing that people with disabilities can suffer from many small instances of uncontrolled power throughout their daily lives which can have a significant long-term impact:

The result is often a phenomenon I shall call ‘micro-domination’: the capacity for decisions to be arbitrarily imposed on someone, which, individually, are too minor to be contested in a court or a tribunal, but which cumulatively have a major impact on their life (O’Shea 2018: 136).

In this article, we have analyzed how bosses can employ systems of algorithmic domination to control a more flexible labor force. But algorithmic domination could be extended to consider ways in which individuals are influenced by algorithmic systems that impact upon their everyday behavior. Questions of what to watch, what to buy and where to shop are all open to new digital infrastructure that can define our choice sets and manipulate our behavior through targeted notifications and nudges. As digital platforms and algorithms play an increasingly important role in our workplaces and social lives, the question of how they can both enhance and limit our freedom will be one we should continue to explore.


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Notes

1. This differs slightly from (Pettit, 2012) and note that this differs from Pettit's earlier formulation in terms of arbitrary power (Pettit, 1997), which we cannot explore here. Pettit, of course, disagrees with labour, workplace, and socialist republicans on whether the capitalist economy is a site of domination (Pettit, 2006), but this turns not on his concept of freedom, but instead on his descriptive understanding of the capitalist economy (Kinna and Prichard, 2019).
2. On this view, we may say that someone is forced to do X iff they have no reasonable alternative to doing X (see Cohen, 1988).
3. This is drawn from (Gourevitch, 2015: 106–16), with one modification: while Gourevitch draws on Pettit's earlier definition of domination in terms of arbitrary power, we read it through Pettit's later definition of domination in terms of uncontrolled power.
4. Not all republicans would agree that workers are dominated by bosses in capitalism. Theorists such as Phillip Pettit and Robert S. Taylor argue that under suitable background conditions – such as open and competitive markets or a basic income – workers can exercise considerable control over their work. We follow Gourevitch, O'Shea and others in this article and build our analysis of algorithmic domination on this basis.
5. We use 'commands can be determined' rather than formulation like 'decisions made' in order to deliberately avoid the agential-sounding implications of the latter.
6. See <https://coopcycle.org/en/> and <https://eva.coop/#/>.

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