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RESEARCH PAPER

Algorithmic Management in the Food-Delivery Sector – a Contested Terrain?

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ABSTRACT

Forms of algorithmic management (AM) play an essential role in organizing food-delivery work by deploying artificial intelligence-based systems to coordinate driver routes. Given the risks of precarity and threats posed by AM, which are typically related to (migrant) platform work, the question arises to what extent structures of co-determination can positively shape this type of work and the technologies involved. Based on an in-depth case study within a large food-delivery company, this article is guided by two questions: (1) How do companies use algorithm-based management and performance control, and how do the couriers perceive them? (2) What priorities, strategies, resources, and achievements do works councils and trade unions have with regard to co-determination practices? Our analyses indicate that algorithmic management poses problems of non-transparency and information asymmetry, which in turn call for new forms of and procedures for co-determination. Our study does not find evidence that AM practices aim to individually profile and discipline couriers. The main challenges for the works council and trade unions arise from the couriers' generally precarious working and employment conditions; data- and AM-related issues do not represent the central area of

conflict. However, our study identifies new demands regarding the co-determination of AM and underlines the importance of institutional regulation at the legal and sectoral level.

1 Introduction

The term algorithmic management (AM) refers to the use of algorithm-based systems and tools to manage an organization's work force, labor processes, and work performance (see Meijerink & Bondarouk, 2023; Wood, 2021). Often, AM is based on artificial intelligence (AI) systems that automate decision-making and technology-based control (Kellogg et al., 2020), and it plays an essential role in organizing food-delivery work. Taking into account customer demand as well as restaurant and driver availabilities, AM calculates the sequence of deliveries and assigns them to couriers via an app on their mobile phones that optimizes their routes. This process entails constant tracking of the couriers along their routes. One stream of the scientific literature and public debate on platform work emphasizes the performance-control function of algorithm-based management systems, often citing the food-delivery sector as a typical example (Veen et al., 2020; Woodcock, 2020). From this perspective, workers are not only exposed to precarious working conditions but also to algorithm-based forms of monitoring and control.

Given the risks of precarity and threats that AM systems typically pose in the context of platform work, the question arises as to what extent structures of co-determination are able to mitigate the negative effects on work. Based on an in-depth case study in a large German food-delivery company, this article is guided by two questions: (1) How does the company use algorithm-based management and performance control, and how do the couriers perceive them? (2) What priorities, strategies, resources, and achievements do works councils and trade unions have with regard to co-determination practices?

To address the first question, we refer to the recent sociological debate on AM, which emphasizes new risks of monitoring and disciplining workers and interprets these as a new means of control (Kellogg et al., 2020). In this article, we first assess to what extent our case study in the German food-delivery sector substantiates this hypothesis in the sense that algorithms are used for individual profiling and disciplining of couriers. Regarding the second question, we refer to power resource theory. This approach provides a theoretical framework for understanding worker representation by addressing differences in power resources. Our study aims to identify and explain practices of co-determination and demands for regulation by referring to given power–resources constellations in the food-delivery sector. The article closes by discussing emerging demands related to the regulation and co-determination of AM in the food-delivery sector.

2 Literature Review, Research Questions, and Theoretical Framework

Digital platform companies are a typical field of employment for migrant workers, especially in the area of food delivery. Such platforms are known for precarious working conditions in that they are characterized by low-skilled tasks, high turnover, temporary contracts, low pay, and (unreliably) flexible working hours. For similar reasons, however, they attract migrant workers (often refugees) as their low formal requirements, low language barriers, and short recruitment procedures make them easily accessible (van Doorn et al., 2022).

Many articles deal with platform work in terms of precarious and migrant work, whereas others have focused primarily on the functioning and impact of AM in firm-level case studies. In addition to (location-based forms of) platform work, such as food delivery or other driving services (see the overview by Lücking, 2019), prominent fields of AM-related research include logistics (Butollo et al., 2018; Staab & Geschke, 2019), manufacturing (Evers et al., 2019), and HR work (Spielkamp & Gießler, 2020). In the German food-delivery sector, as in other forms of location-based platform work, the smart phone is the focal point of AM. It not only ensures platform workers' mobility, but also enables extensive collection of data – in particular positional data via GPS – that can be evaluated. Within AM, this data collection occurs in the form of "app-based management" (Ivanova et al., 2018) and raises issues of performance control and surveillance.

