A "Circuits of Power"-based Perspective on Algorithmic Management and Labour in the Gig Economy[1] [2]

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Abstract: The bulk of contributions on digital business so far provide mainly descriptive analyses when it comes to the study of power-related phenomena within the gig economy. We particularly lack systematic, integrative studies which focus on interdependencies of power relations, labour conditions and business model efficiency, based on robust theoretical approaches which capture meso-level structures and micro-level dynamics of power simultaneously. Our conceptual paper addresses this gap by investigating power relations in platform arrangements, based on the framework of "circuits of power". We use the case of the ridesharing platform Uber, which has caused debates in and beyond academia to illustrate how this framework, combined with concepts from labour process theory, behavioural economics and micro-politics, can be applied for a systematic analysis of the diversified portfolio of power-related control and influence mechanisms that are embedded in platforms' software infrastructures. Departing from this, we examine how our approach can inform future research focused on assessing specific forms of management, organisation and work in the wider gig economy. Our discussion concentrates on a) the classification and comparison of heterogeneous forms of gig work; b) the assessment of labour-related problems; and c) power-related organisational dynamics or inertia in such settings. The latter point is related to the central question of why employee voice and resistance are rare in certain gig-work arrangements.

Keywords: Uber, gig work, platform economy, power, circuits of power, algorithmic management, organisational control, labour conditions (JEL: J29, J40, J70, J81)

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Zusammenfassung: Vorliegende, vorwiegend deskriptive Beiträge zu digitalen Geschäftsmodellen zeigen die Rolle von Machtverhältnissen zwischen Plattformbetreibern und Plattformarbeitern auf. Machtbeziehungen werden hier sowohl mit organisationalen Gewinnerzielungsabsichten als auch mit problematischen Beschäftigungsbedingungen assoziiert. Obwohl die Forschungslandschaft Beschreibungen und Analysen machtbezogener Phänomene liefert, fehlen bisher holistische Theorieperspektiven, die auf machttheoretischer Grundlage systematisch machtbezogene Phänomene auf der Makroebene organisationaler Strukturen und der Mikroebene organisationsinterner Prozesse simultan analysieren. Das konzeptionelle Papier adressiert diese Lücke. Am Beispiel des kontroversen Falls des Fahrdienstleisters Uber illustrieren wir das Potenzial des Konzepts der „Circuits of Power“. Wir zeigen, wie es die Anwendung des Konzepts in Kombination mit Erkenntnissen der Labour Process Theory, der Verhaltensökonomie sowie mikropolitischer Arbeiten erlaubt, das ‚diversifizierte Portfolio‘ softwarebasierter Einfluss- und Kontrollpraktiken in Plattformarrangements mit Blick auf ihre Macht-, Effizienz- und Beschäftigungsimplikationen hin integrativ zu analysieren. Hiervon ausgehend zeigen wir das Potenzial dieses Ansatzes, der Analyse von Macht im Feld plattformbasierter Organisation und Arbeit ein theoretisches Fundament zu liefern. Der Ausblick zeigt, wie die Befunde Ansatzpunkte liefern, um a) heterogene Formen plattformbasierter Erwerbsarbeit zu vergleichen, b) die Diskussion über Probleme plattformbasierter Erwerbsarbeit voranzubringen, und c) systematisch-vergleichend zu beleuchten, warum „endogener“ Wandel von Machtverhältnissen durch direkte Interessenartikulation und Widerstand von Plattformarbeitern in spezifischen Plattformarrangements unwahrscheinlich ist.

1. Introduction

Gig-work platforms present a specific type of digital business model that is based on online software applications that coordinate operations. Platforms build lean (Heiland, 2018) software-based organisational architectures to support semi-automated "algorithmic management" (Lee, Kusbit, Metsky & Dabbish, 2015) "driven by algorithms" and "fuelled by data" (Van Dijck, 2016). A characteristic of these models is the provision of on-demand services in the absence of conventional employment relations. Services are provided by "gig workers", who are formally classified as independent contractors or micro-entrepreneurs (e.g. Risak & Warter, 2015; Kuhn & Maleki, 2017). The work relationships are market-mediated (e.g. Kalleberg, 2011; Wood, Graham, Lehdonvirta, & Hjorth, 2018) and "account membership" replaces conventional employment contracts (Kirchner & Schüßler, 2018).[6]

Uber and Lyft (ridesharing), Foodora and Deliveroo (food delivery) and Postmates (courier services) present a specific type of platform enterprises. They provide on-demand services that require local execution. Academic and public discussion about these platforms is full of controversy. Although these platforms can provide high autonomy (Schmidt, 2016) and income opportunities for marginalized worker populations due to low entry barriers (e.g. Rosenblat & Calo, 2017), Uber and similar platforms have received substantial criticism. They are accused of offering "precarious working-class jobs" (Scholz, 2013, p. 1; Schor, Walker, Lee, Parigi & Cook, 2015) as their freelance subcontracting approach bypasses the protective labour regulation and obligations that are associated with regular employment. This contributes to a "severe commodification of contingent workers" (ibid.). Thus, this business approach is considered problematic for the well-being of gig workers (e.g. Bajwa, Gastaldo, Ruggiero & Knorr, 2018) and research indicates low levels of mutual trust between workers and platform providers due to the delicate labour conditions (Wentrup, Nakamura & Ström, 2019). Whilst problematic for workers, this workforce management approach is considered beneficial for platform providers as it allows for the externalization of costs and risks which would occur in the context of regular employment. Hence, the "strategic legal misclassification" of gig workers as freelance "business partners" rather than employees is seen as a crucial building block for the economic success of these platforms (e.g. Srnicek, 2017).

[6] There is a vivid and interesting debate about the classification of gig workers, in terms of their legal and theoretical status as employees versus independent subcontractors (see e.g. Felstiner, 2011; Kuhn & Maleki, 2017; Capelli & Keller, 2013, Kirchner & Schüßler, 2018; De Stefano, 2015). To date, Uber workers remain legally classified as independent subcontractors. However, research suggests that in various ways, Uber gig workers strongly resemble employees.

Researchers have thus related labour issues and these efficiency-seeking strategies to specific power relations between platform providers and gig workers. For instance, the ability of platforms to unilaterally set the formal terms and conditions of account membership and to prescribe processes by designing platform software infrastructure is described as an "asymmetric order" based on "algorithmic bureaucracy" (Kirchner & Schüßler, 2018; Kirchner, 2019). Similarly, Wood et al. (2018) examine the "weak structural power" of digital workers. Power asymmetry is seen as an "outcome of platform-based rating and ranking systems" (ibid., p. 15) enabling high levels of control. It has been linked to problematic labour conditions, such as "overwork, sleep deprivation and exhaustion" (ibid.). In a similar vein, Rosenblat and Stark's study on "algorithmic control" at Uber (2016) draws attention to various related mechanisms embedded in the platform's organisational setup. These features are "fundamental to its ability to structure control over its workers" (ibid., p. 3758). Thus, the study of power relations in gig-work settings seems important for understanding how specific management strategies of platforms relate to labour conditions and power relations in the emerging digital economy.

