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Algorithmic Management and Emotional Exhaustion among Ride-Hailing Drivers in Portugal: The Role of Job Demands and Economic Dependence

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ALGORITHMIC MANAGEMENT AND EMOTIONAL EXHAUSTION AMONG RIDE-HAILING DRIVERS IN PORTUGAL: THE ROLE OF JOB DEMANDS AND ECONOMIC DEPENDENCE

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Resumo

As plataformas digitais de trabalho recorrem cada vez mais a sistemas algorítmicos para organizar, monitorizar e avaliar o trabalho, levantando preocupações sobre as suas implicações para o bem-estar psicológico dos trabalhadores. Esta dissertação analisa a relação entre a gestão algorítmica e a exaustão emocional entre motoristas de plataformas de transporte individual em Portugal, considerando as exigências do trabalho como mecanismo mediador e a dependência económica como potencial moderador.

Foi conduzida uma experiência baseada em cenários, com um desenho entre sujeitos, junto de 209 motoristas TVDE, aleatoriamente distribuídos entre uma condição de elevada gestão algorítmica e uma condição de baixa gestão algorítmica. Os resultados mostram que os participantes expostos à condição de elevada gestão algorítmica reportaram níveis significativamente superiores de exaustão emocional em comparação com os participantes expostos à condição de baixa gestão algorítmica. Mais importante, as exigências do trabalho emergiram como o principal mecanismo explicativo. Níveis mais elevados de gestão algorítmica estiveram associados a maiores exigências percebidas do trabalho, que, por sua vez, se associaram fortemente à exaustão emocional. O efeito indireto através das exigências do trabalho foi significativo, enquanto a relação direta entre gestão algorítmica e exaustão emocional se tornou não significativa após a inclusão das exigências do trabalho no modelo.

Em contraste, a dependência económica não moderou esta relação como inicialmente previsto, embora tenha apresentado uma associação positiva com a exaustão emocional. Estes resultados sugerem que as consequências psicológicas da gestão algorítmica podem depender menos da simples utilização de sistemas algorítmicos do que das condições de trabalho exigentes que estes sistemas criam ou intensificam. Ao focar-se na exaustão emocional e no setor TVDE português, este estudo contribui para uma compreensão mais específica da forma como o trabalho gerido algoritmicamente pode tornar-se psicologicamente consequente.

Palavras-chave: Gestão algorítmica; Exaustão emocional; Exigências do trabalho; Dependência económica; Plataformas de transporte individual; motoristas TVDE.

Abstract

Digital labour platforms increasingly rely on algorithmic systems to organise, monitor and evaluate work, raising concerns about their implications for workers' psychological well-being. This dissertation examines the relationship between algorithmic management and emotional exhaustion among ride-hailing drivers in Portugal, focusing on job demands as a mediating mechanism and economic dependence as a potential moderator.

A scenario-based between-subjects experiment was conducted with 209 TVDE drivers, who were randomly assigned to either a high or low algorithmic management condition. The results show that participants exposed to the high algorithmic management condition reported significantly greater emotional exhaustion than those exposed to the low condition. More importantly, job demands emerged as the central explanatory mechanism. Higher algorithmic management was associated with greater perceived job demands, which were in turn strongly associated with emotional exhaustion. The indirect effect through job demands was significant, while the direct relationship between algorithmic management and emotional exhaustion became non-significant once job demands were included in the model.

By contrast, economic dependence did not moderate this relationship as hypothesised, although it was positively associated with emotional exhaustion overall. These findings suggest that the psychological consequences of algorithmic management may depend less on the mere use of algorithmic systems than on the demanding working conditions these systems create or intensify. By focusing on emotional exhaustion and the Portuguese TVDE sector, the study contributes to a more specific understanding of how algorithmically managed work may become psychologically consequential.

Keywords: Algorithmic management; Emotional exhaustion; Job demands; Economic dependence; Ride-hailing; TVDE drivers.

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1. Introduction

Digital labour platforms have become an increasingly important feature of contemporary labour markets, transforming the way work is organised, allocated and monitored (Duggan et al., 2020; Wood et al., 2019). Ride-hailing platforms are a particularly visible example of this transformation, connecting drivers and passengers through digital applications while simultaneously coordinating key aspects of the labour process (Möhlmann et al., 2021). Although platform work is frequently associated with flexibility and autonomy, this apparent independence coexists with extensive forms of digital control (Wood et al., 2019; Duggan et al., 2020; Möhlmann et al., 2021). This tension between formal autonomy and platform-based control represents a central feature of the ride-hailing work experience.

Algorithmic management plays a central role in this form of work organisation by enabling platforms to use data and algorithms to coordinate and control activities traditionally performed by human managers (Kellogg et al., 2020; Möhlmann et al., 2021). In ride-hailing, these systems can allocate rides, monitor drivers in real time, evaluate performance through ratings and other metrics, provide incentives and sanctions and automate decisions affecting work opportunities (Duggan et al., 2020; Kellogg et al., 2020). While these mechanisms allow platforms to coordinate large and dispersed workforces, they may also increase performance pressure and uncertainty while reducing workers' control over important aspects of their work (Cram et al., 2022; Mbare et al., 2024).

The growing importance of these forms of control has raised concerns about their psychological consequences. Previous research suggests that algorithmic management may expose workers to high levels of stress and anxiety (Bartel et al., 2019; Glavin & Schieman, 2022), burnout (Cheng et al., 2024; Liu et al., 2025) and other forms of psychological strain (Mbare et al., 2024). In ride-hailing, these pressures may be particularly relevant because drivers' income and continued access to work depend heavily on their interaction with platform (Möhlmann et al., 2021). Drivers may retain some discretion over when to work, but once connected to the platform, their activity is shaped by algorithmic rules, performance expectations and economic incentives (Duggan et al., 2020; Kellogg et al., 2020).

Much of the existing literature, however, has examined relatively broad psychological outcomes. It therefore remains less clear how more intensive forms of algorithmic management relate to more specific manifestations of psychological strain. Against this

background, the present dissertation focuses on emotional exhaustion, a central component of burnout characterised by the depletion of workers' emotional and physical resources following sustained exposure to work-related demands and strain (Maslach & Jackson, 1981; Maslach et al., 2001). By examining emotional exhaustion as a specific outcome, the study seeks to provide a more precise assessment of a potential psychological consequence of algorithmic management rather than treating psychological well-being as a broad outcome.

However, identifying a relationship between algorithmic management and emotional exhaustion does not, by itself, explain how this relationship develops. Existing research suggests that algorithmic systems may increase the pace and intensity of work, reinforce time pressure and require sustained attention and responsiveness (Kim et al., 2021; Cheng et al., 2024; Mbare et al., 2024). These characteristics are closely related to job demands, which refer to aspects of work requiring sustained physical, cognitive or psychological effort (Cheng et al., 2024). Previous evidence further suggests that job demands may constitute an important pathway through which platform-based control is associated with adverse psychological outcomes (Cheng et al., 2024). Accordingly, the present dissertation examines job demands as a potential mediating mechanism between algorithmic management and emotional exhaustion.

At the same time, understanding this mechanism does not imply that all drivers experience algorithmic control in the same way. Workers' ability to reduce their availability, refuse opportunities or distance themselves from unfavourable conditions may be constrained by their economic dependence (Schor et al., 2020; Glavin & Schieman, 2022; Kougiannou & Mendonça, 2025). When platform earnings represent a more important source of income, workers may have less room to adjust their participation without compromising their economic situation (Schor et al., 2020). Economic dependence therefore becomes relevant as a potential condition shaping how drivers experience the effects of algorithmic management and is examined in this study as a moderator of the relationship between algorithmic management and emotional exhaustion.

Beyond these conceptual questions, there remains a need to examine these relationships within specific national and sectoral contexts. The present study focuses on the Portuguese ride-hailing sector, formally known as TVDE (*Transporte Individual e Remunerado de Passageiros em Veículos Descaracterizados a partir de Plataforma Eletrónica)*. In Portugal, this activity operates through a distinctive structure in which digital platforms, intermediary TVDE operators and

individual drivers coexist within the same regulatory framework (Niebler et al., 2023). This context is particularly relevant for examining algorithmic management because drivers' working conditions are shaped not only by formal employment and regulatory arrangements, but also by platform systems that organise and control work. Although TVDE activity is formally regulated, existing research continues to identify economic uncertainty and fragmented employment relations among drivers (Niebler et al., 2023).

The relevance of this context is reinforced because the TVDE sector has expanded substantially in Portugal and by April 2026, included more than 40,000 active drivers (ProTVDE, 2026). Yet, it remains less clear how algorithmic management relates specifically to emotional exhaustion among TVDE drivers in Portugal, through which mechanisms this relationship may occur and whether economic dependence may shape how it is experienced. Integrating these dimensions within the same conceptual framework therefore makes it possible to examine not only whether algorithmic management is related to emotional exhaustion, but also how this relationship may develop and under what conditions it may become more relevant.

Accordingly, the present dissertation examines the relationship between algorithmic management and emotional exhaustion among TVDE drivers in Portugal, considering job demands as a mediating mechanism and economic dependence as a potential moderator. Rather than focusing solely on a direct relationship between algorithmic management and psychological outcomes, the study incorporates both working conditions and economic constraints that may help explain differences in drivers' experiences of algorithmic control.

Accordingly, the dissertation is guided by the following research question:

How is algorithmic management related to emotional exhaustion among TVDE drivers in Portugal and to what extent is this association mediated by job demands and moderated by economic dependence?

The study seeks to make several contributions to the literature. First, it advances the understanding of the psychological consequences of algorithmic management by focusing specifically on emotional exhaustion. Second, it seeks to clarify how this relationship may occur by examining job demands as a mediating mechanism and whether economic dependence conditions the relationship between algorithmic management and emotional exhaustion. Third, by examining these relationships in the Portuguese TVDE sector, the

study contributes evidence from a national context that has received comparatively less attention in the literature. From a practical perspective, the findings may also contribute to a better understanding of how algorithmically managed working conditions relate to drivers' emotional exhaustion, particularly through the role of job demands.