Control issues are a major subject in labor sociology within which they have a long-standing history. The theoretical and empirical origins of control issues lie in the so-called Labour Process Debate, which was initiated by Harry Braverman's (1999/1974) work in *Labour and Monopoly Capital*, where he examined the control mechanisms of Tayloristic production. To this day, other authors have continued to study characteristic forms of control and their development within different regimes of capitalistic production (classically, Burawoy, 1985, 2010/1979; Edwards, 1981; Friedman, 1977; in summary, Smith, 2015). "Direct" forms of control "through detailed instruction, evaluation and sanctioning of workers" (Marrs, 2010, p. 335) that were initially dominant in the Fordist era, were distinguished from "indirect" strategies to enhance work performance. Prominent examples are "responsible autonomy" (Friedman, 1977, 1987) or "bureaucratic control" (Edwards, 1981) working via indirect incentives, for example through "job security, opportunities for advancement and scope for autonomy" (Marrs, 2010, p. 336; cf. Hildebrandt & Seltz, 1989). A third mode of control, which became increasingly prevalent around the mid-1990s, is "market-centered control": Here, the company's market pressure and the management's entrepreneurial responsibility is passed on to the employees (Marrs, 2010, p. 342ff; Menz & Nies, 2019).

In the context of control and digitalization, Nies (2021) emphasizes that companies' strategies to realize valorization of capital vary. Whereas digitalization provides new tools for enhanced control, companies are not necessarily focused on maximizing individual work performance through close-meshed control systems, as the idea of a reinvigorated, digital Taylorism would suggest. Nies provides a typology of four different management strategies at the company level that relate to characteristic types of control: *workforce-related strategies* in which technology indeed is used to maximize individual work performance through sophisticated digital control systems; *process rationalization strategies or systemic rationalization strategies* that focus on the rationalization of work process and work organization by "making internal functional processes more effective"; *market and business strategies* in which companies use digital technologies to strengthen their positioning and influence on markets; and *innovation- or discourse-driven digitalization*, which is characterized by a genuine lack of precise strategy and follows a "search for problems through technically available solutions" (Nies, 2021, pp. 489–491).

With the rise of digital technology and algorithms, new business models and control options are emerging. Formerly integrated organizational structures have been partially replaced by loose organizational ties, predominantly in the field of digital platforms (Nachtwey & Staab, 2020). Various studies on ride-hailing and food-delivery platforms have therefore shaped the discourse in recent years. Regarding issues of control, some authors emphasize the continuing dominance of market-based logics of control (Menz et al., 2019), whereas others, following Edwards' theory of direct control via instruction, evaluation, and sanctioning, have postulated a new quality and type of algorithmic control based on automated, digitalized forms of direct, close-meshed management control (Kellogg et al., 2020). The question in which ways AM relates to different types or new forms of control and the extent to which it is unfolding a new "contested terrain" between management and workers (Edwards, 1981; Kellogg et al., 2020) are topics that are still discussed in the scientific debate.

The study by Ivanova et al. (2018) on the management of food-delivery-platform work via smart phone applications provided evidence that tracking movement generates an enormous amount of data, which in turn enables comprehensive control of work processes. Automatically evaluating these data serves to optimize the processes and to monitor the work performance of the "riders," as couriers are called internally. The assignment of work orders is based on data evaluation. The fact that automated decision-making occurs through algorithms often creates the impression of technical rationality and objectivity. The app can also be used to generate additional incentives for motivation and performance improvement through push messages. By offering minor choices, the app can foster the impression of autonomy and set incentives to increase individual productivity gains ("digital nudging"; Lücking, 2019).

Data on work performance are sometimes used to initiate competition among workers, but they are also used for hierarchical purposes by dividing couriers into different groups. For example, lucrative shifts or orders are only displayed to "best performers." A central element of algorithmic control by the app is information asymmetry. The couriers remain unaware of the exact extent and purpose of the service. They know neither how the summary metrics used to monitor their performance are calculated, nor how the metrics enter into decisions regarding the shifts or orders offered to them (Schreyer & Schrape, 2018).

Although the food-delivery sector is often regarded as an example of strong algorithm-based control and standardization of low-skilled work, case studies in the manufacturing and logistics sectors present a more ambiguous picture. On the one hand, algorithm-based work governance at industrial workplaces is also criticized for its potential to gather data on worker productivity and hence closely monitor activities (Falkenberg, 2018; Schaupp, 2021). In particular, in assembly work and logistics, algorithm-based assistance systems are applied to guide workers through the assembly process or in the selection of parts. On the other hand, studies demonstrate that these systems can, indeed, be deployed with very different concepts of work. Algorithm-based assistance systems can provide flexible, situational information to employees, or they can be used to improve the transparency of work processes, optimize individual work performance and work organization, and increase the quality of tasks and enhance skills (Klippert, 2020).

