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Leveraging Workforce Flexibility to Navigate Platform-Induced Uncertainty: A study of the Italian Restaurant and Hospitality Sectors

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Leveraging Workforce Flexibility to Navigate Platform-Induced Uncertainty: A study of the Italian Restaurant and Hospitality Sectors

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Abstract

As the platform economy continues to reshape the way we live, work, and consume, firms across industries are increasingly dependent upon platforms to engage with customers. Although prior research highlights how these firms develop strategic responses to cope with risks and vulnerabilities stemming from platform power, it tends to overlook how such uncertainty may affect their internal organizational structures. In this study, we examine how reliance on digital platforms influences firms' employment practices. Drawing on a comprehensive dataset from the Digital Platform Survey (DPS), administered by Italy's National Institute for Public Policy Analysis (INAPP) to over 20,000 hotels and restaurants, we find that platform participation has a positive correlation with the use of non-standard employment relationships (NSERs). Specifically, holding everything else constant, companies that rely on platforms for customer acquisition exhibit roughly 5% higher share of NSERs compared to those that do not. Multiple tests indicate that this effect varies according to structural characteristics, competitive strategies, and contextual factors that expose firms to differing levels of dependence on platforms—findings that support our conjecture of reliance on NSERs being a coping mechanism for platform-induced uncertainty. Our study advances the literature on how firms respond to the risks of platform-based intermediation and contributes to ongoing debates about the labor implications of digital transformation. As platform intermediation intensifies across sectors, these insights have important academic and policy implications.

Keywords: digital platforms; labor; platform dependence; employment relationships, Industrial organization, industrial economics; Cross-sectional large-N, survey; Power, domination, resistance

JEL codes: L22, O23, D22, D80, J21, J23, J82

1. **Introduction**

Contemporary business has been dramatically affected by the increasing centrality of digital platforms, as they have profoundly reorganized social and economic interactions, reshaping competitive landscapes across nearly all industries (Cusumano, Gawer, & Yoffie, 2019; Gawer, 2022; Kenney & Zysman, 2016; Parker, Van Alstyne, & Choudary, 2016). This transformation has sparked widespread enthusiasm as digital platforms provide a technological architecture that can resolve frictions associated with market entry and expansion by reducing entry barriers, search costs and information asymmetries between producers and consumers (Jacobides, Cennamo, & Gawer, 2024; Kretschmer, Leiponen, Schilling, & Vasudeva, 2020; Nambisan, 2017; von Briel, Davidsson, & Recker, 2018). Yet, as these platforms capture an ever-greater share of markets, this initial optimism has been gradually tempered by a growing recognition that the very platforms hailed as engines of business opportunities also create unique risks for the firms that depend upon them to secure customers. By controlling the technological infrastructure that mediates access to customers—and by having unilateral control of the rules that govern participation—these platforms exercise an asymmetrical form of gatekeeping power that results in new forms of dependence for the firms whose relationships are intermediated, which significantly conditions their opportunities, strategies and operational activities (Curchod, Patriotta, Cohen, & Neysen, 2020; Cutolo & Kenney, 2021; Hurni, Huber, & Dibbern, 2022).

In response to these emerging dynamics, recent scholarship has increasingly turned its attention to how firms strategize to mitigate the risks and vulnerabilities imposed by platform dependence. Much of the extant literature has focused on external strategic responses (Oliver, 1991)—such as forging alliances with other firms experiencing similar conditions (X. Chen, Yang, & Wei, 2024; Kuhn & Galloway, 2015), diversifying across multiple platforms (Cutolo, Hargadon, & Kenney, 2021; Hagiu & Wright, 2021), creating alternative income streams (Gastaldi, Appio, Trabucchi, Buganza, & Corso, 2023; Wang & Miller, 2020), or even invoking government intervention — that allow firms to "adapt to the new environment of platforms and undercut their dependence on them" (Balsiger, Jammet, Cianferoni, & Surdez, 2023, p. 167). However, surprisingly, virtually no attention has been paid to the internal organizational adjustments, especially those related to the workforce and employment arrangements, that firms make in order to manage the inherent challenges of platform participation. Given the well-established importance of structural flexibility for thriving in uncertain competitive environments (Allaire & Firsirotu, 1989; Ashford, George, & Blatt, 2007; Davis-Blake & Uzzi, 1993) and the growing interest in the relationship between platforms and labor dynamics (Aloisi & De Stefano, 2022; Kuhn & Maleki, 2017; Vallas & Schor, 2020), this oversight is particularly striking.