The remainder of this dissertation is structured as follows. Chapter 2 reviews the relevant literature, develops the conceptual model and presents the research hypotheses. Chapter 3 describes the methodological approach, including the experimental design, data collection procedure and measures used. Chapter 4 presents the empirical results, while Chapter 5 discusses these findings in light of the existing literature. Finally, Chapter 6 presents the main conclusions, theoretical and practical implications, study limitations and directions for future research.

2. Literature Review

2.1 Contextualising Ride-Hailing Platform Work and the Portuguese TVDE Sector

2.1.1 Ride-Hailing as a Form of Platform Work

Platform work has become an increasingly visible feature of contemporary labour markets, as digital infrastructures mediate the connection between workers and customers in real time (Duggan et al., 2020). It is often presented as offering workers greater flexibility and autonomy over when and where they work, which helps explain its rapid expansion across different sectors (Wood et al., 2019). At the same time, this form of work is frequently characterised by limited employment protections, given the widespread classification of workers as independent contractors (Bajwa et al., 2018). In this sense, platform work is marked by a central tension between the promise of flexibility and the persistence of insecurity.

Within this broader platform economy, ride-hailing represents one of its most visible and influential segments. It is a form of app-mediated labour in which drivers and passengers are matched through digital platforms, making access to customers increasingly dependent on real-time coordination through apps (Möhlmann et al., 2021; Muralidhar et al., 2022). Unlike conventional taxi markets, ride-hailing platforms do not simply facilitate transport services; they also shape workers' access to tasks, income and market participation through digital systems whose underlying logic often remains opaque to drivers (Gandini, 2018; Muralidhar et al., 2022). Ride-hailing is therefore a particularly relevant setting in which to examine how platform-based forms of control may affect workers' everyday experiences.

2.1.2 The Portuguese TVDE Context

The Portuguese TVDE sector provides a particularly relevant empirical context for examining the dynamics of ride-hailing platform work. Uber began operating in Lisbon in 2014 and in the following years other platforms, such as Bolt and Free Now, also entered the Portuguese market, contributing to the expansion of app-based ride-hailing services in the country (Niebler et al., 2023). This rapid expansion prompted the creation of a specific legal framework for the sector. Law 45/2018 regulated TVDE activity and introduced a formally structured model in which platform companies operate through intermediary partner-companies, which in turn work with individual drivers (Niebler et al., 2023). The scale of the sector expanded significantly after regulation. Niebler et al. (2023) report that

there were fewer than 6,000 TVDE drivers in March 2019. More recent official data from the IMT show that by April 2026 the sector included 40,596 active TVDE drivers, 37,325 active vehicles, 14,805 active operators and three active platforms (ProTVDE, 2026).

Under this model, drivers must either be contracted by a partner-company or establish their own firm to work, while platform companies intermediate between drivers and passengers and transfer earnings to partner-companies, which then pay drivers (Niebler et al., 2023). This triadic structure makes the Portuguese case especially relevant, as labour relations are mediated not only by the platform itself but also by an intermediary subcontracting arrangement. Although the sector is formally regulated, existing research suggests that drivers' work remains marked by economic pressure, fragmented employment relations and persistent vulnerability (Niebler et al., 2023). For this reason, the Portuguese TVDE sector offers an appropriate setting in which to analyse the relationship between algorithmic management and drivers' psychological well-being.

2.2 Algorithmic Management in Ride-Hailing Platforms

Algorithmic management has become a central concept for understanding how platform work is organised. Broadly, it refers to the use of data and algorithms to perform coordination and control functions traditionally associated with human managers, including task allocation, monitoring, performance evaluation, compensation, rewards and sanctions (Duggan et al., 2020; Kellogg et al., 2020; Möhlmann et al., 2021). Its distinctive character lies not simply in the use of technology, but in the extent to which managerial functions are embedded in automated systems that operate continuously and at scale, allowing control to be exercised with limited direct human supervision (Kellogg et al., 2020; Cram et al., 2022).

A useful distinction in the literature is between algorithmic matching and algorithmic control. Matching concerns the coordination of supply and demand, whereas control concerns the monitoring and steering of worker behaviour in line with platform objectives (Möhlmann et al., 2021). In ride-hailing, however, these functions are closely intertwined. The same system that matches a driver with a passenger may also determine when a task is offered, how quickly the driver is expected to respond, what information is available and how subsequent performance is recorded (Möhlmann et al., 2021). Algorithmic management should therefore be understood not merely as a technical matching mechanism, but as an organisational system through which coordination and control are jointly exercised.

Across the literature, there is broad agreement that this control operates through several interconnected mechanisms. Automated task allocation and behavioural guidance shape the opportunities presented to workers and the speed with which they are expected to respond (Kellogg et al., 2020; Cram et al., 2022), a dynamic that is particularly visible in ride-hailing, where drivers rely on the app to organise much of their daily activity (Bartel et al., 2019; Kim et al., 2021; Mbare et al., 2024; Möhlmann et al., 2021). Continuous data collection further makes workers' activity visible and measurable by allowing platforms to track location and performance-related behaviour (Bajwa et al., 2018; Gandini, 2018; International Labour Organization [ILO], 2021), 2021; Kellogg et al., 2020; Möhlmann et al., 2021). Customer ratings, rankings and other performance metrics then transform this information into indicators that may influence workers' visibility, access to future opportunities and position within the platform (Ashkrof et al., 2020; Möhlmann et al., 2021; Wu et al., 2019).

These evaluative mechanisms become particularly consequential when they are linked to rewards and sanctions. Bonuses, performance targets and peak-hour incentives may encourage greater availability and task completion, whereas unfavourable evaluations or failure to meet particular criteria may reduce access to opportunities or rewards or, in more severe cases, lead to suspension or deactivation (Henao & Marshall, 2019; Reid-Musson et al., 2020; Wu et al., 2019). Algorithmic control therefore operates through a combination of incentive and discipline, linking workers' behaviour to their access to work and income (Kellogg et al., 2020; Wu et al., 2019).

A particularly relevant feature of algorithmic control is its limited transparency. The criteria and rules underlying automated systems are often only partially visible to workers and may therefore be experienced as "black boxes", with limited opportunities to understand, contest or obtain human review of resulting decisions (Möhlmann et al., 2021; Rahman, 2021; Alacovska et al., 2025).

Existing evidence does not, however, suggest that algorithmic management is inherently detrimental to workers. Digital coordination can facilitate matching between workers and customers, support flexible forms of participation and provide performance feedback (Wood et al., 2019; Li et al., 2025). Its implications therefore depend not simply on the use of algorithmic systems, but on how these systems are designed and used to organise work, shape workers' autonomy and impose demands on their activity.

While the literature provides a relatively consistent account of how algorithmic management operates, its implications for workers cannot be understood solely at the level of coordination and control. The same mechanisms that organise work may also create sustained pressure, uncertainty and reduced control over important aspects of the working experience (Kim et al., 2021; Möhlmann et al., 2021; Mbare et al., 2024). This raises a further question of whether more intensive algorithmic management is associated with specific forms of psychological strain. The following section addresses this issue by focusing on emotional exhaustion.

2.3 Emotional Exhaustion as a Dimension of Drivers' Psychological Well-Being

Research on platform work increasingly suggests that algorithmic control is associated with adverse psychological outcomes. Across different contexts, studies have associated platform-based control with stress, anxiety, burnout and poorer mental well-being (Ranga et al., 2025; Dong et al., 2025). Although these studies focus on different psychological outcomes, they point to a common pattern in which digitally mediated control may become a source of psychological strain.

The same mechanisms through which algorithmic management organises and controls work help explain this relationship. Continuous monitoring, evaluation through performance metrics, time-sensitive task allocation and limited system transparency may increase perceived pressure and reduce workers' control over relevant aspects of their activity (Kim et al., 2021; Möhlmann et al., 2021; Rahman, 2021). In ride-hailing, this combination is particularly relevant because drivers depend on the platform to access work opportunities while having limited influence over the rules through which those opportunities are allocated and evaluated (Bartel et al., 2019; Ashkrof et al., 2020; Möhlmann et al., 2021). The tension between the formal autonomy associated with independent work and the behavioural control exercised through digital systems may therefore make these forms of management psychologically consequential (Reid-Musson et al., 2020; Möhlmann et al., 2021).

Despite this convergence, the literature has generally examined these consequences through relatively broad outcomes. More intensive forms of platform control and subordination have been associated with poorer psychological outcomes, including burnout, deterioration in mental health and other psychosocial risks, particularly when combined with lower control over work and greater time pressure (Cheng et al., 2024; Liu et al., 2025; Mbare et al., 2024). These findings establish that platform control is relevant to workers' well-being, while leaving room for a more specific examination of the form that psychological depletion may take.

This gap is relevant because emotional exhaustion represents a central dimension of burnout and refers to the depletion of workers' emotional resources following prolonged exposure to work-related demands and strain (Maslach & Jackson, 1981; Maslach et al., 2001). Unlike broader measures of psychological well-being, emotional exhaustion allows for a more specific examination of the depletion process associated with the continued mobilisation of emotional resources in the work context (Wang & Ren, 2026; Hobfoll et al., 2018). Recent research has also identified emotional exhaustion as a relevant manifestation of psychological strain in algorithmically managed work contexts (Dong et al., 2025).

In this sense, the literature suggests that more intensive forms of algorithmic management may be associated with higher levels of emotional exhaustion. When monitoring, evaluation and performance pressure become continuous features of work, sustained exposure to these conditions may contribute to the depletion of workers' emotional resources (Wang & Ren, 2026). Although existing evidence establishes a broader relationship between algorithmic control and adverse psychological outcomes, it remains less clear whether this relationship is specifically reflected in emotional exhaustion among ride-hailing drivers. Accordingly, the following hypothesis is proposed:

H1. Higher levels of algorithmic management are positively associated with greater emotional exhaustion among ride-hailing drivers.

2.4. Job Demands as a Mediating Mechanism in the Relationship Between Algorithmic Management and Emotional Exhaustion

2.4.1 Job Demands in the Context of the Present Study

Job demands encompass aspects of work that require sustained physical or mental effort and may therefore impose physiological or psychological costs on workers (Demerouti et al., 2001). In the context of ride-hailing, these demands are particularly reflected in the need to work quickly and intensively, exert physical effort, maintain concentration for prolonged periods and cope with a hectic work pace (Cheng et al., 2024). These characteristics are consistent with evidence on platform work, which is often characterised by heavy workloads, time pressure, long or irregular working hours and limited opportunities for rest and recovery (Liu et al., 2025; Mbare et al., 2024).