The literature on AM in the industry sector highlights the fact that structures of co-determination can be a crucial factor in this ambiguous field. Several studies show the importance of co-determination with regard to both the introduction of new (digital) technology and issues of performance regulation to recognize aspects of the human-oriented design of assistance systems (Albrecht & Görlitz, 2021; Evers et al., 2019; Krzywdzinski et al., 2023). One notable result is the relatively high acceptance of digital assistance systems, even within highly standardized industrial processes. In Germany, which has a strong tradition of co-determination in the industrial sector, there are notably few conflicts; this is also due to the strong role of works councils in securing data protection criteria and preventing performance monitoring and behavioral control. Moreover, there is evidence that workers' acceptance of algorithm-based assistance systems (such as smart wearables) relates to issues of transparency and co-determination. Employees tend to accept such systems if they retain control over the data and data usage and if doing so has a clear benefit for their work, especially in terms of reducing workload (Evers et al., 2019).

In Germany, where our study was conducted, we find an overall lack of formalized regulations that explicitly focus on AM issues on the one hand. On the other hand, a relatively large number of established legal regulations, sectoral and company agreements, and union and works council activities are already indirectly governing the field of AI and AM application. They address issues of

data protection, platform work, co-determination, or discrimination. However, in many respects, existing national regulations do not cover specific issues that arise in the context of AM (see Arbeitsgruppe "Algorithmisches Management", 2023; Krzywdzinski et al., 2023; Molina et al., 2023). Moreover, structures and mechanisms of co-determination are less pronounced in the food-delivery sector, where work and employment are often organized via platforms, bargaining coverage is low, and works councils tend to be the exception, rather than the rule. The business models and management strategies in this sector are strongly based on cheap labor, precarious employment conditions, and market-based incentive systems. At the same time, the decentralized character of work and high degree of labor turnover challenges both management demands and co-determination practices. Because platform workers are separated in terms of space and time (due to varying shift times), organizing them presents particular difficulties. In addition, platform companies attempt to prevent contact and communication among workers, and they fight the establishment of works councils (Kluge, 2022). Nevertheless, growing organization among platform workers is increasingly causing problems for the management in the German delivery-service sector. Alongside existing practices of individual resistance by workers and grass-roots movements (Cini, 2023), we see a growing number of attempts to establish institutionalized collective interest representations. The couriers at Lieferando (Germany's leading delivery service) represent a prominent example, as they founded a works council in 2018 – the first of its kind in this sector (Cabanis, 2021). Currently, several works councils exist, many of which cooperate with the trade union. In this way, they combine new and established forms of resistance, organizing, and negotiation in labor conflict and interest representation. However, to the best of our knowledge, the role and importance of AM-related issues in workers' interest representation has not received much attention in previous research.

The sectoral characteristics outlined above establish particular control demands for management due to the decentralized character of work and high labor turnover. Moreover, the mainstream debate on AM postulates opportunities for a new quality and level of control based on algorithms. Given these conditions, we might expect significant attempts by management to use AM for control purposes. However, the ways in which and the extent to which different forms of control are applied – ranging from (indirect) market-based control over the rationalization of work processes to (direct) performance control – remains an empirical question that depends on given management strategies, the organizational context, institutional regulation, and individual and collective interest representation and power relations. Our study will reconstruct these contextual characteristics by studying the case of a large German food-delivery company. We pay particular attention to the role of workers' interest representation in the German regulatory context.

Power resource theory provides a fruitful approach to understanding co-determination practices as they relate to available power resources. As a concept, it