Technological transformations have long been known to have significant and even profound impacts on labor and employment relationships (Barley, 1986; Braverman & Stiglitz, 1986; Leonardi, 2021). In this sense, the revolution brought by the adoption of online digital platforms should be no exception: the challenges introduced by the maturation of the platform economy on internal organizational arrangements are important to understand. In this paper, we argue that as firms become more dependent upon platforms, they will tend to adopt more short-term contracts, contingent labor, and other non-standard employment relationships (NSERs) as adaptive mechanisms to buffer the platform-related risks and uncertainties, such as opaque algorithmic control or sudden changes in platform policies. These internal adjustments facilitate cost reduction and represent a way of responding rapidly to market shifts (Davis-Blake & Uzzi, 1993), serving thus as measure against vulnerabilities that accompany uncertainty caused by platform dependence (Cutolo & Kenney, 2021; Stark & Vanden Broeck, 2024).

To empirically evaluate these arguments, we utilize a novel dataset from the Digital Platform Survey (DPS), conducted by the National Institute for Public Policy Analysis (INAPP) to monitor Italian companies in the restaurant and hospitality sectors. Our analysis focuses on 20,638 firms (13,739 observations in the restaurant industry and 6,899 observations in the hospitality sector) with at least one employee, among which 6,920 used digital platforms to reach customers. Our analysis indicates that platform-based firms are approximately 5% more likely than comparable non-platform businesses to adopt non-standard employment relationships. Consistent with our theoretical predictions, we run multiple tests to show that this effect is more (less) pronounced for firms whose structural characteristics (e.g., size), competitive strategies (e.g., multihoming and level of platform-specific investment), or contextual factors (e.g., engaging with dominant vs non dominant platforms) expose them to higher (lower) risks of dependence.

By systematically investigating firms' internal structural responses to platform participation, our study makes two significant contributions. First, it is among the first to illuminate how existing firms configure their internal employment strategies in the face of platform dependence, thus enriching our understanding of organizational responses and firms' agency in the platform economy (Cenamor, 2021; Cutolo & Kenney, 2021; Kude & Huber, 2025). Second, our findings extend the discussion on digital platforms and labor (Garcia Calvo, Kenney, & Zysman, 2023; Vallas & Schor, 2020), by demonstrating that their influence penetrates beyond the direct mediation of work practices (e.g., Scott & Orlikowski, 2012), and the introduction of ambiguous and precarious employment statuses (Kuhn & Maleki, 2017; Sundararajan, 2016), to indirectly affect employment relationships via the constellation of firms participating in platform economy. In illuminating these dynamics, our study advances current understanding of how platforms' infrastructural power affects the internal employment relationships, thereby opening new avenues for future scholarship and offering critical insights for policy-makers.

2. Platform Economy: Power, dependence and systemic uncertainty

Digital platforms have seamlessly woven themselves into the fabric of modern life, transforming everything from how we shop and stream media to how we book travel and even find romantic partners (Stark & Pais, 2021). For all these needs and more, digital platforms have coalesced into powerful intermediaries that enhance the efficiency of interactions between consumers and producers (Evans & Schmalensee, 2016; Parker et al., 2016). Platforms are reorganizing ever more industries (Kenney, Bearson, & Zysman, 2021) and thus forcing traditional companies to enter markets in which platforms intermediate the relationship with customers. The sheer scale and centrality can be seen by the fact that in April 2023, Amazon was the most visited online marketplace in the United States, with about 2.2 billion visits per month (Statista, 2025); in 2024, 43% of travelers used digital platforms for booking hotels[1], and Uber Eats, one of the most popular food delivery service, is used by more than 88 million users across the globe. As a result, an ever-growing number of businesses across industries find that thriving in today's economy requires active participation in these platform-mediated markets. Given their extensive influence, it is no surprise that digital platforms

[1] V. Arora, The Shifting Landscape of Travel Bookings: Skift Research, September 3rd, 2024, last accessed: 23/02/2025.

are under intense scrutiny for the influences they exert over platform -based businesses and society writ-large (Belleflamme & Peitz, 2021; Hunt et al., 2025; Jacobides et al., 2024; Jacobides & Lianos, 2021).