In line with this, issues of power and labour underlie many contributions to digital labour with existent studies highlighting the role of standing conditions and organisational structures which influence power relations in the context of platforms at the meso-level of organisations as well as the situation of gig workers and how their work processes are controlled at the micro-level, based on the exercise of power (e.g. Aloisi, 2015; Bauer & Gegenhuber, 2015; Fieseler, Bucher & Hoffmann, 2017; Gillespie, 2014; Harmon & Silberman, 2018; Malin & Chandler, 2016; Nachtwey & Staab, 2016; Schor, 2017; West, 2019). However, we hitherto lack a holistic theoretical framework of power in the gig economy to integrate these findings and capture how case-specific meso-level conditions, such as organisational structures, affect organisational interactions and work processes. Such a systematic and integrative framework seems necessary to understand how specific power configurations emerge, become stabilized or change, and how they relate to more-or-less problematic working conditions in various gig-work settings. This conceptualization would introduce a theoretically elaborate foundation for studies of power to gig-work scholarship. It would also help to draw clear lines between "the good, the bad, and the ugly" in the gig economy vividly discussed in recent debates (e.g. Kalleberg & Dunn, 2016; Davis, 2015, 2016).

To provide such a conceptual foundation, we propose to apply key ideas of the "circuits of power" approach (Clegg, 1989) to the study of management, organisation and work arrangements in platform businesses. To do so, our paper is structured as follows: departing from an introduction of the framework (section 2), we illustrate how power relations in platform- businesses can be studied based on Clegg's approach, drawing on the case of the U.S ridesharing provider Uber to illustrate our

argument (section 3). Next, we discuss our contribution to power theory and gig-work scholarship (section 4) and finally reflect on how our study can inform further research (section 5).

2. The Circuits of Power approach

The circuits of power approach (Clegg 1989; Clegg, Courpasson & Phillips, 2006) is an established theoretical framework that provides a flexible "power compass" (Mumby, 2004) to "explain the relative capacity of various actors to influence organizational relations" (Oliveira & Clegg, 2015, see figure 1). The framework has informed research in diverse contexts, ranging from analyses of power in historic and contemporary societies (Clegg, 1989) to contributions on identity regulation in organisations (Alvesson & Willmott, 2002), organisational information systems (Silva & Backhouse, 2003), and power relations in multinational corporations (e.g. Vaara, Tienari, Piekkari, & Säntti, R., 2005; Mezihorak, 2018; Pedraza-Acosta & Mouritsen, 2018).

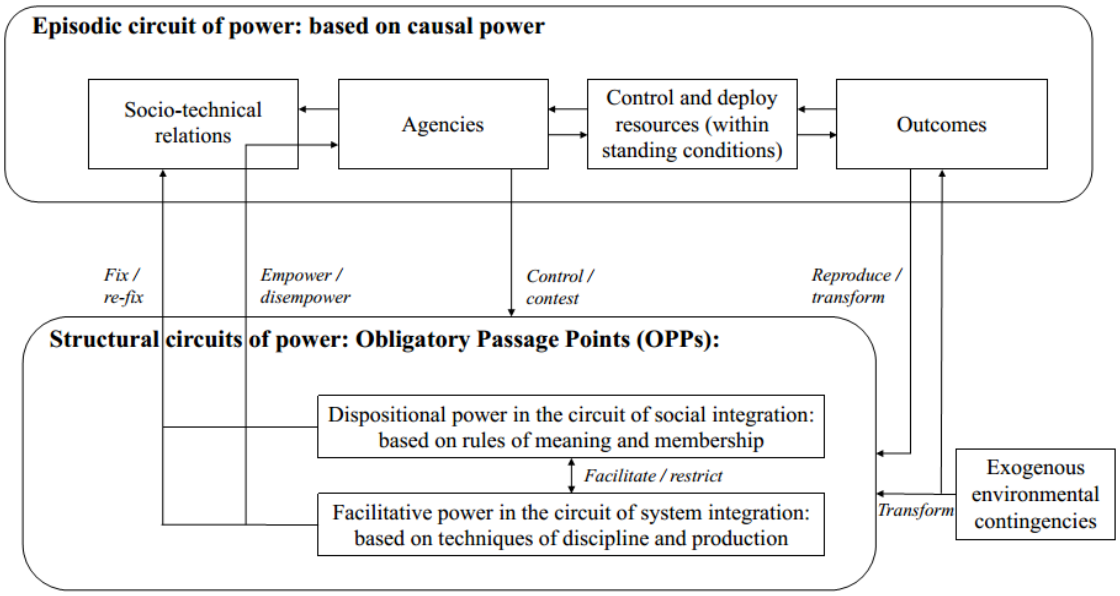

Fig. 1: Framework of Circuits of Power. Source: Own compilation based on Oliveira & Clegg, 2015, p. 444.

Clegg's analysis of power emphasizes the *disciplinary and restrictive effects* of power as well as its *facilitative effects* as a core, generic force, keeping systems of organized and coordinated action coherent (Clegg et al., 2006).[7] The framework integrates micro-, meso-, and macro-level analytical perspectives based on the idea that power, "like electricity[,] circulates through social relations, working practices, and techniques of discipline" (Backhouse, Hsu, & Silva, 2006, p. 415) in any organisational arrangement. Accordingly, three interrelated circuits of power are distinguished:

[7] This conceptualization of organizations as "partial organizations" (Ahrne & Brunsson, 2011) stresses the interactive constitution of organizations and the key role organizing instead of formal structures boundaries. Accordingly, we viewed platform businesses as "platform arrangements." These organizational systems of coordinated action are influenced by internal and external stakeholders who possess varying degrees of power.

1. The c*ircuit of episodic power* captures episodes at the organisational micro-level of processes, including the exercise of power in conflictual situations. It also includes "business as usual" interactions, echoing notions of "causal power" (e.g. Weber, 1921; Dahl, 1957). In ongoing interactions, "agencies", i.e. individual or collective actors such as managers or workers, interact within established socio-technical relations by using means and power resources (e.g. access to information, networks, knowledge) available to them to pursue their interests. These power-related processes at the episodic (micro-) level of organisations are embedded in social meso- and macro-structures. To understand the constitution of these standing conditions, Clegg – drawing on Foucault (1977, 1980), Parsons (1951), and Callon (1986) – highlights that actors not inherently "possess power" but the power "held" by certain actors is based on their relative capacity to influence other actors based on resources rooted in the socio-normative and socio-technical structures of a given organisational setting and its environment. To analytically capture this conditional environment of episodic processes he relates episodic power to two additional "structural circuits of power" (Oliveira & Clegg, 2015):
2. The *circuit of system integration* "captures material conditions in organizational settings, which consist of techniques of production and discipline, such as [...] machinery, information systems, organizational structures and […] processes" (Clegg, Geppert, & Hollinshead, 2018, p. 9). These "structures of domination" (Geppert & Dörrenbächer, 2014) enable certain powerful actors to implement mechanisms of surveillance, discipline and control, evaluation and incentives, all of which affect episodic processes and the power resources of other agencies.
3. The c*ircuit of social integration* "captures prevailing rules of practice shaping actors' dispositions to behave in certain ways" (Clegg, Geppert, & Hollinshead, 2018, p. 9). This circuit includes the "non-material" aspects of organisational arrangements, such as formal and informal *rules of meaning and membership*. In line with Foucauldian and neo-institutionalist scholarship (e.g. DiMaggio, 1988; Meyer & Rowan, 1991), these "rules of the game" (Geppert & Dörrenbächer, 2014) provide organisational decision-makers with dispositional, structural power. This allows them to prescribe and legitimize processes and templates and to assign specific roles, rights, and responsibilities to the various agencies.

Both facilitative and dispositional power rooted in the circuit of social and systemic integration together become institutionalized[8] and are inscribed in "obligatory passage points". Clegg uses this concept – derived from actor-network theory – to draw attention to the "nodal points" (Callon, 1986; Latour, 2005) of organisational power, where structural and episodic power intersect. Obligatory passage points institutionalize the rhetorical and material "devices […] channelling and framing the 'conduct of conduct' (Dean, 2013) in specific situation[s]" (Clegg et al., 2018, p. 10) and thereby facilitate the emergence of relatively stable patterns of social relations and episodic processes. The concept of obligatory passage points is thus crucial for analysing interdependencies, intersections and dialectics at the micro-level, as well as episodic processes with the structural configuration of power at the organisational meso-level.