was first spelled out by Erik Olin Wright (2000) and Beverly Silver (2003; cf. Schmalz et al., 2018, p. 114) and further developed by various authors, building on the "basic premise that the workforce can successfully defend its interests by collective mobilisation of power resources in the structurally asymmetric and antagonistic relationship between capital and labour" (Schmalz et al., 2018, p. 115). Modern approaches speak of (at least) four types of power resources. Schmalz and Dörre (2014) summarize these as: *structural power*, referring to the position of workers within the economic system (Wright, 2000, p. 962; Silver, 2005, p. 30ff) and consisting of marketplace bargaining and production power; *associational power*, measured by the collective representation of workers' interests (e.g., through works councils, trade unions, and workers' parties); *institutional power*, defined by agreements between capital and labor, which are usually the result of the enforcement of structural and organizational power, that can establish far-reaching rights, but may also restrict the political autonomy of trade unions; and *societal power*, which results from successful cooperation with other social actors and organizations, as well as support from broader sections of society and the general public sphere, thus benefiting from external organizational resources and support in public discourses (Schmalz & Dörre, 2014, pp. 222–233). This theoretical approach has been used for various studies in the field of platform work and delivery services (e.g., Goods et al., 2023; Pastuh & Geppert, 2020; Però & Downey, 2022; Vandaele, 2021), but to the best of our knowledge, it has not yet been employed to understand worker representation strategies related to AM usage in this sector.

3 Evidence from the Case Study

The following results are based on an in-depth, firm-level case study conducted in 2022–2023 in a large food-delivery company in Germany. Work force characteristics include precarious employment conditions, low-skilled work, high labor turnover, and a large share of migrant workers. The engagement of trade unions and co-determination are still young and contested in the food-delivery service sector. In contrast to many other companies and areas of the platform economy, the company we examined issues fixed-term and permanent contracts to their couriers. After long periods of labor disputes, this company introduced structures of co-determination. This specific organizational setting gives us the opportunity to study the role of co-determination in the food-delivery sector, which the academic literature has not previously covered.

The empirical data underlying this paper were collected within a large qualitative research project examining the use of AM systems in various countries and sectors. The case study presented here focused on a large food-delivery

company in a metropolitan area. In total, 14 expert interviews, lasting between 30 and 120 minutes, were conducted with 11 unique interviewees.

Table 1: Overview of Interview Partners

Group	Individual Position	Number of Interviews
Management of Public Relations	Corporate Communications Manager	1
	Manager of Public Affairs and Government Relations; Corporate Communications Manager	2
Riders and Work Council members	Chairman of the Works Council	3
	Rider and Works Council member #1 (pro–trade union cooperation)	2
	Rider and Works Council member #2 (critical of union cooperation)	1
	Rider	2
Human Resources Management	Recruiter	1
Trade union	Trade union secretary	1
External professionals	PhD researcher	1

To gain a differentiated view on the introduction and impact of AM and its relevance with the company, we interviewed various groups of actors. The interviews differed slightly in their focus and course, depending on the group of actors. Our semi-structured interview approach focused on three core topics: (1) the objectives, functionalities, and areas of application, as well as the introduction process; (2) the effects of AM with regard to work processes; and (3) the structures and strategies of workplace representation and the relationships between employees, works council, trade unions, and management regarding AM and other prevalent issues.

The data were evaluated by means of qualitative content analysis (Kuckartz, 2018, p. 92ff; Schreier, 2014, p. 170ff). We developed a deductively structured code system with detailed reference to the three core topics and transferred this to the MAXQDA analysis software. The interview material was then analyzed on this basis, and further codes were added inductively.

3.1 Management Objectives and Workers' Experiences Regarding the Use of AM

Management Objectives

In the company observed in this study, algorithm-based management takes place via an app that couriers must install on their cell phones. It assigns jobs to couriers, navigates them to the destination, and transmits information about pickup and arrival times to customers. Thus, the company continually tracks couriers' location, speed, response time, delivery time, and route.

How does this relate to different types of control – from (direct) individual performance control over process optimization to (indirect) market-centered control – that have been identified in the previous section? It is evident that couriers are instructed and directed and that their performance (e.g., start of work, speed, distance, and number of orders) is recorded. The number of orders also feeds into a bonus system, which rewards couriers when they achieve certain numbers of orders per month. But we found neither evidence of direct disciplining if couriers are slow, nor of nudging or gamification elements related to market-centered forms of (indirect) control. The control potential that is technically possible is clearly not exerted here. We did not observe automated forms of performance control that would push couriers to deliver faster or punish them for late arrivals. The app does highlight arrival time in red, thus indicating when couriers get behind schedule, but it does not execute any automated forms of sanctions. The primary delivery-process related variable for the company's productivity is the efficient coordination of tasks, not individual work performance, which points to process-oriented types of rationalization and control.