There is substantial convergence in the literature regarding the capacity of algorithmic management to intensify work. Automated task allocation and time-constrained requests may

increase time pressure by requiring drivers to continuously monitor the platform and respond rapidly to new opportunities (Bartel et al., 2019; Cram et al., 2022; Mbare et al., 2024). In some forms of platform work, workers may have only a short time window to accept a task before losing both the request and the associated income, reinforcing the need for constant attention and rapid decision-making (Kim et al., 2021; Mbare et al., 2024). These pressures may be particularly relevant because drivers are simultaneously responsible for driving, monitoring the application and responding to constantly changing information from the platform (Bartel et al., 2019; Kim et al., 2021).

Continuous monitoring and performance evaluation may further intensify these demands. When acceptance rates, cancellation rates, trip completion times or customer ratings may affect future opportunities, workers have incentives to remain attentive not only to the task itself but also to how their behaviour is being measured (ILO, 2021; Möhlmann et al., 2021). The effect does not simply arise from workers being monitored; rather, monitoring may increase the amount of cognitive and behavioural effort required to remain aligned with platform expectations (Rahman, 2021).

Customer ratings and feedback introduce an additional source of demand, as workers must manage the interpersonal dimension of service while remaining aware of its potential reputational consequences (Gandini, 2018). Similarly, incentive structures may encourage workers to increase task volume, extend their availability or remain active despite fatigue in order to reach particular thresholds or secure bonuses (Reid-Musson et al., 2020; Sun, 2023; Mbare, 2023). These practices may therefore increase both quantitative demands, such as workload and work pace, and qualitative demands, such as attentional effort and the need to regulate behaviour under continuous evaluation.

2.4.2 Job Demands as a Mediating Mechanism

The relationship between job demands and emotional exhaustion can be understood through the Conservation of Resources perspective. According to this perspective, individuals seek to acquire and preserve important resources that allow them to cope with the demands of their environment. Continued exposure to demanding conditions may consume these resources and when losses are not offset by adequate opportunities for recovery, increase vulnerability to emotional exhaustion (Hobfoll, 1989; Hobfoll et al., 2018; Wang & Ren, 2026). In this sense, it is not necessarily the isolated presence of a particular demand that leads to exhaustion, but rather its intensity, continuity and accumulation over time.

In ride-hailing, these demands may become particularly consequential when they persist over prolonged working periods. Repeated exposure to demanding work may hinder recovery and progressively contribute to emotional exhaustion. This interpretation is consistent with established evidence linking job demands to exhaustion across occupational groups (Demerouti et al., 2001), as well as with more recent research associating demanding psychosocial working conditions with burnout and poorer mental well-being among platform workers (Cheng et al., 2024; Liu et al., 2025).

Available evidence further suggests that job demands may constitute an important pathway through which more intensive forms of digital labour control are associated with less favourable psychological outcomes (Cheng et al., 2024). This finding supports the idea that the psychological consequences of algorithmic control may arise, at least in part, from the working conditions that such control creates or intensifies rather than from the use of technology itself. Although Cheng et al. (2024) do not isolate emotional exhaustion as the specific outcome, it provides a relevant basis for examining whether the same mechanism applies to emotional exhaustion among ride-hailing drivers.

The literature reviewed therefore supports a sequential argument. More intensive algorithmic management may increase work pace, attentional demands and the effort required. When these demands persist over time, they may contribute to the depletion of workers' resources and, consequently, to emotional exhaustion. Job demands therefore constitute a plausible mechanism through which algorithmic management may relate to emotional exhaustion. Based on this argument, the following hypothesis is proposed:

H2. Job demands mediate the positive relationship between algorithmic management and emotional exhaustion among ride-hailing drivers.

2.5 Economic Dependence as a Moderator

2.5.1 Economic Dependence in Platform Work

Economic dependence is an important condition shaping how workers experience platform work because it affects the extent to which they can absorb financial uncertainty, reduce participation or distance themselves from unfavourable working conditions (Schor et al., 2020; Glavin & Schieman, 2022; Kougiannou & Mendonça, 2025). In this sense, economic dependence concerns not only the proportion of income obtained through platform work,

but also the degree of economic room for manoeuvre available to workers when earnings fall or working conditions become difficult.

There is broad agreement in the literature that greater reliance on platform income is associated with more constrained choices. Workers with fewer alternative sources of income or financial buffers may have less flexibility to reduce working time, refuse opportunities or leave the platform when conditions become unattractive (Schor et al., 2020; Kougiannou & Mendonça, 2025). Continued participation should therefore not necessarily be interpreted as evidence of satisfaction or preference, since workers may remain attached to platform work because viable alternatives are limited (Muralidhar et al., 2022). Economic dependence can thus increase vulnerability by reducing workers' capacity to respond to adverse working conditions.

These dynamics are particularly relevant in ride-hailing, where earnings may vary with fluctuations in passenger demand and driver supply and workers bear substantial operating costs, including fuel, vehicle maintenance and other expenses that reduce net income, creating a gap between expected and actual financial returns (Henao & Marshall, 2019; Bartel et al., 2019). Consequently, this financial uncertainty may also encourage drivers to extend their working hours in order to secure sufficient income, even when longer schedules become difficult to sustain (Louzado-Feliciano et al., 2022).

In the Portuguese TVDE context, these pressures coexist with fragmented employment relations, unpaid working time, limited employment protection and costs associated with operating as a driver (Niebler et al., 2023). Under these conditions, economic dependence may make unfavourable working conditions more difficult to absorb or avoid, even when it does not directly create those conditions.

2.5.2 Why Economic Dependence May Intensify the Effects of Algorithmic Management

The relevance of economic dependence becomes particularly apparent in the context of algorithmic management. Platform systems may link ratings, performance metrics, incentives, sanctions and automated decisions to workers' access to tasks and income (Gandini, 2018; Wood & Lehdonvirta, 2021). When workers rely more heavily on platform earnings, these mechanisms may become more consequential, as the economic cost of

refusing tasks, reducing availability or disengaging from platform demands is higher (Schor et al., 2020; Glavin & Schieman, 2022; Kougiannou & Mendonça, 2025).

Economic dependence may therefore intensify exposure to algorithmic control. Financially constrained workers may remain available for longer periods or continue working under demanding conditions in order to secure sufficient earnings, even when doing so becomes difficult to sustain or has adverse consequences for their well-being (Bartel et al., 2019; Louzado-Feliciano et al., 2022). At the same time, when access to work depends on platform metrics and opaque evaluative systems, economically dependent workers may have stronger incentives to adapt their behaviour to platform expectations and less capacity to resist or distance themselves from those systems (Möhlmann et al., 2021; Rahman, 2021). In this way, economic dependence may transform the formal flexibility associated with platform work into a more constrained form of participation.

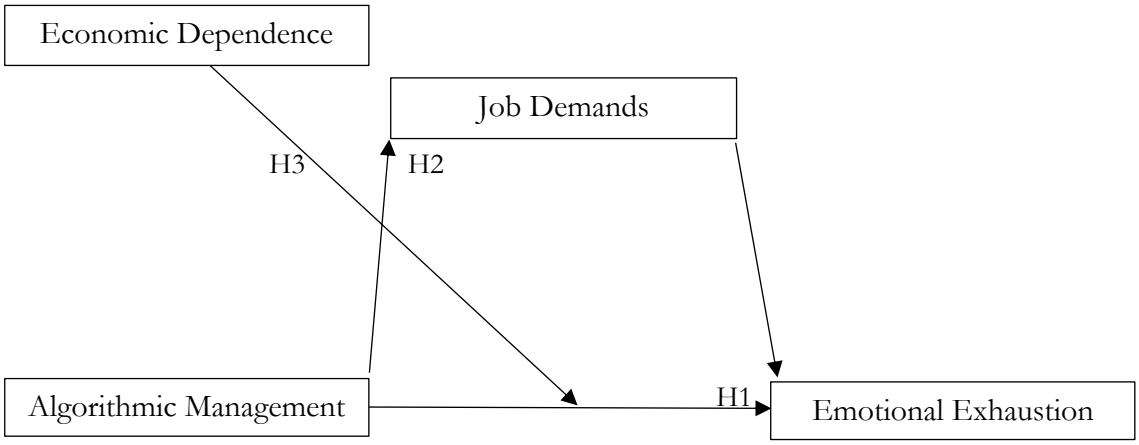
Existing literature suggests that economic dependence may shape how workers experience algorithmic management. Greater economic dependence is associated with reduced flexibility and greater vulnerability, while algorithmic management can influence access to work through monitoring, evaluation and performance mechanisms. What remains less clearly established is whether economic dependence specifically amplifies the relationship between algorithmic management and emotional exhaustion. This question is particularly relevant because workers with fewer economic alternatives may have less capacity to avoid, interrupt or recover from demanding forms of algorithmic control. Based on this argument, the following hypothesis is proposed:

H3. Economic dependence moderates the positive relationship between algorithmic management and emotional exhaustion, such that this relationship is stronger among ride-hailing drivers with higher levels of economic dependence

2.6. Conceptual model

Based on the literature reviewed, the present dissertation proposes a conceptual model in which algorithmic management is positively associated with emotional exhaustion, with job demands acting as a mediating mechanism in this relationship. The model further proposes that economic dependence moderates the relationship between algorithmic management and emotional exhaustion, such that this relationship is expected to be stronger among drivers with higher levels of economic dependence.

Figure 1. Conceptual Model of the Study



3. Methodology

3.1 Methodological Approach and Research Design

This study adopts a quantitative, deductive and explanatory methodological approach, using a scenario-based experimental design to examine the effect of algorithmic management on the emotional exhaustion of TVDE drivers in Portugal. The quantitative approach enables the empirical testing of the relationships proposed in the conceptual model through the systematic collection and statistical analysis of numerical data (Creswell, 2014). The deductive nature of the study derives from the formulation of hypotheses based on the theoretical and empirical literature reviewed, while its explanatory orientation reflects the aim of examining not only whether algorithmic management is associated with emotional exhaustion, but also the mediating role of job demands and the moderating role of economic dependence (Saunders et al., 2023).