3. Platform Businesses and Gig Work from a Circuits of Power Perspective

Next, we turn to the illustrative case study of Uber, where the circuits of power approach is applied to gain insight into how the power relations of a platform business are constituted, and the effects of those relations on the labour conditions of gig workers. Uber has gained particular public and academic attention. The company is often used as an "iconic" example to illustrate the economic potential of platform businesses as well as the problematic aspects (e.g. De Stefano, 2015) of certain gig-economy business models for the affected gig workers. In our view, this makes Uber a suitable case for analysing the power relations in platform arrangements. Based on seminal contributions on Uber in its home country, we will especially point to intersections of episodic and structural power relations and illustrate both their facilitative and restrictive character. We propose the following "heuristic template" (see table 1) which will guide our analysis:

- First, we examine Uber's initial "socio-political setup" (standing conditions) in terms of actors, interests, scope of agency and the technologies of production and discipline. These provide grounds for the establishment of a distinct setup of power-related control and influence mechanisms inscribed in the platform's algorithmic management approach.
- Second, we analyse specific control and influence mechanisms at Uber, which we conceptualize as a distinct setup of obligatory passage points.

[8] Note: We use the term "institutionalization" in this sense of an existing and relatively stable organizational "status quo." We do not imply "taken-for-grantedness" in the sense of "institutionalization" in the tradition of Berger & Luckmann (1991). Instead, we stress that "negotiated orders" (Strauss, Schatzman, Ehrlich, Bucher, & Sabshin, 1963) within an organization, once established, tend towards persistence and inertia to a certain degree (notwithstanding that this "status quo" might of course become subject to modification as well as can still be questioned and challenged in various ways, i.e. by interest-driven stakeholder campaigning).

- Third, we illustrate how these institutionalised mechanisms "top-down" constitute processes and relations at the episodic level of day-to-day interaction. We also examine both their facilitative effects, in terms of business-model efficiency, and their restrictive effects in terms of labour conditions.
- Fourth, we link the circuits of power approach with the ideas of micro-political scholars to demonstrate how these control-and-influence mechanisms curtail gig workers' power, thus limiting their opportunities for voice, bargaining and resistance. We also demonstrate how these specific power-related processes in the "problematic case" of Uber thereby tend to reify and stabilize initial power asymmetries between providers and workers at a structural level.

Analytic Dimension/ Step of analysis	**Relevant sub-concepts derived from Circuits of Power**	**Guiding questions for the study of gig-work arrangements**
Standing/initial conditions for "socio-political setup" of focal platform (section 3.1)	Key actors and agencies, interest of key agencies, technologies of production and discipline	Which are the key agencies? What are the interests of key actors and agencies? (e.g. platform providers and gig workers). How do the interests of key agencies and actors differ? Which technologies of production and discipline are available to key agencies to set up platforms' software-based obligatory passage points? Which actors control the setup of software-based obligatory passage points, and to what extent?
Control and influence mechanisms institutionalized in platforms' software infrastructure (section 3.2)	Software-based obligatory passage points	Which control-and-influence mechanisms are utilized by key agencies (e.g. platform providers) to steer episodic processes of production and service provision?
Top-down perspective: *Effects on process management and business model efficiency* (section 3.3.)	Impact of mechanisms embedded in software-based obligatory passage points on episodic circuit of power, focusing on the facilitative facet or effects of power	How does the specific mechanisms used for software-based work and process organisation in focal case contribute to the business model efficiency of the platform?
Top-down perspective: *Labour-related outcomes*, effects on working conditions (section 3.3)	Impact of software-based obligatory passage points on episodic circuit of power, focusing on the restrictive, disciplinary and punitive facet or effects of power	How does the specific mechanisms used for software-based work and process organisation in focal case affect work quality and labour conditions?
Bottom-up perspective: *Micro-political Implications and outcomes for structural power relations* (section 3.4)	"Transformative" vs. "reproductive" outcomes of episodic processes that affect structural circuits of power	How does the specific approach of software-based work organisation in focal case affect structural power relations between key agencies (e.g. platform providers and gig workers) in continuous interaction (e.g. by reifying or altering existent power asymmetries)?

Table 1: Heuristic template to study platform power relations based on the Circuits of Power approach: Own compilation.

3.1 Uber's Socio-Political Setup

Investigating Uber based on this heuristic template, platform providers[9] and drivers[10] present the key agencies, each pursuing specific interests. The *interests* of platform providers and drivers only partially match (Calo & Rosenblat, 2017; Nachtwey & Staab, 2015).[11] A core interest of gig workers is finding decently paid work with a predictable and steady income, transparent pay rates, and opportunities for self-determined and flexible working hours. In contrast, Uber's key objective as a for-profit enterprise is focused on generating profits based on lean, semi-automated management and its app-based subcontracting approach (Srnicek, 2017; Scholz, 2017). For Uber, efficient operations crucially rely on managing the fluctuations in demand and supply (Kirchner & Schüßler, 2018) to pursue its economic objectives. Its software infrastructure, which allows for semi-automated process coordination, is the core technology utilized by the platform to pursue this objective. Hence, Uber – like other platforms – implements mechanisms of managerial control in its application, thereby "inscribing rules into the technology, so that only rule-conforming processes allow for successful user activities" (ibid., p. 14). In this kind of platform-based work organisation, software devices can be conceptualized as the core obligatory passage points*;* they are a technology-based "conduits through which traffic must necessarily pass" (Clegg, 1989, p. 206). The shape of power relations in platform business models is thus fundamentally influenced by the way power-related mechanisms are established in these software-based conduits.

In the case of Uber, the ability of various actors to control obligatory passage points differs markedly. While gig workers' influence is limited or lacking, Uber possesses far-reaching competences to design the platform's app-based infrastructure "from sketch" (e.g. Calo & Rosenblat, 2017; Davis, 2015). This power results from the legal setup, ownership structure and governance model of the company. Uber can also draw on vast *user-generated* and *process data,* such as GPS-based information about drivers' speeds, breaks, log-in and log-out-patterns, ride acceptance rates, reactions to pop-ups and internal messages, and rider evaluation systems. This privileged access to masses of data "create[s] an extensive reservoir for quasi-panoptic observations" (Kirchner & Schüßler, 2018, p. 10). In terms of circuits of power, this exclusive access to data, together with far-reaching competencies to design

[9] Research indicates distinct power-related processes and conflicts between different actors (or groups of actors) within the core of the platform, which is organized as a conventional Coasian enterprise (Davis, 2016) based on contracts. Research also indicates problematic labour conditions, echoing studies on problematic work among highly qualified workers such as software developers. These cases provide a fruitful field for critical scholarship. However, we do not focus on this aspect as the issues appear quite different. In addition, interaction between gig workers and Uber is almost entirely app-based (Nachtwey & Staab, 2015), thus making Uber appear as a "black box" to the workers. Hence a detailed analysis would not contribute to the purpose of this paper.

[10] We focus on power relations between platform providers and gig workers and the resulting labour conditions; hence, we mainly concentrate on these two stakeholders in our discussion.

[11] Similar to all capital-labour relations, some overlap occurs between consent and conflict (see e.g. Burawoy, 1979). However, the power-related processes we study here genuinely relate to structural conflicts between platform providers and gig workers. Thus we focus on the divergence in interests between platforms and gig workers in the remainder of our paper.

software infrastructure, provides a core technique for production and discipline that is fundamental to Uber's operations.