According to the company officials and couriers we interviewed – and in contrast to the idea of algorithmic control (Kellogg et al., 2020) – management does not use information on individual work performance (e.g., distances, and number and times of deliveries) to discipline couriers or to achieve performance gains, at least not in an automated way. Our study finds evidence that the company uses AM, above all, for functional reasons, specifically to optimize the sequence and allocation of orders. This orientation fulfills the function of maximizing efficiency by processing data quickly, keeping routes short, and enlarging the geographical scope of deliveries. The information also feeds into the pay and bonus system and establishes incentives for the workers to complete many orders, but it does not directly evaluate individual work performance or discipline based on it. This is also evidenced by the fact that couriers are not obliged to finish more than two deliveries per hour, and that the company has introduced a kilometer limit for orders.

The possibility of systematic abuse and hidden performance tracking cannot be ruled out, however. The works council suspects that performance measures are used in staff appraisals (so-called feedback talks) and to identify couriers who do not conform to the minimum performance target. Both the black-box character of the system and the management's lack of willingness to provide full insight and transparency limit the opportunities for co-determination and cause feelings of mistrust and uncertainty on the side of couriers and the works council.

Experience and Evaluation of AM Practices by Couriers

Tracking and performance recording are widely accepted by the couriers we interviewed, who consider it to be "part of the job." We also find evidence that some couriers even prefer working via the app to being constantly monitored by a human superior. In other words, some experience the app as a partial liberation from direct, personal management control. Interaction with private apps or tracking of private information are more likely to be discussed as hazards. Hence, there is often the desire for a company cell phone. At the same time, the works council and some riders who take a critical stance have strong concerns regarding data protection issues. They emphasize the risk that the company might collect and process information that is not needed merely for the execution of the work process. Issues of algorithmic control and data acquisition are seen as a crucial point for negotiations between the works council and the management. Interestingly, the works council applies a kind of double strategy here. On the one hand, it strives for more transparency and co-determination regarding the development and functioning of the app. On the other, they can use their information and approval rights (granted by the German Works Council Constitution Act) to enforce non-AM related claims. In this respect, blocking and delaying software adaptations by not consenting to its implementation represents a strong means to pressure companies that employ digital business models.

Surprisingly, the app's basic flaws are a major topic among couriers. They see bad navigation and poorly calculated arrival times as an obstacle to good work performance. Moreover, they also saw the app's lack of transparency as a major shortcoming. Couriers are unsure what information is tracked and who might possibly see it and use it for performance assessments. As stated above, our research does not provide evidence of such malpractice at the company surveyed. Still, couriers are unsettled by a lack of certainty regarding whether or not this is done and thus results in indirect disciplining. As one rider comments:

> So, there's this fear that it'll kind of backfire on me. That there is something like a digital profile of me. And if I somehow make mistakes or become rebellious, then I only get very unattractive orders, so to speak. I already had the feeling that a few colleagues were very reluctant when it came to criticism or confrontation. (Courier)

Feelings of insecurity are particularly present among vulnerable groups like migrant workers, who represent a large proportion of the workforce.

In line with existing literature that emphasizes information asymmetries due to the black-box character of algorithmic systems, it is difficult for the works council to understand and evaluate the functions of the app with regard to their effects on couriers. The works council criticizes the management for only reluctantly providing insights into these matters. As a consequence, the works council and individual couriers have developed reverse-engineering strategies to understand how the app functions (e.g., using their own Python programming skills and documentation to assess the app's algorithm).

3.2 Trade Unions' and Works Council's Resources, Strategies, and Achievements

In terms of its labor policy background, the company is characterized by a very active, dedicated general works council that uses all institutional resources provided by the GDPR, labor law, and the Works Constitution Act to improve the couriers' working conditions. This includes appealing to the labor court and arbitration commission or using the option provided by the Works Council Modernization Act to call in an external IT expert. The relationship between the management and the works council is conflictual. Management makes few attempts, outside their legal obligations and requirements, to actively inform or integrate the works council in management processes. On the contrary, we find many examples of the management attempting to stop or delay initiatives or offers to negotiate labor policies. As a consequence, the works council's institutional power, which is provided by the available legal options, remains limited. There is no bargaining agreement either at the company or sector level to which the works council could refer. In addition to this institutional power, the works council, the union, and the couriers' (grassroots) movement have been quite successful in organizing protests and strikes among the couriers and in carrying out works council elections. This indicates at least some associational power, despite the overall decentralized character of work and high labor turnover, which usually complicate worker representation.

Overall, the focus of the works council's policies is not primarily on control issues related to software and algorithms, but rather on other topics, such as the definition of the delivery area (which the company wants to be as large as possible) or the destination of the last delivery (which the couriers would like to be as close to their home as possible). Work cell phones, work equipment (particularly bikes), pay, issues related to working hours, and most of all, a fair distribution of shifts, are major issues that form the company's primary contested terrain.