The study follows a scenario-based experimental design. In this type of design, participants are exposed to a hypothetical but realistic work situation and respond to subsequent questions based on the conditions described (Aguinis & Bradley, 2014; Atzmüller & Steiner, 2010). This approach is appropriate for the present study, as it allows the level of algorithmic management to be manipulated in a controlled manner while keeping the general work context comparable across experimental conditions (Aguinis & Bradley, 2014). Compared with an assessment based exclusively on participants' real-life experiences, the use of scenarios helps create a more controlled and comparable setting, reducing the influence of contextual differences related to platforms, operators and individual ways of organising work (Aguinis & Bradley, 2014; Atzmüller & Steiner, 2010).

More specifically, the study adopted a between-subjects design with a single factor and two experimental conditions representing different levels of algorithmic management: a high algorithmic management condition and a low algorithmic management condition (Creswell, 2014). Each participant was randomly assigned to only one of these conditions. Random assignment reduces the likelihood that pre-existing differences between participants systematically influence group composition, allowing for a more rigorous comparison of responses across the two levels of algorithmic management (Creswell, 2014).

The Portuguese TVDE sector constitutes an appropriate context for this study, as drivers' work is extensively mediated by digital platforms and algorithmic systems that influence the

organisation, monitoring, and evaluation of work (Möhlmann et al., 2021; Cram et al., 2022). This context therefore enables the analysis of algorithmic management in a professional setting where the mechanisms represented in the scenarios are part of participants' everyday work reality.

3.2 Questionnaire Design, Experimental Procedure and Measures

The data collection instrument consisted of an online questionnaire developed and administered through the Qualtrics platform. The questionnaire was initially designed in English and was subsequently made available in Portuguese, allowing participants to select the language in which they preferred to respond. The Portuguese version was reviewed to preserve linguistic clarity and conceptual equivalence across the instructions, scenarios and measurement items.

The questionnaire followed a predefined structure. In the first stage, participants received information about the general purpose of the study, the voluntary nature of participation and the treatment of the data collected. After providing informed consent, they answered an eligibility question at the beginning of the questionnaire. Only participants who confirmed that they were currently working as TVDE drivers or had recently worked as TVDE drivers (within the previous six months) were allowed to proceed to the remaining sections.

Eligible participants were then randomly assigned to one of the two experimental conditions. Randomisation was implemented through the Qualtrics Survey Flow, with the "Evenly Present Elements" option activated to promote a balanced distribution of participants across the high and low algorithmic management conditions. In accordance with the between-subjects design, each participant viewed only one of the scenarios (Atzmüller & Steiner, 2010).

Both scenarios described a hypothetical work situation in which a TVDE driver provided services through a digital platform. The high algorithmic management condition involved stronger platform intervention in the direction, monitoring and evaluation of work, whereas the low algorithmic management condition involved greater driver autonomy and less intensive algorithmic supervision. The scenarios were informed by Shi et al. (2025) and their full versions are presented in Annex A.

After reading the scenario, participants completed scenario-based measures of job demands, emotional exhaustion and economic dependence, responding according to how they would

perceive and experience work under the conditions described. Each scale was presented in a separate page and the order of the scales was randomised across participants to reduce potential order and priming effects between constructs (Podsakoff et al., 2003).

Job demands were measured using a five-item scale based on Cheng et al. (2024) and adapted to the context of the present study. This variable aimed to capture participants' perceptions of the level of demand associated with the work described in the scenario, including aspects such as work intensity, pace, effort and required concentration.

Emotional exhaustion was measured using a three-item scale based on Zhao et al. (2026) and adapted to the context of the present study. It assessed the extent to which participants would feel emotionally exhausted if they worked under the conditions described in the scenario.

Economic dependence was measured using a four-item scale based on Maffie (2023) and adapted to the context of the present study. Participants responded to these items according to how they would experience their economic situation if they were working under the conditions described in the scenario. The measure captured perceived difficulty in disengaging from ride-hailing work and financial dissatisfaction related to costs and earnings.

After the main scenario-based measures, a three-item manipulation check was also included to assess whether participants perceived the intended difference between the high and low algorithmic management scenarios. Its placement after the dependent measures is consistent with recommendations to avoid influencing participants' responses to the study variables (Hauser et al., 2018). Sociodemographic and professional characteristics were collected afterwards.

All main scales were assessed using a seven-point Likert scale, ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Higher values indicate higher levels of the construct being measured. The full set of items used for each variable is presented in Table 1.

All questions requiring a response were configured using the Qualtrics Force Response function, with the aim of reducing item-level missing data. This setting was not applied to informational texts, instructions or scenario descriptions, as these elements did not require an active response from participants.

Table 1 *Operationalisation of Variables and Measures*

Variable	Number of items	Items/Operationalisation	Source
Algorithmic management	—	Operationalised through the experimental scenario assigned to each participant: high algorithmic management or low algorithmic management.	Based on Shi et al (2025).
Job demands	5	JD1. My work requires me to work fast. JD2. My work requires me to work hard. JD3. My work requires a lot of physical effort. JD4. My work requires me to concentrate on the job for a long time. JD5. I am very hectic at work.	Based on Cheng et al. (2024).
Emotional exhaustion	3	EE1.I feel emotionally drained from my work. EE2. I feel burned out from my work. EE3. I feel exhausted when I think about having to face another day on the job.	Based on Zhao et al. (2026).
Economic dependence	4	ED1. I feel I cannot stop working rideshare. ED2. I wish I would have never started working rideshare. ED3. Rideshare vehicle maintenance is higher than I expected. ED4. When I started rideshare, I thought I would earn more than I actually do.	Based on Maffie (2023).
Manipulation check	1	MC1. In the scenario, the platform closely monitored drivers' work and performance. MC2. In the scenario, the platform closely monitored drivers' work and performance. MC3. In the scenario, important work-related decisions were made automatically by the platform.	—
Participant Characteristics	8	Gender; age; education level; experience as a TVDE driver; monthly income from TVDE work; average weekly working hours; number of platforms used; professional situation in TVDE.	—

Note. AM = algorithmic management; TVDE = Transporte Individual e Remunerado de Passageiros em Veículos Descaracterizados a partir de Plataforma Eletrónica. All main scale items were measured using a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree").

3.3 Population, Sampling and Data Collection

The target population of this study consisted of individuals with current or recent experience as TVDE drivers in Portugal. This criterion ensured that participants had direct and recent experience with platform-mediated work, allowing them to interpret the experimental scenarios in light of their familiarity with the professional context under analysis.

A non-probability purposive sampling strategy was adopted, as the study targeted a specific professional group that is relatively difficult to access (Saunders et al., 2023). The selection of participants did not aim to obtain a statistically representative sample of all TVDE drivers in Portugal, but rather to collect responses from individuals belonging to the population relevant to the objectives of the research.

The questionnaire was disseminated through several channels in order to reach TVDE drivers with different profiles and work experiences. Data collection was supported by ProTVDE, an organisation connected to the sector, which helped disseminate the study among the driver community. In addition, the questionnaire was shared in Facebook groups related to the TVDE sector, through contacts with drivers on social media, namely Instagram, via WhatsApp, direct contacts and personal or professional networks linked to the sector. Complementary in-person recruitment efforts were also carried out in locations where TVDE drivers were expected to be present, particularly at the airport.

As an initial reference for the recruitment process, the study aimed to obtain approximately 200 valid responses. Whenever possible, data collection aimed to exceed this value allowing for potential exclusions due to incomplete responses, ineligibility or other data quality criteria.

Data collection took place between 12 June 2026 and 22 July 2026. At the end of the data collection period, a total of 338 responses had been submitted.

3.4 Data Preparation and Analysis

After the data collection period ended, responses were exported from Qualtrics and prepared for statistical analysis using IBM SPSS Statistics. The export included randomisation and viewing-order metadata, which allowed the assigned experimental condition and the order of the post-scenario blocks to be verified. In addition, the PROCESS macro extension for SPSS was used to test the mediation, moderation, sequential mediation and moderated mediation analyses included in the study (Hayes, 2022).

Before applying the exclusion criteria, a final experimental condition variable was created and verified for each response and coded as a binary independent variable, with 0 corresponding to the low algorithmic management condition and 1 corresponding to the high algorithmic management condition. Where necessary, the assigned condition was confirmed using the randomisation metadata exported from Qualtrics.

Responses were screened for eligibility, informed consent, completeness and researcher-generated preview or test entries. Although the questionnaire included three manipulation-check items, only the item assessing close platform monitoring was retained for the formal manipulation check and data-quality screening. The screening criterion excluded clear manipulation-check failures, namely responses that were directly inconsistent with the assigned experimental condition, such as perceiving the high algorithmic management scenario as very low or the low scenario as very high.

After data cleaning, composite variables were created for the main constructs by calculating the mean score of the respective scale items. Internal consistency of the multi-item scales was assessed using Cronbach's alpha and the final composite scores were calculated based on the retained items. Descriptive statistics and correlations were examined to characterise the main variables and the final sample. The manipulation check and Hypothesis 1 were assessed using independent-samples t-tests.

Hypothesis 2 was tested using PROCESS Model 4 to examine the indirect effect of algorithmic management on emotional exhaustion through job demands, while Hypothesis 3 was tested using PROCESS Model 1 to assess the moderating role of economic dependence (Hayes, 2022). Additional exploratory analyses used PROCESS Model 8 for moderated mediation and PROCESS Model 6 for sequential mediation.

3.5 Ethical Considerations

The study was developed in accordance with ethical principles related to research involving human participants. Before starting the questionnaire, participants received information about the general purpose of the study, the voluntary nature of participation and the treatment of the data collected. Only participants who provided informed consent were allowed to proceed to the remaining sections of the questionnaire.

Participation was voluntary and participants could leave the questionnaire at any point before submitting their responses. No directly identifiable data, such as names, telephone numbers or email addresses were collected. Responses were treated confidentially and analysed only in aggregate form for academic purposes. Automatically generated technical metadata, such as IP addresses or location-related information, were not used in the analysis and were removed from the final analytical dataset.