3.2 Control and Influence Mechanisms

Next, we examine various control-and-influence mechanisms implemented in software-based obligatory passage points. We illustrate how these mechanisms influence the behaviour of Uber drivers and control their work arrangements and processes. In our illustrative case discussion, we also refer to findings from research in work and organisational sociology, labour process theory, and behavioural economics. We thus further develop the circuits of power approach and the discussion about the role of obligatory passage points. Moreover, the approach has not yet been applied to the study of new organisational forms like platform businesses, and new work arrangements like gig work. In case of Uber, five important groups of mechanisms can be distinguished as described below.

First, the fundamental shape of value-creating processes at Uber can be described as a regime of "*algorithmic bureaucracy",* in which

> "Comparable to traditional bureaucracies, activities (…) resemble predefined 'performance programs' (March and Simon, 1958) or 'conditional programs' (see Luhmann, 2000) performing (.) simple bureaucratic if-A-then-do-B rules. Thus, very similar to regular formal organizations (Mintzberg, 1979), [platform] marketplaces standardize processes by bureaucratic routines to effectively cope with the vast uncertainty and the manifold alternatives of possible user activities." (Kirchner & Schüßler, 2018, p. 10).

While processes and performance programs are set this way by the design of the software, the rules of membership are set by platform providers in "click-through agreements". These are binding formal guidelines that define the fundamental shape of "account membership" (ibid.) resembling mechanisms of bureaucratic control known from labour process theory (e.g. Child, 1984) which – in contrast to "conventional", non-digitalised, organisations – are embedded almost entirely in software infrastructure in the case of platform businesses.

Second, Uber and other platforms implement *user evaluation systems* that allow customers (riders in this case) to rate gig workers' (drivers') performance. Yet drivers have almost no direct contact with members of Uber's management as the app-based approach to work and process organisation keeps management almost invisible to drivers the existence of such evaluation systems introduces an element of "direct control" and "output control" (Burawoy, 1979; Child, 1984; Edwards, 1981) to the gig-work process. By "outsourcing" managerial tasks in this manner, platforms empower customers "to act as middle managers over drivers, whose ratings directly impact their employment eligibility (Fuller & Smith, 1991; Stark & Levy, 2015)" (Rosenblat & Stark, 2016, p. 3772). The mechanisms used are quite similar to those described in debates on "control by customers" in the works of labour process scholars (e.g. Taylor, Mulvey, Hyman, & Bain, 2002).

Third, platforms such as Uber apply various forms of *"market manipulation"* (Kirchner & Schüßler, 2018) such as *dynamic pricing system*s. These systems are referred to as "surge-pricing" as they ensure service coverage in case of temporal and spatial mismatches between demand and supply (Nachtwey & Staab, 2015). In line with Taylorist logic regarding monetary incentives (e.g. Littler, 1978), drivers are informed by push-up notifications when the demand is high or is expected to be high soon, and payment rates during times of high demand are temporarily increased (e.g. Rosenblat & Stark, 2016; Shapiro, 2017). This kind of notifications are sent to drivers regardless of whether they are logged-in or offline.

Fourth, Uber's software setup designs *internal communication and leverages selective information* in a purposeful manner to influence the drivers' behaviour. These mechanisms are discussed as "info-normative control" in labour process perspectives on platform work (Gandini, 2018). Communication with drivers is almost entirely app-based and is unidirectionally "top-down". Uber intensively uses pop-ups, push notifications, and email alerts, which provide drivers with selective information focused on motivating them to act according to the platform's requirements. For example, they are urged to keep on driving when the demand is high (e.g. Rosenblat, 2018). In contrast, drivers' access to information and their ability to communicate with the platform providers is limited (ibid.). Uber purposefully uses this "arm's length relationship" and the existing information asymmetry to expose, hide and circulate certain information to induce the desired behaviour among drivers (i.e. Scheiber, 2017). For instance, Uber's app hides information about a passenger's destination before the driver accepts a certain ride, to ensure that unfavourable ride requests – such as rides that lead drivers into remote areas with sparse demands for further rides – are covered (ibid.). The top-down communication also includes rhetoric manoeuvres that seem to supplement and enhance surge-based incentives. An example reported by Rosenblat and Stark (2016) are push-notifications reading "Are you sure you want to go offline? Demand is very high in your area. Make more money, don't stop now!" (ibid., p. 3768). Reports quote a veteran Uber driver who stated: "It was all day long, every day – texts, emails, pop-ups: 'Hey, the morning rush has started. Get to this area, that's where demand is biggest'"' (Scheiber, 2017, p. 5). This indicates the extensive use of such invocations that can be conceptualized as "inspirational appeals" (i.e. Yukl & Tracey, 1992) from a micro-political perspective.

Fifth, research highlights forms of control used by Uber and similar platform businesses, which can be conceptualized as *nudges* from a behavioural economics perspective (e.g. Thaler & Sunstein, 2008; Kahneman & Egan, 2011). By embedding automatized nudges in software infrastructure, Uber creates "persuasive technologies" (Berdichevsky & Neuenschwander, 1999). These technological devices "persuasive in themselves" (ibid.) have proven to effectively influence users by triggering

cognitive biases and exert social influence in a non-coercive way (e.g. Fogg, 2002; Nye, 2014). In addition to the more obvious influence mechanisms such as dynamic pricing and selective information described above, studies have identified a range of such persuasive mechanisms that are more subtle and "hidden from view" in case of Uber (Calo & Rosenblat, 2017). For instance, drivers can set target incomes in the app. After target-setting, the app visualizes the driver's progress and continuously encourages him or her to reach the goal. In a similar vein, research points to various elements of *gamification* such as gratification badges (e.g for high ride-acceptance rates, good customer ratings, and availability at short notice) and other "non-cash-rewards" (Scheiber 2017). These practices are geared towards influencing behaviour by triggering user motivation through elements known from game design (Blohm & Leimeister, 2013).

Put together, the described mechanisms form a "diversified portfolio" of control and influence measures that are embedded in Uber's obligatory passage points. We subsequently analyse the effect of these mechanisms on business efficiency, labour conditions and power relations at Uber.

3.3 Labour- and Efficiency-related Outcomes

The circuits of power approach emphasizes both the facilitative and the restrictive or disciplinary effects of power in and around organisational settings. In this section, we show how the five groups of mechanisms discussed above both facilitate economic efficiency and affect drivers' labour conditions.

First, *algorithmic bureaucracy* can be seen as the cornerstone of Uber's approach to process coordination. This aspect structures the power relations between drivers, riders and platform providers by "facilitat[ing] the semi-automated management of large, disaggregated workforces" (Calo & Rosenblat, 2017, p. 256) and provides the basis for the platform's "disciplinary regimes" (Kirven, 2018). It enables platform providers to sanction users through exclusion from the platform in case of misbehaviour; it also enforces discipline in accordance with predefined rules and process patterns. This approach is coupled with Uber's business-model efficiency and provides the platform with flexibility to react to market contingencies. Uber can unilaterally alter the conditions and formal rules of membership according to its goals, which are mainly economic, while leaving gig workers with little opportunity for voice and resistance when conditions are changed in ways that do not favour them (e.g. Aloisi, 2015; De Stefano, 2015). For example, Uber decided to lower its fares in several incidents and the drivers' only opportunity to continue working was to agree to these changes during their next login (e.g. Scheiber, 2017). While favourable for the platform provider, such practices decrease the income predictability for workers.