The works council has been successfully engaged in many of these issues. Nevertheless, shift planning currently remains a significant source of conflict, as the works council states that the weekly scheduling has been outsourced to employees without remuneration for the additional work time, and this forces them to compete for attractive shifts at a certain time of the week. For drivers who have to apply for shifts during working hours, this poses an additional safety risk. It also causes feelings of existential threat on a weekly basis for some employees, due to the uncertainty with regard to acquiring shifts. Non-transparency regarding management decisions on shift distribution reinforce feelings of uncertainty and possible unfairness. The app and related control issues receive significant attention, but rather remain secondary. Here, the works council is primarily concerned with access to the functional parameters, understanding how the app is processing this information, and how it affects the work of the couriers. The works council recognizes the need to engage with the app, but reports difficulties in doing so:

> I have an idea of what I do as a works council member: co-determination rights. But the problem is when it comes to the question of what I should deal with precisely, I'm poking around in the dark. (Works council member)

Because the works council can only assess the consequences of AM to a limited extent, the scope for co-determination is restricted, and uncertainties remain regarding the effects of possible changes in the AM-system. This is illustrated by the works council's attempts to co-determine the length of tracking intervals:

> The thing is, we have no idea about what the impact of, for example, extending the tracking intervals will be. That's always the problem. And we are not told that either. If I have a minute now […], could it be that the orders will become totally stupid for the couriers? Because they aren't tracked as often anymore. And then they get worse jobs? Maybe they'll get better as a result, but those are the scenarios that we can't answer. (Works council member)

What is the role and position of the trade union with regard to the regulation of AM in the food-delivery sector? Our case study demonstrates strong engagement and cooperation between the union and parts of the works council. There are frequent exchanges, and mutual advice and support regarding legal issues or questions related to technology. The relationship between the management and the union is adversarial. According to the union representative we interviewed, the employer is reluctant to engage in bargaining and does not take part in official communication; rather, it exclusively communicates via press releases. The employer does not respond to emails or requests for meetings and has even set up a department that effectively exists to prevent works council elections. Regarding AM-related issues, the interviewed trade union representative underlines the importance of and need for more formal regulation of AM

systems. The risk of employee monitoring and misuse of data remains high, and the works council often lacks the power and insight to enforce workers' rights. In contrast to the dominant debate on the German industrial core sector (see, e.g., Krzywdzinski et al., 2023), the trade union in the food-delivery sector expresses a stronger interest in defining detailed and binding agreements regarding AM usage at the company and sectoral level, as the organizational power of works councils and couriers is limited. In the industrial sector, in contrast, more emphasis is placed on regulating AI and AM at the company level (Albrecht & Görlitz, 2021; Evers et al., 2019; Krzywdzinski et al., 2023).

In the union's view, the issues discussed below must be covered by a collective agreement. In addition to safety issues and compensation for night work, the agreement should strengthen the right of co-determination and information regarding algorithmic systems and data. Obligations should be reversed: data collected by the company should be provided to the works council without request. Moreover, the company must ensure that no data are passed on to third parties during processing. Live tracking should be abolished and supplemented by more worker-friendly alternatives. The right to refuse orders (e.g., in dangerous situations) and the need for digital emergency buttons are also noted as important. Regarding the app's technical shortcomings, a clarification of liability issues is recommended: in this case, the employer must compensate the couriers for possible financial disadvantages resulting from app failures.

Regarding associational power, the level of unionization among riders is increasing, but is not yet considered strong enough to adequately represent the workforce and enforce their demands. Persistent ideological conflicts in the works council over the general question of cooperation with trade unions are hampering this development as well. In the initial phase of the labor conflict, high media attention and strong networking and alliance building (societal power) have provided important attention and support for the couriers. On the one hand, media scandalization of working conditions in the delivery-service sector has gradually subsided. However, works councils and trade unions continue to expand their presence on social media and successfully use it as a vehicle for networking and building broad alliances, including grassroots movements. Interestingly, cooperation with restaurant operators is an additional strategy to increase (structural) power during strikes.