4. Results

4.1 Data Screening and Sample Characteristics

Data collection resulted in 338 questionnaire responses. Before conducting the statistical analyses, the dataset was screened according to the criteria described in the methodology chapter. Following the application of these criteria, 129 responses were excluded, resulting in a final analytical sample of 209 TVDE drivers of whom 100 were randomly assigned to the low algorithmic management condition and 109 to the high algorithmic management condition. These two groups represented 47.8% and 52.2% of the final sample, respectively.

Table 2 summarises the main sociodemographic and professional characteristics of the sample. Most participants were male (77.5%) and most were aged 35 years or older. The sample also reflected substantial involvement in TVDE work: 83.7% reported working at least 35 hours per week, including 43.5% who worked 50 hours or more, and 80.9% regularly worked with two TVDE platforms.

Table 2 *Sample Characteristics of the Final Analytical Sample*

Characteristic	Category / summary	%
Gender	Male	77.5
Gender	Female	22.0
Gender	Other	0.5
Age	25–34 years	23.0
Age	35–44 years	25.8
Age	45–54 years	29.7
Education	Secondary education	56.0
Education	Bachelor's degree	33.0
TVDE experience	1–2 years	34.9
TVDE experience	3–5 years	30.6
Monthly TVDE income	EUR 500–999	26.3
Monthly TVDE income	EUR 1,000–1,499	43.1
Weekly working hours	35–49 hours	40.2
Weekly working hours	50 hours or more	43.5
Platforms used	One platform	17.2
Platforms used	Two platforms	80.9
Platforms used	Three or more platforms	1.9
Professional situation in TVDE	TVDE operator / partner company	58.9
Professional situation in TVDE	Own TVDE company	38.3
Professional situation in TVDE	Other	2.9

Note. $N = 209$. The table reports the main categories used to describe the sample profile; percentages may not sum to 100 within each characteristic when less frequent categories are not displayed.

4.2 Manipulation Check

To assess whether the experimental scenarios produced the intended difference in perceived algorithmic management, an independent-samples *t*-test was conducted using the retained manipulation-check item, which assessed close platform monitoring of drivers' work and performance.

As expected, participants assigned to the high algorithmic management condition reported substantially higher perceived monitoring ($M = 5.72$, $SD = 1.12$) than participants assigned to the low algorithmic management condition ($M = 3.51$, $SD = 1.44$), corresponding to a difference of 2.21 points on the seven-point scale. Levene's test was statistically significant, $F = 16.12$, $p < .001$, indicating that the assumption of equal variances was not met. The results of Welch's independent-samples *t*-test were therefore considered.

Consistent with this pattern, the difference between the two experimental conditions was statistically significant, $t(186.26) = -12.31$, $p < .001$, 95% CI [−2.56, −1.85]. The magnitude of this difference was also large (Cohen's $d = 1.73$), indicating that the distinction between the two scenarios was not only statistically significant but also clearly perceived by participants.

These findings indicate that participants assigned to the high algorithmic management scenario perceived substantially stronger platform monitoring than those assigned to the low algorithmic management scenario. The experimental manipulation was therefore considered successful.

Table 3 Manipulation Check by Experimental Condition

Manipulation check item	Low AM, *M* (*SD*)	High AM, *M* (*SD*)	Welch's *t*	*df*	*p*	Cohen's *d*
The platform closely monitored drivers' work and performance	3.51 (1.44)	5.72 (1.12)	−12.31	186.26	< .001	1.73

Note. Low AM: n = 100; High AM: n = 109. Responses were provided on a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Welch's t-test is reported because Levene's test indicated unequal variances.

4.3 Measures and Reliability

Before testing the hypotheses, the internal consistency of the multi-item measures was assessed using Cronbach's alpha. As shown in Table 4, the five-item job demands measure demonstrated good internal consistency, with a Cronbach's alpha of .837. Similarly, the three-

item emotional exhaustion measure showed excellent internal consistency, with a Cronbach's alpha of .923. All items from these two scales were therefore retained.

The initial four-item economic dependence measure showed weak internal consistency, with a Cronbach's alpha of .587. In addition, examination of the item statistics showed that the first item, reflecting the perceived inability to stop working in TVDE, had a corrected item–total correlation of .140, suggesting that it was weakly aligned with the remaining economic dependence items. This item was therefore excluded from the final measure. The detailed item statistics are presented in Appendix, Table 11.

Following its removal, the reliability of the three-item economic dependence measure increased to .679. Although this value remained slightly below the conventional threshold of .70, it represented a clear improvement over the original measure, and the three retained items were averaged for the main analyses.

Composite scores were subsequently calculated by averaging the items retained for each construct, thereby preserving the original seven-point response scale and facilitating the interpretation of the results. Algorithmic management was not included in the reliability analysis because it was manipulated through the experimental scenarios rather than measured through a multi-item scale.

Table 4 *Reliability Analysis of the Study Measures*

Construct	Number of items	Cronbach's α	Final decision
Job demands	5	.837	All items retained
Emotional exhaustion	3	.923	All items retained
Economic dependence - initial measure	4	.587	First item excluded
Economic dependence - final measure	3	.679	Used in the main analyses

Note. α = Cronbach's alpha.

4.4 Descriptive Statistics and Correlations

Table 5 presents the descriptive statistics and correlations among the variables included in the conceptual model. Across the full sample, participants reported a mean level of job demands of 4.95 (SD = 1.31), the mean level of emotional exhaustion was 3.98 (SD = 1.80) and a mean level of economic dependence of 4.36 (SD = 1.43).

The experimental condition was positively and significantly correlated with job demands (r = .315, p < .001) and emotional exhaustion (r = .216, p = .002). Since the experimental

condition was coded from low to high algorithmic management, these associations indicate that participants in the high algorithmic management scenario tended to report higher levels of both job demands and emotional exhaustion. The experimental condition was also positively correlated with economic dependence ($r = .295$, $p < .001$).

Job demands were strongly and positively associated with emotional exhaustion ($r = .645$, $p < .001$), suggesting that participants who perceived their work as more demanding also tended to report higher emotional exhaustion. Job demands were also positively correlated with economic dependence ($r = .641$, $p < .001$). Finally, emotional exhaustion and economic dependence displayed a strong positive association ($r = .652$, $p < .001$), indicating that participants reporting greater economic dependence also tended to report higher emotional exhaustion.

These bivariate associations should be interpreted as preliminary descriptive relationships and do not, by themselves, establish causality, mediation or moderation. The proposed direct, mediating and moderating relationships were therefore examined through the hypothesis tests presented in the following section.

Table 5 *Descriptive Statistics and Correlations*

Variable	*M*	*SD*	1	2	3	4
1. Algorithmic management condition	0.52	0.50	—			
2. Job demands	4.95	1.31	.315***	—		
3. Emotional exhaustion	3.98	1.80	.216**	.645***	—	
4. Economic dependence	4.36	1.43	.295***	.641***	.652***	—

Note. $N = 209$. Algorithmic management condition was coded 0 = low algorithmic management and 1 = high algorithmic management. Job demands, emotional exhaustion and economic dependence were measured on seven-point scales. ** $p < .01$. *** $p < .001$.

4.5 Hypothesis Testing

4.5.1 Direct Effect of Algorithmic Management on Emotional Exhaustion

Hypothesis 1 proposed that drivers exposed to higher algorithmic management would report greater emotional exhaustion.

Participants assigned to the high algorithmic management condition reported higher emotional exhaustion ($M = 4.35$, $SD = 1.83$) than those assigned to the low algorithmic management condition ($M = 3.58$, $SD = 1.67$). This corresponds to a mean difference of

approximately 0.77 points on the seven-point scale, indicating that the high algorithmic management scenario was associated with noticeably higher emotional exhaustion.

Levene's test was not statistically significant ($F = 0.78$, $p = .378$), suggesting that the assumption of homogeneity of variance was satisfied. The results based on equal variances were therefore considered. An independent-samples *t*-test showed that the difference between conditions was statistically significant, $t(207) = -3.18$, $p = .002$. The standardized mean difference was Cohen's $d = 0.44$, indicating a small-to-moderate difference between the experimental conditions.

Overall, these findings indicate that participants exposed to the high algorithmic management scenario reported greater emotional exhaustion than those exposed to the low algorithmic management scenario. Hypothesis 1 was therefore supported.

Table 6 *Emotional exhaustion by experimental condition*

Experimental condition	*n*	*M*	*SD*	*t*	*df*	*p*	Cohen's *d*
Low algorithmic management	100	3.58	1.67				
High algorithmic management	109	4.35	1.83	−3.18	207	.002	0.44

Note. The negative *t* value results from calculating the mean difference as low Algorithmic management minus high algorithmic management.

4.5.2 Mediating Role of Job Demands

Hypothesis 2 proposed that job demands would mediate the positive relationship between algorithmic management and emotional exhaustion. Specifically, the high algorithmic management condition was expected to be associated with higher perceived job demands, which would, in turn, be associated with higher emotional exhaustion. This hypothesis was tested using PROCESS Model 4 (Hayes, 2022).

The first stage of the mediation analysis showed that algorithmic management had a positive and statistically significant effect on job demands ($b = 0.82$, $p < .001$, 95% CI [0.48, 1.16]). This indicates that participants assigned to the high algorithmic management condition reported job demands approximately 0.82 points higher than those assigned to the low algorithmic management condition.

Job demands were, in turn, positively associated with emotional exhaustion, even when the experimental condition was included in the model ($b = 0.88$, $p < .001$, 95% CI [0.73, 1.03]). Thus, participants who perceived their work as more demanding also tended to report higher emotional exhaustion.

The total effect of algorithmic management on emotional exhaustion was positive and statistically significant ($b = 0.77$, $p = .002$, 95% CI [0.29, 1.25]). However, after job demands were included in the model, the direct effect of algorithmic management on emotional exhaustion became small and was no longer statistically significant ($b = 0.05$, $p = .803$, 95% CI [−0.35, 0.45]).

Most importantly, the indirect effect of algorithmic management on emotional exhaustion through job demands was positive and statistically significant ($b = 0.72$, Boot$SE = 0.16$, 95% BootCI [0.43, 1.05]). Since the bootstrap confidence interval did not include zero, the results supported the proposed mediating effect of job demands.

In this way, these findings suggest that the higher emotional exhaustion observed in the high algorithmic management condition was largely explained by the higher job demands reported by participants in that condition. Hypothesis 2 was consequently supported.