Second, the *user evaluation systems* used by platforms to obtain cost-efficient, semi-automated process controls also entail both facilitative and disciplinary effects. In the case of Uber, riders can rate drivers based on a five-star metric after ride completion. For drivers, these ratings can have severe consequences: in essence, when their average rating drops below 4.7 for a certain period, drivers are excluded from the app.[12] Drivers thus rely heavily on favourable user evaluations. Coupled with job insecurity, this dependence is associated with psychological pressure, identity issues and other negative aspects discussed in studies on emotional labour (Gandini, 2018). This also highlights the problem of power asymmetry between the platform management and drivers. The rating criteria are centrally set, with no input from drivers. Thus, the ratings by riders can be highly subjective and at times may involve irrational, emotional, and biased judgements. In line with this, research indicates that gender- and race-based discrimination can occur (Rosenblat, Levy, Barocas & Hwang, 2017). These issues are highly problematic because software-based evaluation systems one-sidedly discriminate against drivers, who have limited opportunities to defend themselves in cases of unjustified poor ratings (ibid.).

Third, measures of *market manipulation* by dynamic pricing also one-sidedly favour the business-model efficiency of Uber and similar platforms (e.g. Nachtwey & Staab, 2015; Kirchner & Schüßler, 2018). However, while this "control lever" (Gurvich, Lariviere, & Moreno, 2016) superficially appears to provide opportunities for additional income for gig workers, research points to problematic side effects. For instance, Shapiro (2017) reports that surges during short-term spikes in demand, accompanied by push notifications sent to offline drivers – referred to as "bat signal" in the company lingo – often lead to numerous driver log-ins. Mike, one of Shapiro's interviewees, discussed the adverse consequences of this practice: "If you send out a bat signal, that's fifty people that are going to sign on (.) within a few minutes, and then the work just gets scattered" (ibid., p. 11). Dynamic pricing, an influence tactic used by Uber and other on-demand platforms to temporarily alter monetary incentives for gig workers, can thus have adverse effects. It can create a temporary oversupply, leading to a reduced prospect of being assigned to rides (Rosenblat & Stark, 2016). Due to its lack of reliability, transparency, and predictability for drivers, this kind of market manipulation has been criticized by journalists, drivers and researchers (e.g. Scheiber, 2017; Shapiro, 2017).

Fourth, the use of information asymmetry by *selective internal communication*, such as the policy of blind ride acceptance to ensure the coverage of less desirable rides, similarly ensures efficient platform operations. However, this policy hampers drivers' ability to make informed cost-benefit calculations when deciding whether to accept a ride request (e.g. Shapiro, 2017; Calo & Rosenblat, 2017). Thus, although working for Uber appears to provide a high degree of autonomy for drivers,

[12] For a detailed description of Uber's user evaluation mechanism, see for example Rosenblat, Levy, Barocas & Hwang, 2017.

enforced blind passenger acceptance combined with surge-pricing and centrally set rules illustrate "how little control Uber drivers have over critical aspects of their work and how much control Uber has over the labor of its users" (Rosenblat & Stark, 2016, p. 3672). Similarly, while the facilitative effect of *rhetorical manoeuvres* for Uber is straightforward, these practices also curtail the informed and rational entrepreneurial decision-making of drivers. Essentially this decreases their income security and predictability.

Finally, elements of *nudging and gamification* seem to be highly effective mechanisms in Uber's portfolio of control-and-influence mechanisms. In line with scholarship on ethical issues of gamification (Kim & Werbach, 2016), critics highlight that gamification that rewards "useless" or imaginary gratification (Schmidt, 2016) can serve a manipulative purpose. Some researchers have even dubbed software-based gamification in a business context as "exploitationware" because these practices "replace real incentives with fictional ones" (Bogost, 2011, 2013). In addition to the ethical issues of such practices, they negatively affect people's income predictability and working conditions. A recent article in *New York Times* discussed these aspects:

> "Uber […] is engaged in an extraordinary behind-the-scenes experiment in behavioral science to manipulate [drivers] in the service of its corporate growth […] using psychological inducements and other techniques […] to influence when, where and how long drivers work. [Methods include] video game techniques, graphics and noncash rewards of little value that can prod drivers into working longer and harder – and sometimes at hours and locations that are less lucrative for them" (Scheiber 2017, p. 1-2).

To sum up, the effects of the mechanisms explained above, which are embedded in the organisation's obligatory passage points affect the episodic level of organisational interaction. The influence derives from a mixture of bureaucratic, incentive-based, discursive and psychological elements. Top-down, these mechanisms thus appear as narrow efficiency-seeking political tactics of platform management to influence drivers' behaviour. Simultaneously, this "diversified portfolio" of control and influence mechanisms comes along with negative outcomes for gig workers' labour conditions.

3.4 Micro-Political Implications and Outcomes on Structural Power

After having provided insight on the facilitative and restrictive effects of Uber's software-based control mechanisms, we focus on the outcomes of these practices on power relations. In the course of continuous organisational interaction, "actors seek to maintain, gain or deny strategic advantage by controlling or contesting the meaning and control of these obligatory passage points" (Oliveira & Clegg, 2015) to influence the shape of structural power relations. In addition, "control [of] obligatory passage points, provides [agencies] … with the capacity to influence meaning and day-to-day interactions, and control work and resources" (Hutchinson, Vickers, Jackson & Wilkes, 2010, p. 35).

With a focus on this dialectic of structure and action, the concept of obligatory passage points thus helps to explain why organisational settings such as Uber are characterized by rather persistent power configurations, whereas other platform settings have less inert power relations. More dynamic arrangements are likely to occur where low-power actors possess considerable room for agency. In contrast, more persistent arrangements can be expected in settings where powerful players, such as platform managers, possess far-reaching competences to channel episodic processes in ways that reproduce or increase their own power resources, while curtailing low-power actors' resources and capacity to engage in micro-political activities.

From this perspective, the initial setup of structural circuits of power in the case of Uber seems to support the emergence and persistence of asymmetric power relations. This is based on the mechanism discussed above by reifying the providers' dominance while diminishing the workers' power. These effects can be disentangled from a micro-political perspective by focusing on the outcomes of episodic processes, in terms of gig workers' power resources, interests and social relations:

First, as a result of Ubers' algorithmic management approach, gig workers' *power resources* are limited in several ways. The company imposes strict process patterns by algorithmic bureaucracy and account membership, combined with a specific subcontracting approach that legally classifies gig workers as independent contractors. Besides beneficial consequences for platforms providers and a range of negative consequences for gig workers' labour conditions, these practices also impede gig workers' access to "hard power resources" and "robust tool-kits" (Williams & Geppert, 2011). Such missing resources include formal participation rights, guaranteed pay rates, and protective labour regulation which workers could use to safeguard their interests (i.e. De Stefano, 2015).

Moreover, this setup restricts gig workers' ability to engage in activities geared to the utilization of "soft" power, as described in micro-political studies (e.g. Crozier & Friedberg, 1979). Digital Taylorism and the "quasi-panoptic" (Kirchner & Schüßler, 2018) possibilities of the platform management to monitor gig workers together with direct control through customer evaluation systems curtails the ability of Uber drivers to productively use "zones of uncertainty" (Crozier & Friedberg, 1979) to enhance their power base. Traditional organisational arrangements provide low-power actors with a certain room to utilize zones of uncertainty for micro-political activities. This point was demonstrated in studies such as that of Strauss et al. in their work on the "negotiated order" in hospitals (Strauss, Schatzman, Ehrlich, Bucher, & Sabshin, M., 1963), Crozier's study on technicians in tobacco factories (1964), and Barley's study on technicians in hospitals (1986). In contrast, the possibility of Uber drivers to engage in micro-political activities remain rather limited, not least because of the

impersonalized management practices and the absence of top and middle managers to engage in negotiations.