> Any disruption we cause from outside causes real problems for the company. We also called and contacted restaurants at the same time and said: "Please support our strike. You'll have problems with customers that day if your name appears in the app." So, the restaurants said: "Before I get into trouble with the customer, who is waiting for the food and that falls back on me, I'd rather shut down [the app] that day." (Trade union secretary)

According to union representatives, an alliance on the "production side" of the platform (i.e., cooperation between riders and restaurants) offers a potentially powerful tool for disrupting not only logistics, but also the functionality of the restaurant platform itself. If successful, this could put enormous pressure on the platform infrastructure, which represents the core component of the business model for generating revenue.

In summary, our case study provides evidence that institutional power at the legal and sectoral level has gained importance for the co-determination strategies in the food-delivery sector. Associational power retains importance, too, but rather in terms of situational interventions (e.g., organizing strikes or demonstrations) of minor parts of the work force. In addition, we find that the (restricted) access to knowledge resources (information asymmetry) is a major issue regarding the co-determination of AM. We do not find clear evidence for AM-based performance control or discipling of workers. The company uses the algorithmic system primarily for process optimization and efficient allocation of orders. Nevertheless, we cannot rule out that management uses data, in part, to individually profile and discipline, as the works council suspects.

4 Discussion and Conclusion: Lessons Learned Regarding the Regulation and Co-Determination of AM

This study addressed questions of (1) how companies deploy algorithm-based management and control and how workers in the German food-delivery sector perceive this, and (2) how works councils and trade unions in this sector encounter possible risks regarding AM and control. Our findings, based on an intensive case study in a large German food-delivery company, complement existing research in this field by shedding light on the role of and interplay between management objectives, couriers' experiences, and strategies of the works council and the trade union. Below we summarize five primary findings.

1) *Algorithmic control*: In contrast to our expectations and suggestions common in both the AM literature (Kellogg et al., 2020) and the literature on the platform economy (Schreyer & Schrape, 2018), our study did not yield evidence for strong management efforts to individually profile or discipline workers. In this case, the potential for a rigid, algorithmically driven control system, made possible by the collection of vast amounts of data and other technological possibilities (as demonstrated in other cases), has not been realized in practice. The company's AM system was primarily introduced to coordinate and synchronize the complex process of order distribution, rather than as an instrument of individual performance control. Work intensity, however, is affected indirectly through algorithmic coordination and efficiency criteria, as it is designed to maximize the

mean occupancy of drivers. Surprisingly, the riders, who are interested in bonus payments, do not often contest this. The insecurity about the fairness of order assignment and the distribution of work shifts is more controversial for them. Although the management strongly objects to the suspicion of using data transparency for disciplining workers, the works council claims that the management is doing this informally.
Overall, our findings suggest that those engaged in the scientific debate should use the term algorithmic control more carefully. Neither are AM systems implemented primarily for the sake of individual performance control in the case we examined, nor do we find an AI-based substitution for management functions. Both aspects are over-emphasized in the debates about AM that tend to paint the picture of an automated digital panopticon that does not correspond to the findings of our study. However, as long as the couriers remain uncertain and suspicious about the possibility of being monitored, AM has an indirect discipling effect based on opacity, and thus it contributes to feelings of stress and insecurity.
The ambiguity and uncertainty related to the algorithmic system and its effects underscore the need to encounter the "black-box" character and information asymmetry that goes along with AM.

2) *Information asymmetries and limits of co-determination regarding AM (i.e., the "black-box" problem)*: When trying to tackle issues of AM, the works council faced difficulties in getting necessary information from the management and in understanding how the algorithmic system affects work performance (i.e., lack of knowledge resources). The works council members we interviewed emphasized the difficulties in understanding the operations of algorithmic systems and expressed their inability to monitor and shape the use of technology. Consequently, the works council is heavily engaged in demanding co-determination rights that also affect technology development. They used the option provided by the new Works Councils Modernization Act *("Betriebsrätemodernisierungsgesetz")* to consult an external AI expert. Moreover, the members have collected information on the operation of the app and exerted pressure on management to disclose documentation related to it. The problem of the software's technological opacity is complicated by the problem of "social opacity," as management, in the works council's view, is not willing to share information on the app in a meaningful way. Co-determination related to technological issues is contested, which reflected the generally hostile relationship between the works council and the management of the company we investigated. Consequently, and despite rather rich co-determination rights and recent reforms (Works Council Modernization Act) in the German context, the works council faces difficulties in obtaining the information on the parameters that feed into the AM system that is necessary to understand their functioning and interaction and to evaluate the effects of possible changes and alternative usages. This raises a crucial question regarding the extent to which employee repre-

sentatives are able to co-determine AI- or AM-based systems themselves, an issue that has often been suggested in the current debate, and one that underscores the need for transparency, (external) expertise, and processual co-determination rights through which changes and updates of AM systems can be tackled.