Table 7 *Mediation Analysis with Job Demands as Mediator*

Effect	*b*	*SE*	*t*	*p*	95% CI
Algorithmic management → job demands (*a*)	0.8230	0.1722	4.78	< .001	[0.4835, 1.1624]
Job demands → emotional exhaustion (*b*)	0.8804	0.0771	11.42	< .001	[0.7285, 1.0324]
Total effect of algorithmic management (*c*)	0.7747	0.2434	3.18	.002	[0.2949, 1.2546]
Direct effect of algorithmic management (*c′*)	0.0502	0.2012	0.25	.803	[−0.3464, 0.4468]
Indirect effect through job demands (*ab*)	0.7245	0.1578[1]	—	—	[0.4344, 1.0502] [2]

Note. $N = 209$. PROCESS Model 4 was used with 5,000 bootstrap samples. Algorithmic management was coded 0 = low algorithmic management and 1 = high algorithmic management. [1] Bootstrap standard error. [2] 95% bootstrap confidence interval.

4.5.3 Moderation by Economic Dependence

Hypothesis 3 proposed that economic dependence would moderate the relationship between algorithmic management and emotional exhaustion. More specifically, the effect of algorithmic management on emotional exhaustion was expected to be stronger among drivers with higher levels of economic dependence. This hypothesis was tested using PROCESS Model 1 (Hayes, 2022).

The overall model was statistically significant and explained 42.8% of the variance in emotional exhaustion ($R^2 = .428$, $F(3, 205) = 51.10$, $p < .001$). In addition, economic dependence was positively associated with emotional exhaustion ($b = 0.88$, $p < .001$, 95% CI

[0.68, 1.08]), indicating that participants reporting higher economic dependence also tended to report higher emotional exhaustion.

However, the interaction between algorithmic management and economic dependence was not statistically significant ($b = -0.13$, $SE = 0.14$, $t = -0.92$, $p = .357$, 95% CI [−0.40, 0.15]). The additional variance explained by the interaction term was also very small and non-significant ($\Delta R^2 = .002$, $F(1, 205) = 0.85$, $p = .357$).

These results provided no evidence that economic dependence significantly moderated the relationship between algorithmic management and emotional exhaustion. Hypothesis 3 was therefore not supported.

Table 8 *Moderation Analysis with Economic Dependence as Moderator*

Predictor	*b*	*SE*	*t*	*p*	95% CI
Algorithmic management	0.0885	0.1984	0.45	.656	[−0.3026, 0.4796]
Economic dependence	0.8767	0.1013	8.65	< .001	[0.6769, 1.0765]
Algorithmic management × economic dependence	−0.1285	0.1391	−0.92	.357	[−0.4027, 0.1457]

Note. $N = 209$. Unstandardized coefficients are reported. PROCESS Model 1 was used. Algorithmic management was coded as 0 = low algorithmic management and 1 = high algorithmic management. Economic dependence was mean-centered.

4.6 Additional Analyses

4.6.1 Exploratory Moderated Mediation Analysis

Although economic dependence was initially hypothesised as a moderator of the direct relationship between algorithmic management and emotional exhaustion, it may also act as a boundary condition of the mediating mechanism, by shaping the extent to which algorithmic management is associated with higher perceived job demands. Therefore, an additional exploratory moderated mediation analysis was conducted using PROCESS Model 8 (Hayes, 2022). This analysis examined whether economic dependence moderated the indirect effect of algorithmic management on emotional exhaustion through job demands, while also testing whether it moderated the direct effect of algorithmic management on emotional exhaustion.

The results showed that the interaction between algorithmic management and economic dependence significantly predicted job demands ($b = -0.34$, $SE = 0.10$, $t = -3.51$, $p < .001$,

95% CI [−0.54, −0.15]). This indicates that the relationship between algorithmic management and job demands varied depending on drivers' level of economic dependence. Specifically, the effect of algorithmic management on job demands was significant when economic dependence was low ($b = 0.93$, $p < .001$), but not when economic dependence was at medium ($b = 0.24$, $p = .100$) or high levels ($b = -0.15$, $p = .455$). The detailed conditional effects are presented in Appendix, Table 12.

By contrast, the interaction between algorithmic management and economic dependence did not significantly predict emotional exhaustion directly ($b = 0.06$, $SE = 0.13$, $p = .648$). This is consistent with the previous moderation analysis, which showed that economic dependence did not change the direct relationship between algorithmic management and emotional exhaustion.

Importantly, the index of moderated mediation was statistically significant, as its bootstrap confidence interval did not include zero (*index* = −0.19, BootSE = 0.07, 95% BootCI [−0.34, −0.07]). This suggests that the indirect effect of algorithmic management on emotional exhaustion through job demands depended on the level of economic dependence. However, the direction of this conditional indirect effect was not the one initially expected. The indirect pathway from algorithmic management to emotional exhaustion through job demands was significant only when economic dependence was low (*effect* = 0.51, 95% BootCI [0.21, 0.88]), but not when economic dependence was at medium (*effect* = 0.13, 95% BootCI [−0.01, 0.29]) or high levels (*effect* = −0.08, 95% BootCI [−0.29, 0.09]).

Overall, these findings suggest that economic dependence did not strengthen the direct effect of algorithmic management on emotional exhaustion. Nevertheless, it appeared to shape the indirect pathway through job demands, although in a direction contrary to the expected pattern. Therefore, this result should be interpreted cautiously and treated as an additional exploratory finding rather than as support for Hypothesis 3.

Table 9 Exploratory Moderated Mediation Analysis

Effect	Estimate	*SE*/Boot*SE*	*p*	95% CI / BootCI
AM × economic dependence → job demands	−0.3445	0.0982	< .001	[−0.5381, −0.1508]
AM × economic dependence → emotional exhaustion	0.0604	0.1323	.648	[−0.2005, 0.3213]
Conditional indirect effect at low economic dependence	0.5088	0.1711[1]	—	[0.2094, 0.8788][2]
Conditional indirect effect at medium economic dependence	0.1310	0.0765[1]	—	[−0.0086, 0.2890][2]
Conditional indirect effect at high economic dependence	−0.0831	0.0947[1]	—	[−0.2887, 0.0936][2]
Index of moderated mediation	−0.1889	0.0679[1]	—	[−0.3425, −0.0691][2]

Note. $N = 209$. Unstandardized coefficients are reported. PROCESS Model 8 was used with 5,000 bootstrap samples. Low, medium and high levels of economic dependence correspond to the 16th, 50th and 84th percentiles, respectively. [1] Bootstrap standard error. [2] 95% bootstrap confidence interval.

4.6.2 Exploratory Sequential Mediation Analysis

As a further exploratory analysis, PROCESS Model 6 was used to examine whether job demands and economic dependence sequentially mediated the relationship between algorithmic management and emotional exhaustion (Hayes, 2022). The ordering of the mediators was guided by the conceptual assumption that algorithmic management may first be associated with higher perceived job demands, which may in turn be associated with higher levels of perceived economic dependence and contribute to emotional exhaustion. Accordingly, job demands were entered as the first mediator, economic dependence as the second mediator and emotional exhaustion as the dependent variable. Given the exploratory nature of this analysis, this ordering should not be interpreted as establishing a definitive temporal or causal sequence.

The results showed that the high algorithmic management condition was associated with higher job demands ($b = 0.82$, $p < .001$). Job demands were, in turn, positively associated with economic dependence ($b = 0.67$, $p < .001$). When both mediators were included in the final model, both job demands ($b = 0.54$, $p < .001$) and economic dependence ($b = 0.51$, $p < .001$) were positively associated with emotional exhaustion. Further details on these regression paths are presented in Appendix, Table 13.

The total indirect effect of algorithmic management on emotional exhaustion was significant ($b = 0.88$, 95% BootCI [0.54, 1.22]). Looking at the specific indirect effects, the pathway

through job demands alone was significant (b = 0.44, 95% BootCI [0.24, 0.70]), whereas the pathway through economic dependence alone was not significant (b = 0.15, 95% BootCI [−0.02, 0.34]). Importantly, the sequential indirect effect through both job demands and economic dependence was significant (b = 0.28, 95% BootCI [0.15, 0.46]).

These results are consistent with an exploratory statistical pathway in which higher algorithmic management is associated with higher perceived job demands, which are in turn associated with higher levels of economic dependence and emotional exhaustion. However, because this analysis was not part of the original hypothesised model and because economic dependence was primarily conceptualised as a moderator, these findings should be interpreted cautiously and treated as exploratory.

Table 10 *Exploratory Sequential Mediation Analysis*

Indirect effects	Effect	BootSE	p	95% BootCI
Total indirect effect	0.8751	0.1733[1]	—	[0.5427, 1.2207][2]
AM → job demands → emotional exhaustion	0.4431	0.1166[1]	—	[0.2366, 0.6952][2]
AM → economic dependence → emotional exhaustion	0.1505	0.0917[1]	—	[−0.0191, 0.3415][2]
AM → job demands → economic dependence → emotional exhaustion	0.2814	0.0823[1]	—	[0.1459, 0.4619][2]

Note. N = 209. Unstandardized coefficients and effects are reported. PROCESS Model 6 was used with 5,000 bootstrap samples. Algorithmic management was coded as 0 = low algorithmic management and 1 = high algorithmic management. [1] Bootstrap standard error. [2] 95% bootstrap confidence interval.

5. Discussion

As algorithmic systems become increasingly embedded in the organisation of platform work, understanding their psychological implications is particularly relevant in ride-hailing, where key managerial functions are largely exercised through digital platforms (Duggan et al., 2020; Möhlmann et al., 2021). The present study investigated the relationship between algorithmic management and emotional exhaustion among TVDE drivers, with particular attention to job demands as a mediating mechanism and economic dependence as a potential moderator

The positive relationship between algorithmic management and emotional exhaustion is consistent with previous research linking platform-based control to psychological strain, stress and burnout (Apouey et al., 2020; Bartel et al., 2019; Mbare et al., 2024). Algorithmic management operates through mechanisms such as automated task allocation, real-time monitoring, performance evaluation, ratings, incentives, sanctions and automated decision-making (Kellogg et al., 2020; Möhlmann et al., 2021; Cram et al., 2022). In particular, the study extends previous evidence by showing an association specifically with emotional exhaustion, a central dimension of burnout characterised by the depletion of workers' emotional resources (Maslach & Jackson, 1981; Maslach et al., 2001).