Second, in line with behavioural economics and discursive approaches (see above), it is important to disentangle how some of the mechanisms outlined above affect gig *workers' decision-making*. On an individual level, mechanisms related to nudging, rhetorical invocations and gamification steer episodic processes in a way that is likely to produce outcomes that reproduce (or enhance) existing power asymmetries. They also hinder the emergence of resistance that could challenge the existing work arrangements, because drivers' informed decision-making is limited by these influence mechanisms (e.g. Scheiber, 2017). Related to this, Uber uses its access to information channels to legitimize its "self-employment model by framing engagement as autonomous, self-determined 'entrepreneurship'"' (ibid.). This "strategic sense-giving" (e.g. Rouleau & Balogun, 2011) seems to be aimed at impeding the emergence of counter-discourses. Through the lens of the circuits of power model, these manoeuvres can also be seen as an attempt by platform providers to influence actors' rational calculations and choices (Shapiro, 2017). They embed rhetorical and emotional influencing mechanisms in technology-based obligatory passage points that are geared toward inducing the desired behaviour from drivers. Thus, in light of insights from behavioural economics and the social sciences, the way Uber uses rhetorical invocations, gamification and nudges can be conceptualized as specific techniques of production and discipline in terms of the circuits of power approach.

Third, concerning *socio-technical relations*, mechanisms such as surge pricing notifications not only serve the company's interests for growth and handling fluctuations in demand and supply, but also increase competition among drivers (Schor, 2018). With respect to lateral relations between gig workers, these policies can hinder solidarity as Uber's management approach strongly controls the type and frequency of social interactions and human relations between drivers. Gig workers are thus seen as "atomized" workers (e.g. Aloisi, 2015) with few or no direct encounters in their daily activities. This lack of frequent physical co-presence is typical for many jobs in private transportation. However, Uber drivers have hardly any contact with co-drivers compared with – for example – ordinary taxi drivers, who usually know each other and chat by taxi radio while driving or waiting for customers. This lack of episodic encounters at the professional level impedes the emergence of collective action, solidarity and interest formation among Uber drivers.

The socio-technical setup is also important to understand the consequences of the absence of hierarchic interactions of drivers with management in the Uber case. In socio-political scholarship such interactions and personal encounters are seen as opportunities for "politicking and issue-selling" of low-power actors (Becker-Ritterspach, Blazejewski, Dörrenbächer & Geppert, 2016; Palonen, 2003). We illustrated that the opportunities for gig workers to get in touch with platform

providers are limited and are almost entirely software-based (e.g. Rosenblat, 2018). This can be seen as cost-efficient management practice. However, it also prevents face-to-face interaction, which might provide room for voicing criticisms and developing personal relations with management.

To sum up, the structure of obligatory passage points that is set up in the case of Uber seems to stabilize the platform's asymmetric power relations based on various mechanisms. This affects the drivers' power resources, decision-making processes and social relations. Gig workers have limited room for individual and collective political agency to resist working conditions or to develop effective forms of internal voice.

4. Summary and Contribution

Based on the framework of circuits of power, we developed a template to systematically examine the various elements and power-related effects of algorithmic management and highlight the facilitative and punitive effects of the existent power relations in the case of Uber (see figure 2 and table 2 in the appendix for a condensed overview). Through legal and information-based power resources, Uber management is able to implement a diversified portfolio of techniques of production and discipline, ranging from bureaucratic rules and economic incentives to various efforts at strategic communication and nudges in its persuasive software infrastructure. The implementation of these mechanisms of surveillance, discipline, control and incentives provides the conditions for coordinating value-creating processes at the episodic day-to-day level. By analysing aspects of power in daily interactions, we demonstrated that this setup of social and systemic integration is useful for steering processes efficiently. In addition, it serves to channel outcomes from repeated episodes of power in a way that reifies existing structural power configurations and power asymmetries, by limiting workers' resources for micro-political activity. Hence, our analysis illustrates how a circuits of power based perspective of gig work enables an analysis of how power relations are stabilized in specific gig-work settings.

We also conceptualized how initial power asymmetries allow platform providers to set up mechanisms of control and influence that safeguard managerial objectives such as the cost-efficient and "just-in-time" provision of services. At the same time, these control and influence mechanisms provide grounds for unfavourable working conditions in problematic cases of gig work. Thus, we provide a theoretical conceptualization of descriptive findings from current gig-economy scholarship, arguing that "rhetorical invocations of digital technology and algorithms are used to structure unequal corporate relationships [between platform providers and] labour", which "favor the former" Rosenblat & Stark, 2016, p. 3769).

In our analysis, we also develop the circuits of power approach approach further by drawing on concepts from labour process theory and behavioural economics. In doing so we specify how the concept of obligatory passage points can be refined for the study of digital work organisations. Until now, the meta-theoretical model of circuits of power has not been applied to power relations in platform arrangements. We conceptualize novel software-based mechanisms based on Clegg's original model to illustrate how the model can be applied to this emergent form of business organisation. We believe that this theoretical elaboration provides a fruitful starting point for future research on power relations and labour conditions in platform business models.

Moreover, our illustrative case study of Uber helps in understanding the role of subtle forms of influence exercised in certain platform settings as a consequence of specific non-contractual forms of employment within platform businesses. Conventional contractual models of employment in "Coasian organizations" (Davis, 2016) largely rely on formalized management, formal rules, authority, and hierarchies. These features are based on regular employment contracts and fixed periodic income to handle the "transformation problem" (Braverman, 1974). By contrast, platforms have limited scope to use these conventional mechanisms. Although their freelance subcontractor approach is beneficial for cost-saving and provides high flexibility for platform organizers, a major disadvantage from the managerial perspective is the absence of formally legitimized authority. The intense use of nudges, gamification and rhetorical invocations seemingly aims at handling this control deficit; the technological setup of platform businesses uses these new forms of control and influence as "compensatory" mechanisms. Thus, our findings contribute to recent debates discussing the potentials and boundaries of platform work (e.g. Kirchner & Schüßler, 2018) by highlighting the role of these compensatory mechanisms for the efficiency of platform-based organisation.

5. Avenues for Future Research

We believe that the heuristic template we introduced for the analysis of power relations in the gig economy can inform further development of platform scholarship as well as organisational power theory. It is especially relevant to the body of research on new organisational forms and work arrangements in the gig economy in the following ways:

First, the heuristic analytical template we propose can help to *systematize existing scholarship* and integrate the findings from different camps of research regarding organisational power. As outlined, power is addressed in various contributions to the field of gig-economy scholarship. However, existing research on this topic draws on heterogenous theoretical foundations, sometimes in a rather descriptive manner. Our template might be useful to guide and structure comprehensive reviews on

power in gig-work arrangements, by integrating the findings from these diverse studies in a systematic way based on the meta-theoretical framework of circuits of power.

Second, the proposed template can provide an analytic guideline for systematic comparisons of power relations in different types of platform businesses and gig-work settings. Thereby, future studies departing from a circuits of power approach might *contribute to ongoing debates different forms of gig work* (e.g. Davis, 2016) that stems from case-specific heterogeneities in both episodic and structural power. Our paper concentrated on the problematic case of Uber, with a focus on the intertwined mechanisms of episodic and structural power and how they relate to the emergence of problematic labour conditions "on the dark side" of the gig economy. We identified mechanisms of control and influence that have also been found in other platform arrangements (e.g. Ivanova, Bronowicka, Kocher & Degner, 2018). However, other contributions point to less problematic labour conditions in "high road companies" that prove "relatively stable, good-paying jobs" (Kalleberg & Dunn, 2016, p. 74). These differences seemingly relate to heterogeneous power-related features of platform settings at both the episodic and structural level.