3) *Importance of institutional regulation of AM at the sectoral and legal level:* The union and works council representatives stress the importance of and need for more formal regulation of AI and AM systems, underscoring the importance of institutional power. In their view, the risk of monitoring of employees and misuse of data remains high and cannot be prevented by the works councils, due to both the lack of resources and lack of cooperation by the company. Among the works council members, the role of collective agreements is controversial. A considerable proportion of the members cooperates closely with the union and strives for a collective agreement, although the majority – who come from the couriers' grassroots movement – favors new legal regulations or the enforcement of existing regulations. Union representatives in the food-delivery sector express a strong interest in defining detailed and binding requirements regarding AI and AM usage at the sectoral level, as they often lack the power to regulate these issues at the company level (i.e., lack of associational power). Interestingly, we find some evidence that cooperation with restaurant operators might become an additional source of power. Moreover, works councils and trade unions also continue to expand their presence in social media (thus underscoring the importance of societal power) and successfully use it as a vehicle for networking and building broad alliances, including grassroots movements.

4) *Competing demands for labor policies:* Overall, our findings do not support the idea of a dominant labor conflict regarding issues of AM in the company we investigated. Problems and conflicts primarily arise from the couriers' generally precarious work and employment conditions. Labor policies and conflicts are mainly concerned with traditional issues in terms of pay, working hours, work equipment, and safety issues. Despite the works council's engagement and (fixed- and long-term) employment contracts, classic elements of precarious employment in the low-wage sector tend to persist, such as low pay, a lack of provision of core work equipment, bad and often dangerous working conditions, and insecure employment prospects, due to high market fluctuations. Still, for many workers – especially migrants, who often are particularly reliant on initial labor market access – this form of work offers low-threshold job opportunities.

5) *New bargaining constellations in digital business models?* Finally, we found evidence that given regulations touching issues of data protection and technology can provide works councils with powerful means to achieve goals in other areas of action. In the digital-platform economy, both efficient day-to-day business and quick innovation depend greatly

on the collection and processing of data, as well as on rapid and continuous development of (globally used) software. Putting pressure on the collection or processing of data can therefore quickly threaten companies' core business interests and amplify their cooperativeness in bargaining processes. In this respect, existing co-determination rights related to AM issues can provide a new bargaining resource to employee representation in AM-based business models in the German context. To the best of our knowledge, this fact has not yet received much attention in previous research. It underscores the need to study bargaining processes, power resources, and negotiation strategies in the area of AM more systematically. Future research in this field should take a broader perspective on AM-related policies in organizations, also considering issues and conflicts in other, "traditional" areas of action.

Previous studies have identified challenges for policymakers and the regulation of AM in three areas of the German workplace. Our study confirms these: (1) Transparency issues: Employers often do not provide sufficient information on the methods used in AI applications; (2) Control issues: According to the existing data-protection regulations, employers may collect and process individual data when this information is used to fulfill the specific work purpose. Because this regulation leaves room for interpretation, companies can misuse it. (3) Co-determination issues: Processual forms of co-determination gain importance (Krzywdzinski et al., 2023), because governance and monitoring of AI and AM are becoming permanent tasks in the context of systems that are frequently updated. Rights of co-determination are less effective as soon as such systems have been introduced, amplifying the importance of employees, works councils, and HR managers possessing the appropriate skills and information to draw the right conclusions and to anticipate possible long-term effects and unintended consequences. Considering these challenges, our study underscores the demand for useful policy measures regarding the use of AM, such as transparency in terms of the key functions of these systems (e.g., with the help of independent experts), agreements on investments in AM products between employee representatives and management, the involvement of employee representatives in implementation processes, and regular access rights for them to prevent the expansion (or misuse) of algorithmic systems in the workplace (Rolf, 2024).

Finally, regarding the regulation of AM, our study emphasizes the importance of considering sectoral differences in terms of power resources and information asymmetries. In the food-delivery sector, we observe a higher demand for regulations at the institutional (legal and sectoral) level as compared with, for example, the German industrial core sector. To cope with the outlined information and skill asymmetries (between management and works councils) regarding AM issues, it might also be a useful approach to co-determination to put more emphasis on regulating the effects of AM-based systems to prevent negative out-

comes in terms of staffing, work hours, workload, and safety. Such an approach would rely on classical fields and instruments of employee representation.

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