However, the mediation results provide a more precise explanation of this relationship. Participants exposed to the high algorithmic management condition perceived the work as more demanding and greater job demands were, in turn, strongly associated with emotional exhaustion. This pattern is consistent with previous research suggesting that algorithmic management can intensify the pace, effort and attentional requirements of platform work (Kim et al., 2021; Reid-Musson et al., 2020; Mbare et al., 2024; Möhlmann et al., 2021). The job demands measure used in the present study captured precisely these aspects, including working fast and hard, sustained concentration, physical effort and a hectic work pace. These aspects are also consistent with the sustained and attentional effort required to remain responsive to platform and customer expectations (Gandini, 2018; Bajwa et al., 2018). The findings therefore suggest that algorithmic management may increase perceived job demands by reorganising work in ways that require greater intensity, sustained attention and continuous responsiveness.

Once job demands were included in the model, the direct relationship between algorithmic management and emotional exhaustion was no longer significant, while the indirect effect through job demands remained significant. Rather than suggesting that algorithmic

management is unimportant, this pattern indicates that its relationship with emotional exhaustion is largely accounted for by job demands. This interpretation is closely aligned with previous research suggesting that job demands may help explain the relationship between platform control and workers' mental health (Cheng et al., 2024).

The mediation findings therefore position job demands as the central explanatory mechanism of the study. Rather than suggesting that algorithmic management is inherently harmful, the findings indicate that its psychological consequences become particularly relevant when algorithmic control translates into more intense and difficult-to-manage working conditions. This interpretation is also consistent with the Conservation of Resources perspective, according to which sustained demands consume workers' cognitive and emotional resources and, when recovery opportunities are insufficient, increase vulnerability to exhaustion (Hobfoll, 1989; Hobfoll et al., 2018; Wang & Ren, 2026).

Economic dependence, by contrast, did not operate as initially hypothesised. Although participants reporting higher levels of economic dependence also tended to report higher emotional exhaustion, there was no evidence that economic dependence significantly moderated the relationship between algorithmic management and emotional exhaustion. Previous research suggests that greater reliance on platform income may reduce workers' ability to refuse tasks, reduce availability or disengage from unfavourable platform conditions without jeopardising their income (Schor et al., 2020; Glavin & Schieman, 2022; Kougiannou & Mendonça, 2025). However, this did not translate into a stronger relationship between algorithmic management and emotional exhaustion in the present study.

The findings therefore suggest that economic dependence may be relevant to emotional exhaustion without necessarily amplifying the relationship between algorithmic management and emotional exhaustion. This is particularly relevant in ride-hailing, where high operating costs, unstable earnings and limited employment protection are common features of the work (Bartel et al., 2019; Niebler et al., 2023) and may contribute to emotional strain independently of the specific level of algorithmic control.

The exploratory moderated mediation analysis revealed an unexpected pattern. Previous research shows that ride-hailing drivers' access to work and income is closely shaped by platform systems, while limited alternatives may make continued participation a constrained rather than entirely voluntary choice (Muralidhar et al., 2022; Möhlmann et al., 2021). Under

these conditions, workers who are more economically dependent might be expected to be particularly responsive to platform demands and evaluative mechanisms, especially when the rules governing allocation and performance remain only partially visible (Rahman, 2021). However, the opposite pattern emerged. The relationship between algorithmic management and job demands was weaker at higher levels of economic dependence and the indirect effect through job demands was significant only at lower levels of dependence.

One possible explanation is that participants reporting higher levels of economic dependence may perceive demanding working conditions as more typical or difficult to avoid, making the contrast between the experimental scenarios less salient. By contrast, among participants reporting lower levels of economic dependence, the shift from lower to higher algorithmic management may have represented a more noticeable change in working conditions. This interpretation was not directly tested and should therefore remain tentative.

The exploratory sequential mediation analysis provided further evidence of the prominence of job demands in the results. Previous research suggests that economic dependence may constrain workers' ability to reduce their exposure to demanding platform work, while financial uncertainty may encourage continued participation under unfavourable working conditions (Schor et al., 2020; Kougiannou & Mendonça, 2025; Louzado-Feliciano et al., 2022). Against this background, the significant sequential indirect effect suggests that job demands and economic dependence may be jointly relevant to the relationship between algorithmic management and emotional exhaustion. However, the indirect pathway through economic dependence alone was not significant, whereas the pathway through job demands alone was significant. This pattern further reinforces the central role of job demands in the present findings.

Because both job demands and economic dependence were assessed after exposure to the experimental scenario, the sequential analysis does not establish their causal or temporal ordering. The significant pathway should therefore be interpreted as an exploratory statistical pattern rather than as evidence of a sequential causal process.

Overall, the findings suggest that job demands emerge as the most consistent mechanism linking algorithmic management to emotional exhaustion. Economic dependence was associated with emotional exhaustion but did not moderate the relationship between algorithmic management and emotional exhaustion as hypothesised. The exploratory

analyses indicate that its role may warrant further investigation, but they do not support a definitive conclusion regarding how economic dependence interacts with algorithmically managed working conditions.

6. Conclusion

6.1 Theoretical Implications

The findings make several contributions to the literature on algorithmic management and ride-hailing work. First, the study contributes to a more specific understanding of the psychological consequences of algorithmically managed work by focusing on emotional exhaustion rather than treating psychological well-being as a broad outcome. Although previous research has documented associations between platform-based control and stress, burnout and poorer psychological well-being (Cheng et al., 2024; Liu et al., 2025; Mbare et al., 2024; Ranga et al., 2025), examining emotional exhaustion specifically provides a more focused understanding of the depletion of emotional resources that may accompany more intensive algorithmic management (Maslach & Jackson, 1981; Maslach et al., 2001).

Second, the findings help clarify how algorithmic management may become psychologically consequential for workers. The mediating role of job demands suggests that its consequences may arise not simply from the use of algorithms, but from the way algorithmic systems influence the intensity, pace and demands of work (Cheng et al., 2024; Kim et al., 2021; Mbare et al., 2024). The study therefore connects research on algorithmic management with the broader literature on psychological well-being at work by identifying job demands as a central pathway through which digital control may become psychologically consequential.

Third, the results provide a more nuanced understanding of economic dependence in platform work. The absence of the hypothesised moderating effect suggests that economic dependence and sensitivity to algorithmic control should not necessarily be treated as equivalent. Participants reporting higher economic dependence also reported greater emotional exhaustion overall, consistent with previous research on economic vulnerability in platform work (Schor et al., 2020; Glavin & Schieman, 2022; Kougiannou & Mendonça, 2025), but the difference between the high and low algorithmic management conditions was not stronger at higher levels of economic dependence. This distinction provides a useful basis for future research on the role of economic dependence in algorithmically managed working conditions.

Finally, the study extends existing research to the Portuguese TVDE sector. Much of the literature on algorithmic management has focused on platform workers in other national contexts (Cram et al., 2022; Möhlmann et al., 2021; Wu et al., 2019), while examining these

relationships in Portugal contributes evidence from a sector characterised by the coexistence of digital platforms, intermediary TVDE operators and individual drivers (Niebler et al., 2023), broadening the empirical contexts in which algorithmic management and its consequences are studied.

6.2 Practical Implications

The findings also have implications for the organisation and regulation of platform work. They suggest that efforts to protect drivers' psychological well-being should not focus solely on the use of algorithmic management, but also on the working conditions that algorithmic systems may create or intensify. Since job demands emerged as the main mechanism linking algorithmic management to emotional exhaustion, particular attention should be given to how platform systems influence work pace, continuous responsiveness, sustained concentration and opportunities for rest and recovery.

For ride-hailing platforms, these findings highlight the importance of considering the cumulative effects of continuous monitoring, time-pressured task allocation, performance evaluation and incentive systems. Algorithmic coordination is a central feature of platform work, but its consequences for workers' well-being depend, in part, on how these practices translate into concrete demands. Greater transparency regarding performance criteria and automated decisions, realistic response requirements and accessible mechanisms for reviewing or contesting unfavourable outcomes may help reduce some of the pressures associated with algorithmically managed work.

The findings are also relevant to TVDE operators, sector organisations and policymakers. In Portugal, drivers' working conditions result from the interaction between platforms, intermediary operators and the regulatory framework. Their assessment should therefore consider not only the formal employment relationship, but also how work is organised and controlled through digital platforms. Greater attention to psychosocial risks associated with intensive digital control, sustainable working practices and adequate information and support channels may be particularly important in a sector where many drivers report substantial weekly working hours and high involvement in platform work.

Although economic dependence did not operate as the expected moderator, its positive association with emotional exhaustion suggests that drivers' economic circumstances should not be overlooked. Measures aimed at promoting more sustainable TVDE work should

therefore consider both the algorithmic organisation of work and the broader economic context in which drivers operate.

6.3 Limitations and Future Research

Despite its contributions, the findings should be interpreted in light of several limitations. First, the study relied on a scenario-based experimental design. This allowed the intensity of algorithmic management to be manipulated while maintaining a comparable work context across participants. However, hypothetical situations may not fully reproduce the complexity of drivers' everyday experiences, which involve continued exposure to algorithmic systems, changing economic circumstances and interactions with passengers, operators and platforms. Future research could complement scenario-based evidence with field studies, longitudinal designs or experience-sampling methods.

Second, although algorithmic management was experimentally manipulated, job demands and emotional exhaustion were measured after exposure to the scenario. The mediation results are therefore consistent with the proposed pathway from algorithmic management through job demands to emotional exhaustion, but do not independently establish the temporal or causal ordering between the mediator and outcome. This is particularly important for the exploratory sequential mediation analysis, since job demands and economic dependence were not experimentally manipulated and their temporal relationship cannot be determined from the present data. Longitudinal or time-lagged research could examine these relationships more directly.

An additional limitation concerns the use of self-report measures. Although appropriate for capturing drivers' perceptions of job demands, emotional exhaustion and economic dependence, such measures may be influenced by individual response tendencies. Future research could combine self-report data with objective or behavioural indicators, such as actual working hours, ride acceptance patterns, platform activity or income variability.