For instance, variance in labour conditions in the gig economy has been associated with episodic, *agency-, task- and process-related aspects*. These include, for instance, the qualification levels of gig workers in different settings, specific job- and-task profiles as well as the labour market position of workers (Kalleberg & Dunn, 2016). Case-specific power configurations in other fields of platform-mediated work seemingly differ from those described in our case, because workers power position is more favourable, and they possess more room for micro-political agency. For example, Wood et al. (2018) analysed the ways in which *digital* gig work can be monitored and controlled by management. Compared to our findings on local gig work at Uber, the gig workers studied by Wood et al.'s possess more opportunities to bypass strict controls and surveillances due to characteristics inherent in the tasks and processes. For instance, key-logging and screenshot algorithms applied to monitor digital gig work in the studied setting can be outsmarted more easily than it would be possible at Uber. The nature of tasks in this contrasting case limits the ability of platform providers to engage in quasi-panoptic surveillance, thus providing larger zones of uncertainty to workers and limiting platform organizers' ability to narrowly streamline episodic processes. This ability of workers to partially circumvent software-based control and surveillance provides them more autonomy in their work processes. Similarly, qualified jobs such as programming provide more room for "service differentiation" compared with Uber work, sometimes resulting in higher earnings and less income insecurity as these case-specific features provide workers with more opportunities to build up and utilise their individual power resources at the episodic level, for example by gaining reputation and symbolic capital based on positive user evaluations (Wood et al., 2018).

Similarly, a comparison of different platform settings needs to consider the importance of different conditions at the structural level of power, for instance in terms of *organisational types and societal, regulative institutions*. Although problematic labour conditions seem to be widespread among various gig-work platforms with a strict for-profit orientation based on shareholder-value logics, "The eventual fate of this form of 'micro-entrepreneurship' is uncertain" (Davis, 2016, p. 138). This is because the "Platforms are highly malleable, and there is clearly room for non-corporate alternatives" (ibid.). This points to the role of heterogeneity in actor configurations and structural circuits of power that result from case-specific governance- and ownership-models as well as from different environmental influences related to heterogenous national business systems (Whitley, 1999) and institutional ecosystems (Meijerink & Keegan, forthcoming) in which platform businesses operate and alternative governance and ownership models might lead to socio-technical relations between key actors that differ significantly from those we studied. For instance, cooperative or non-profit platforms presumably are characterised by different initial power relations and interest configurations; this presumably leads to the establishment of different facilitative mechanisms in structural circuits of power. Similarly, varying institutional environments and regulations can enable or restrict the ways in which certain "techniques of production and discipline" can be utilized in the setup of technology-based obligatory passage points, as well as the room for actors to enforce or contest these case-specific structural setups.

Put together, the circuits of power-based perspective we propose allows to capture power- and work- related phenomena at both the micro- and macro-level which are relevant to understand broad heterogeneity of platform-based settings in general and particularly with regard to the labour conditions they offer.

Third, beyond the potential to inform such systematic "cross-sectional" studies of heterogenous platform work arrangements, a circuits of power-based approach provides a toolkit for studying the *processes, formation, and transformation* of power relations in certain gig-work arrangements from a dynamic, "longitudinal" perspective. Our illustrative analysis draws on a case that is characterized by rather stable, asymmetric power relations. However, the circuits of power-lens also allows to study the patterns of organisational change in organisational power relations by conceptualizing the dialectics between episodic processes, organizational structures and environmental contingencies. For instance, by studying repeated episodes of power with regard to their structural outcomes future research could shed more light on cases where successful resistance has led to improved labour conditions in gig-work arrangements, or - vice versa - how changing structural conditions alter subsequent episodic processes. For example, 3F – a Danish trade union – recently signed the first far-reaching collective agreement in gig work worldwide with Hilfr.dk, a platform for private home-

cleaning providing minimum hourly wages, contributions to pension savings, and holiday and sick pay to workers (hilfr.dk, lo.dk). A longitudinal, in-depth investigation based on circuits of power could analyse how this "critical event" has altered the internal power configuration in this case by capturing how the shift in socio-technical-relations and power resources presumably induced by the agreements alters power relations between management and the institutionalization of algorithmic management in the respective organisational settings in the long run. The study of such cases could also help to conceptualize how exogenous environmental contingencies (e.g. changes in labour regulation) interact with structural circuits of power and translate to changing episodic power relations leading to shifts in platform power configurations. Further applications of a circuits of power-based perspective on platform work might therefore ultimately provide more detailed insight into the processes and pathways of organisational change in gig-work arrangements that result from ongoing dialectics of episodic and structural power.

Overall, we think that future comparative and/or longitudinal studies based on circuits of power can provide a more systematic and clear-cut picture on the link of power configurations and labour conditions in the platform economy. In our view, some of the core questions to depart from in course of such investigations are:

> 1) how and why certain control mechanisms and obligatory passage points are set up in a specific way in different platform settings due to differing micro-, meso-, and macro-level conditions,
>
> 2) how these varying practices of algorithmic management influence power relations between management and gig workers in different platform arrangements, and
>
> 3) how and when different regulative, socio-economic and normative institutional influences might facilitate power structures more supportive to gig workers' voice and micro-political activities.

From an industrial relations perspective, studying these questions could also contribute to the question of how problematic conditions in some contemporary digital business models might be overcome by providing elaborated blueprints of successful worker emancipation, which could be triggered both "bottom-up" by workforce resistance and "top-down" by better regulation. This seems particularly important as "Uberization render[ing] the corporate employment relation increasingly dispensable" (Davis, 2016, p. 512) has gained momentum, oftentimes making "(t)hings worse, at least from the perspective of labor" (ibid., p. 511) and therefore posing urgent questions not only to academics but also policy makers and practitioners of labour representation.