There has been much research into how platforms facilitate efficient market interactions, emphasizing their capacity to enable new business opportunities. By serving as matchmakers, platforms lower entry barriers, reduce search costs, and enhance transaction efficiency, particularly for new or small-scale enterprises (Hui, 2020; Nambisan, 2017; von Briel et al., 2018). Despite the fact that these platforms offer tremendous opportunities, their structural realities reveal contradictory effects for the firms using them to reach customers. Platform-organized marketspaces differ markedly from conventional markets, as they are novel institutional arrangements where the platform itself functions as the central hub, leveraging network effects to "tip" or control the market (Gawer, 2022; Jacobides, Cennamo, & Gawer, 2018; Parker et al., 2016; Stark & Pais, 2021). Due to the resulting winner-take-all (or most) dynamics, reliance on it is not merely a choice— but it is almost necessary (Jacobides & Lianos, 2021; Khan, 2016). As a consequence, by building their business on top of platforms, firms become directly dependent on them for their performance and, if the market is sufficiently concentrated, survival (Cutolo & Kenney, 2021).

This dependence is further exacerbated by the fact that digital platforms thus are not merely neutral transactional spaces but highly contested spaces where power asymmetries shape and constrain business practices (Hunt et al., 2025; Hurni et al., 2022). Platform power is ultimately embedded and expressed not only in its technological infrastructure - including application programming interfaces (APIs), software development kits (SDKs), rating systems and recommendation algorithms– but also in the unilateral control over the information and data produced by all participants (Alaimo & Kallinikos, 2024; Gregory, Henfridsson, Kaganer, & Kyriakou, 2021). In addition, platforms are effectively private regulators (Boudreau & Hagiu, 2009; Parker & Van Alstyne, 2018), as they set rules and design incentive systems and control mechanisms to orchestrate desired actions by all the participants (Altman, Nagle, & Tushman, 2022; L. Chen, Yi, Li, & Tong, 2022; Scholten & Scholten, 2012; Wareham, Fox, & Cano Giner, 2014). For instance, platform owners can promote specific offering (Rietveld, Seamans, & Meggiorin, 2021) and directly orient visibility and channel users' behaviors on the platform (Zhou & Zou, 2023). Similarly, platforms not only set but can change at will the fee structure to regulate access (Boudreau, 2010), regulate the division of income between itself and participants (L. Chen et al., 2022), and even exclude participants for undesirable behavior (Evans, 2012).

Despite the implicit assumption that it is in a platform owner's best interest to be a trusted party and satisfy all participants (Iansiti & Levien, 2004), concerns have been raised about what many define as the platform using unfair business practices, abusing of power and exploiting of other participants for its own benefit. For instance, platform owners can manipulate search rankings to nudge consumers towards their own offerings or revenue-maximizing choices rather than potential best-value or better options (De Los Santos & Koulayev, 2017; Zou & Zhou, 2024). Similarly, by wielding asymmetrical access to data and controlling user traffic, platform owners can leverage privileged information to enter or replicate successful market niches established by firms operating on the platform (Zhu & Liu, 2018). Consequently, firms operating through a platform face a competitive landscape characterized by pervasive uncertainty, vulnerability and precarity that constrains their strategic agency and impacts overall performance (Aguiar & Waldfogel, 2021; Curchod et al., 2020; Cutolo & Kenney, 2021; Jacobides & Lianos, 2021; Nambisan & Baron, 2019; Rietveld, Ploog & Nieborg, 2020).

2.1 Strategic Responses by Platform Dependent Businesses

Despite these challenges, firms do not simply acquiesce and capitulate but, as independent and autonomous actors, they possess agency that they use to develop various coping strategies (Hurni et al., 2022; Kude & Huber, 2025). These responses can be adaptive measures, for instance, investing resources to improve their offering, gaining a more nuanced understanding of the platform environment or its algorithmic systems (Cutolo et al., 2021; Petre, Duffy, & Hund, 2019), or forging alliances with competitors to exchange best practices and enhance competitive positioning (X. Chen et al., 2024; Kuhn & Galloway, 2015). In other cases, as firms "constantly work to ameliorate in their favor the balance of bargaining power between them and platform sponsors" (Daymond, Knight, Rumyantseva, & Maguire, 2023, p. 8), businesses may try to reduce their dependence on a single platform by developing multi-homing or multichannel strategies (L. Chen et al., 2022; Gastaldi et al., 2023; Tavalaei & Cennamo, 2020; Wang & Miller, 2020). In other cases, firms operating on platforms may develop tactics that diverge from the goals and rules laid out by the platform owners. For instance, firms might attempt to evade the affordances and regulations set forth by platform owners through algorithmic manipulation, fake reviews or disintermediation of a platform through establishing a direct connection with customers (Cameron, 2022; Gu, 2024; He, Hollenbeck, & Proserpio, 2022; Luca & Zervas, 2016; Wu, Ngai, Wu, & Wu, 2020). For example, Balsiger et al. (2023) show that hotels often invest resources to try to direct potential customers to their own website.