The operationalisation of economic dependence also represents an important limitation. The initial four-item measure showed relatively low internal consistency and the item that most directly captured the perceived inability to stop working in TVDE was removed. Although reliability improved, the final measure may have captured economic pressure and dissatisfaction with financial outcomes more strongly than dependence on platform income in a strict sense. Future research should therefore use more comprehensive measures

distinguishing reliance on platform income, access to alternative income sources, the ability to reduce or interrupt participation and the capacity to absorb periods of lower earnings.

The experimental manipulation represented algorithmic management as a combination of task allocation, monitoring, evaluation, incentives, sanctions and automated decision-making. Although this reflects its multidimensional nature, it does not allow the independent contribution of each mechanism to be identified. Future research could manipulate specific dimensions separately to determine whether particular forms of algorithmic control are especially relevant in generating job demands and emotional exhaustion.

Finally, the study relied on a non-probability purposive sample of TVDE drivers in Portugal. Although this strategy enabled access to the population relevant to the research question, the findings should not be considered statistically representative of all TVDE drivers in Portugal or automatically generalised to other platform workers and national contexts. Replication with larger and more diverse samples, including different platforms, sectors and regulatory environments, would help assess the robustness and generalisability of the relationships identified.

The exploratory findings concerning economic dependence also point to a relevant direction for future research. Rather than considering economic dependence only as a condition that may shape responses to algorithmic management, future studies could examine how it interacts with working conditions over time. In particular, it would be important to understand whether persistent job demands are associated with changes in workers' economic dependence or, conversely, whether greater economic dependence prolongs exposure to demanding working conditions. Longitudinal research could help clarify this potentially dynamic relationship between algorithmic management, job demands, economic dependence and psychological well-being.

Appendix

Table 11 *Item Statistics for the Initial Economic Dependence Measure*

Item	Corrected item–total correlation	Cronbach's α if item deleted
ED1. I feel I cannot stop working rideshare.	.140	.679
ED2. I wish I would have never started working rideshare.	.364	.519
ED3. Rideshare vehicle maintenance is higher than I expected.	.492	.413
ED4. When I started rideshare, I thought I would earn more than I actually do.	.510	.393

Note. The initial four-item economic dependence measure showed weak internal consistency, α = .587. ED1 was removed because of its low corrected item–total correlation (.140), increasing Cronbach's α to .679.

Table 12 *Conditional Effects of Algorithmic Management on Job Demands by Economic Dependence*

Level of economic dependence	Effect	*SE*	*p*	95% CI
Low	0.9278	0.2138	< .001	[0.5062, 1.3494]
Medium	0.2389	0.1443	.100	[−0.0457, 0.5234]
High	−0.1515	0.2025	.455	[−0.5508, 0.2477]

Note. N = 209. Unstandardized conditional effects from PROCESS Model 8 are reported. Low, medium and high economic dependence correspond to the 16th, 50th and 84th percentiles, respectively.

Table 13 *Detailed Sequential Mediation Model Path*

Model paths	*b*	*SE*	*p*	95% CI
Algorithmic management → job demands	0.8230	0.1722	< .001	[0.4835, 1.1624]
Job demands → economic dependence	0.6664	0.0612	< .001	[0.5458, 0.7870]
Job demands → emotional exhaustion	0.5385	0.0886	< .001	[0.3638, 0.7131]
Economic dependence → emotional exhaustion	0.5131	0.0804	< .001	[0.3547, 0.6716]

Note. N = 209. Unstandardized coefficients are reported. PROCESS Model 6 was used. Algorithmic management was coded as 0 = low algorithmic management and 1 = high algorithmic management.

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Annexes

Annex A – Questionnaire

A.1 Participant Information and Informed Consent

My name is Catarina Almeida and I am conducting a study on the work experiences of TVDE drivers in Portugal, as part of our Master's dissertation in Economics of Business and Strategy at the Faculty of Economics of the University of Porto.

This questionnaire aims to better understand how digital platforms and algorithmic management may influence drivers' perceptions of work demands, flexibility, emotional exhaustion and work-related intentions. The questionnaire should take approximately 7 to 10 minutes to complete. ~

There are no right or wrong answers. Please answer as honestly as possible, based on your own perception and experience. Your participation is voluntary, and all responses will be treated anonymously and confidentially. The data collected will be used exclusively for academic research purposes. Please read each question carefully before answering.

Do you agree to participate in this study:

( ) Yes, I agree to participate.

( ) No, I do not agree to participate.

Only participants who answered "Yes" were allowed to continue the questionnaire.

A.2 Eligibility Question

his questionnaire is intended for individuals who currently work or have recently worked (within the last six months), as TVDE drivers in Portugal.

( ) Yes

( ) No

Only participants who answered "Yes" were allowed to continue the questionnaire.

A.3 Experimental Scenarios

A.3.1 High Algorithmic Management Scenario

Imagine that you are working as a TVDE driver through a digital platform. When you are online, the platform algorithm automatically assigns or prioritises trips and provides detailed

instructions through the app, including suggested routes, expected response times, platform standards and performance targets.

While you are working, the algorithm provides real-time information about your work and gives timely feedback on your performance. The platform continuously tracks your location, keeps records of your trips and monitors indicators such as acceptance rate, cancellation rate, customer ratings and trip completion times.

Your work quality is automatically assessed by the algorithm. The platform ranks drivers based on their performance and drivers with better scores may receive priority access to trips, bonuses or cash incentives during specific periods. If a driver does not meet the platform's requirements, the algorithm may reduce access to work opportunities or apply penalties/fines through the app. Most work-related decisions are made automatically, with limited explanation or human intervention.

Please answer the following questions by imagining how you would experience work in the situation described earlier.

A.3.2 Low Algorithmic management Scenario

Imagine that you are working as a TVDE driver through a digital platform. When you are online, the platform provides basic information about available trips, customer requests and possible routes, but you have considerable freedom to decide which trips to accept and how to organise your work.

While you are working, the platform collects only the information needed to complete accepted trips. Your location and trip information are used mainly for operational purposes and the platform does not closely monitor your work behaviour or performance in real time.

Your work quality may be assessed through basic service information and customer feedback, but this information is used mainly to provide transparent feedback rather than to automatically determine consequences. Ratings and indicators do not strongly determine your access to future trips, bonuses or work opportunities. If a problem occurs, decisions can be reviewed with human support and drivers can ask for clarification or appeal platform decisions before any penalties are applied.

Please answer the following questions by imagining how you would experience work in the situation described earlier.

A.4 Post-Scenario Measurement Scales

A.4.1 - Job Demands

Please indicate your level of agreement with the following statements. 1 = Strongly disagree; 7 = Strongly agree

	1 - Strongly disagree	2 - Disagree	3 - Somewhat disagree	4 - Neither agree nor disagree	5 - Somewhat agree	6 - Agree	7 - Strongly agree
My work requires me to work fast.	○	○	○	○	○	○	○
My work requires me to work hard.	○	○	○	○	○	○	○
My work requires a lot of physical effort.	○	○	○	○	○	○	○
My work requires me to concentrate on the job for a long time.	○	○	○	○	○	○	○
I am very hectic at work.	○	○	○	○	○	○	○

A.4.2 - Emotional Exhaustion

Please indicate your level of agreement with the following statements. 1 = Strongly disagree; 7 = Strongly agree

	1 - Strongly disagree	2 - Disagree	3 - Somewhat disagree	4 - Neither agree nor disagree	5 - Somewhat agree	6 - Agree	7 - Strongly agree
I feel emotionally drained from my work.	○	○	○	○	○	○	○
I feel burned out from my work.	○	○	○	○	○	○	○
I feel exhausted when I think about having to face another day on the job.	○	○	○	○	○	○	○

A.4.3 - Economic Dependence

Please indicate your level of agreement with the following statements. 1 = Strongly disagree; 7 = Strongly agree

	1 - Strongly disagree	2 - Disagree	3 - Somewhat disagree	4 - Neither agree nor disagree	5 - Somewhat agree	6 - Agree	7 - Strongly agree
I feel I cannot stop working rideshare.	○	○	○	○	○	○	○
I wish I would have never started working rideshare.	○	○	○	○	○	○	○
Rideshare vehicle maintenance is higher than I expected.	○	○	○	○	○	○	○
When I started rideshare, I thought I would earn more than I actually do.	○	○	○	○	○	○	○

A.5 Manipulation Check

Please answer the following questions based only on the scenario presented at the beginning of the questionnaire, even if your real experience as a TVDE driver is different.

	1 - Strongly disagree	2 - Disagree	3 - Somewhat disagree	4 - Neither agree nor disagree	5 - Somewhat agree	6 - Agree	7 - Strongly agree
In the scenario, the platform relied heavily on algorithms to manage drivers' work.	○	○	○	○	○	○	○
In the scenario, the platform closely monitored drivers' work and performance.	○	○	○	○	○	○	○
In the scenario, important work-related decisions were made automatically by the platform.	○	○	○	○	○	○	○

A.6 Sociodemographic and Professional Characteristics

1. What is your gender?

( ) Male

( ) Female

( ) Other

( ) Prefer not to answer

2. What is your age?

( ) 18–24

( ) 25–34

( ) 35–44

( ) 45–54

( ) 55 or older

3. What is your highest level of education?

( ) Basic education

( ) Secondary education

( ) Bachelor's degree

( ) Master's/Doctoral degree

( ) Other

4. How long have you been working as a TVDE driver?

( ) Less than 1 year

( ) 1–2 years

( ) 3–5 years

( ) More than 5 years

5. On average, what is your approximate monthly income from TVDE work?

( ) Less than EUR 500

( ) EUR 500–999

( ) EUR 1,000–1,499

( ) EUR 1,500–1,999

( ) EUR 2,000 or more

6. On average, how many hours per week do you work in TVDE?

( ) Less than 20 hours

( ) 20–34 hours

( ) 35–49 hours

( ) 50 hours or more

7. How many TVDE platforms do you regularly work with?

( ) 1

( ) 2

( ) 3 or more

8. Which best describes your current situation as a TVDE driver?

( ) I work through a TVDE operator/partner company

( ) I have my own TVDE operator/company

( ) Other, please specify: _____

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