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Appendix

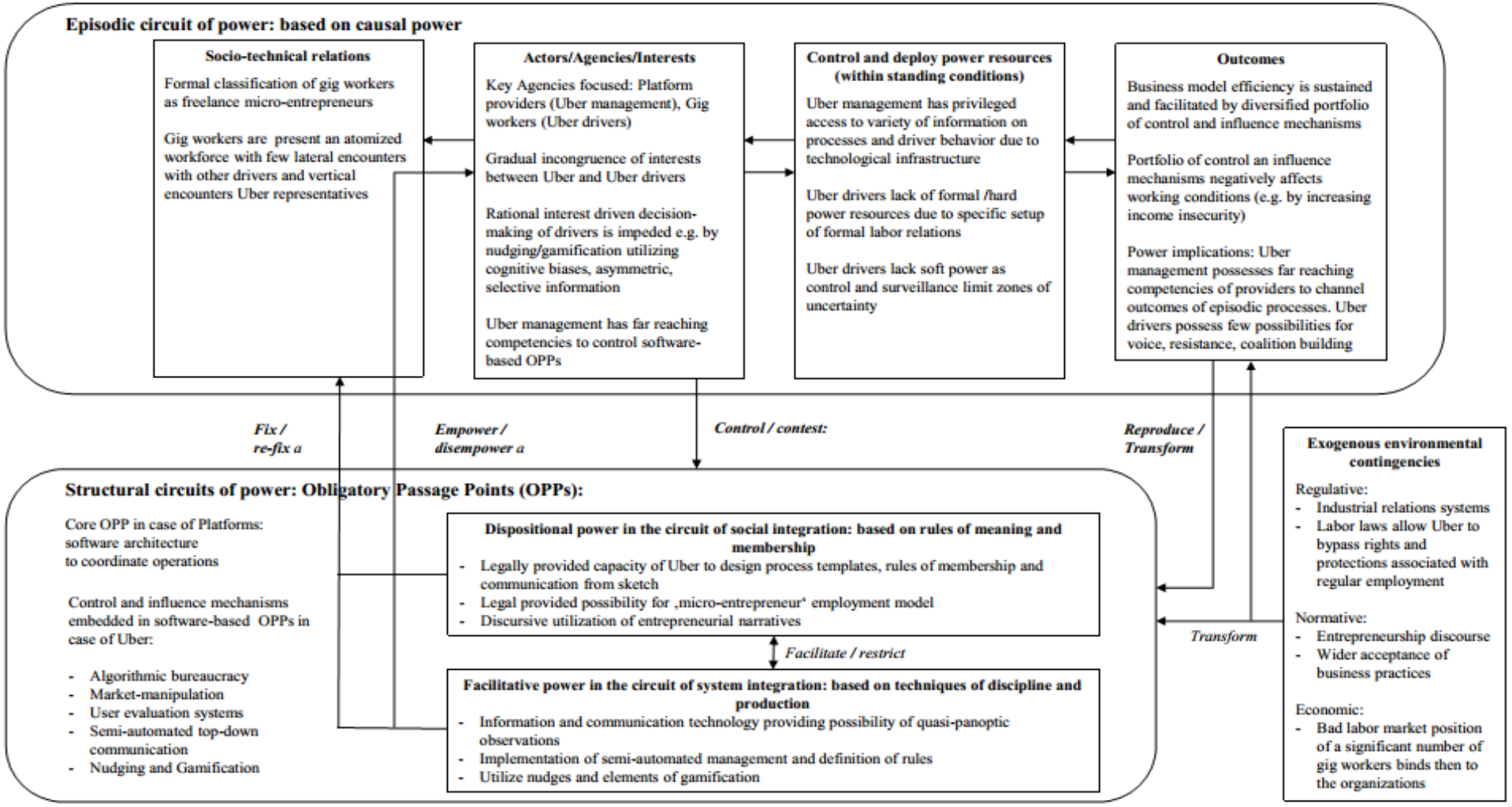

Fig 2.: Findings derived from application of Circuits of Power to the case of Uber. Source: Own compilation

Analytic Dimension **Step of analysis** ***Relevant sub-concept(s) derived from Circuits of Power***	**Guiding questions for the study of gig-work arrangements**	**Findings from the illustrative analysis** ***The case of Uber***
Standing or initial conditions for setup of focal platform *Key actors and agencies,* *Interest,* *Technologies of production and discipline*	Which are the key agencies focused? What are the interests of agencies? How do the interests of key agencies differ? Which technologies of production and discipline are available to key agencies to be embedded in obligatory passage points? Which actors possess the capacity to influence the setup of obligatory passage points?	Gradual Interest incongruence between Uber management and gig workers can be identified. Formal conditions include a for-profit ownership structure and the regulatory environment includes the possibility to implement a specific workforce management approach. These aspects provide far-reaching competencies to Uber management so that it can design its software-based control infrastructure 'from scratch'. This ability allows platform providers to establish and refine a diversified portfolio of algorithmic surveillance, control and discipline, using purposeful integration of various mechanisms in organizational obligatory passage points.
Control and influence mechanisms are institutionalized in platform's software infrastructure *Software-based obligatory passage points*	Which control and influence mechanisms are utilized by key agencies, such as platform providers? These mechanisms steer the episodic processes of production and service provision or organized value-creation.	Five groups of mechanisms embedded in the platform's software infrastructure create a diversified portfolio that is used by Uber to steer processes: - Formal mechanisms include algorithmic bureaucracy and digital Taylorism (e.g. prescribed process templates and formal rules implemented by click-wrap account membership) - Some mechanisms induce elements of direct control by customers (e.g. user evaluation systems) - Incentive-based mechanisms are related to providers' efforts to match demand and supply (e.g. dynamic/surge pricing) - Informal mechanisms are related to platform provider's internal communication, rhetorical manoeuvres and the use of information asymmetry (e.g. push notifications, blind-ride acceptance and inspirational appeals) - Informal mechanisms are related to subtle influencing tactics, based on insight from behavioural economics (e.g. nudging, persuasive app design, gamification by badges and achievements)
Top-down perspective: Effects on process management and business model efficiency *Impact of software-based obligatory passage points on episodic circuit of power. The focus is on the facilitative facet or effects of power*	How do the specific mechanisms of software-based control and work organisation in focal case contribute to the business model efficiency of focal platform?	The mechanisms described contribute to cost-efficient, semi-automated and lean organisation of value-creating activities in several ways: - Algorithmic bureaucracy provides platform organizers with a high degree of flexibility to react to market contingencies and refine labour utilization. The semi-automated fixation of processes and rules can replace more costly forms of control. - User evaluation systems allow for cost-reduction/cost-efficient output control by 'outsourcing' direct supervision to customers. - Surge pricing and patterns of internal top-down communication serves to handle temporal mismatches in demand and supply. - Rhetoric maneuvers and inspirational appeals serves to reduce personnel cost by substituting wage payments with non-cash rewards
Top-down perspective: *Labour-related outcomes*, effects on working conditions *Impact of software-based obligatory passage points on episodic circuit of power. The focus is on the restrictive, disciplinary and punitive facet or effects of power*	How do the specific mechanisms of software-based control and work organisation in focal case affect work quality and labour conditions?	The mechanisms described affect work quality and labour conditions in several ways: - Platform provider's access to process- and user-generated data means that gig workers are subjected to quasi-panoptic surveillance. - Due to algorithmic bureaucracy (e.g. software-based process templates and click-wrap membership agreements), gig workers have little option to negotiate when formal employment conditions are altered in ways that do not favour them. - Algorithmic management creates patterns of coordination that offer few possibilities for direct encounters or opportunities for interest articulation and micro-political activities. - Dynamic pricing can adversely affect drivers' income, due to temporal oversupply and less income predictability. - Software-based rhetorical influence and selective information increase the odds of drivers having to make a decision without enough information, which can lead to accepting unfavourable orders. - Income targeting can lead drivers to work long hours, even in situations where income opportunities are low. - Gamification can influence drivers at a subconscious level, for example to accept low payment rates.
Bottom-up perspective: *Micro-political Implications and outcomes for structural power relations*	How do the specific mechanisms of software-based work organisation in focal case affect structural power relations between key agencies (e.g. platform providers and gig workers) in continuous interaction (e.g. by reifying or altering existing power asymmetries)?	At Uber, the socio-technical relations and the agency's decision-making processes affect the power resources. The specific setup of mechanisms ensures and maintains exclusive control by the platform provider over obligatory passage points, thus reifying the platform's dominance. Platform providers possess far-reaching competencies to channel episodic processes in a way that reproduces or increases their own power. The specific style of software-based work organisation limits gig workers' resources to engage in micro-political activity. The workers encounter zones of uncertainty and platform efforts that impede the emergence of counter discourses, which limits lateral and hierarchic interaction. As a result, existing power asymmetries in Uber tend to become sustained. The possibility for endogenous change (i.e. change in organisational power configurations) induced by gig workers' micro-political activities and geared towards direct voice, resistance, and negotiations, remains limited.

Table 2: Overview of findings in illustrative Uber case study, structured using our circuits-of-power-based heuristic template for studying power relations in platform arrangements. Own compilation.