While it is important to understand the dynamic and sometimes contentious relationship between existing firms and the platform owner, the preponderance of this research is concerned with competitive responses, and far less so, with internal structural responses. However, a firm's ability to build and reconfigure internal resources is equally important to respond and adapt to an unpredictable business environments (Eisenhardt & Martin, 2000). Drawing on research on work and organization studies, we suggest firms' structural coping mechanisms, particularly those employment decisions represent an important response that firms adopt to manage the uncertainty stemming from platform dependence.

2.2 Internal Structural Responses: Leveraging Workforce Flexibility to Mitigate Platform Dependence

Organizational scholarship underscores the critical importance of structural mechanisms in enabling firms to effectively buffer uncertainty (Allaire & Firsirotu, 1989; Davis-Blake & Uzzi, 1993). One particularly salient approach concerns the formation of a flexible workforce—often actualized through greater use of non-standard employment relationships (NSERs) (Atkinson, 1984; Martínez-Sánchez, Vela-Jiménez, Pérez-Pérez, & de-Luis-Carnicer, 2011). Non-standard work relationships refer to all employment relations other than standard, full-time jobs, and include temporary work, contract labor, independent contractors, and on-call work (Kalleberg, 2000; Pfeffer & Baron, 1988). Substantial research shows that firms turn to NSERs as a way to cope with unstable external conditions, whether driven by cyclical demand, regulatory shifts, or broader market volatility (Davis-Blake & Uzzi, 1993; Pfeffer & Baron, 1988; Uzzi & Barsness, 1998), minimizing long-term commitments and preserving operational agility (Kalleberg, 2000; Mangum, Mayall, & Nelson, 1985). Relatedly, engaging contingent or temporary workers also allows firms to quickly plugg specialized skill gaps without incurring the long-term costs associated with hiring and training permanent staff (Abraham & Taylor, 1996; Matusik & Hill, 1998).

Building on these insights, we argue that participation in platform-mediated markets represents a fundamental source of uncertainty that may foster reliance on NSERs. As discussed, firms engaging with digital platforms are particularly vulnerable to sudden demand shifts due to frequent, often opaque and unilateral, changes in algorithmic logic, reconfigurations of the platform policies, and even direct competition from the platform owner itself (Cutolo & Kenney, 2021; Stark & Broeck, 2024; Rietveld et al, 2020; Curchod et al., 2019). Given these structural conditions, a flexible workforce can represent an important yet underrecognized response to the risks stemming from platform dependence. By relying on temporary workers, firms can rapidly adjust to these unpredictable shifts and avoid the rigidity and cost burdens associated with permanent labor. Additionally, such workforce flexibility facilitates the pursuit of cost-reduction strategies that may help firms better hedge against financial vulnerabilities stemming from abrupt changes in the fee structures, commission rates, or content moderation policies (e.g., Liu, Yildirim, & Zhang, 2022; Wu & Zhu, 2022; Zhao, Zervas, & Han, 2024).

Beyond managing demand fluctuations, a flexible workforce may also play a crucial role in coping with the uncertainty associated with the evolution of the platform (Jacobides et al., 2024; Ozalp, Cennamo, & Gawer, 2018). Platform-based business must frequently respond to technical transitions imposed by the platform owner (Gawer, 2014; Tsaruk, 2025). For example, boundary resources such APIs, and SDKs, provided to enable engagement with the platform change and evolve over time (Eaton, Elaluf-Calderwood, Sørensen, & Yoo, 2015). Similarly, various rule changes, introduction of new features (such as advertising on the Amazon Marketplace) can alter the "rules of the game", thereby invalidating firms' business strategies literally overnight .By strategically leveraging temporary workers with expertise in the emerging technologies or features, rather than retrain their entire core staff, firms can enhance their agility in navigating steep learning curves, ensuring they can adapt and capitalize on—rather than be disadvantaged by platform changes (Ozalp et al., 2018).

In sum, we argue that operating on platforms may prompt the adoption of NSERs (e.g., part-time employment, short-term contracts, or project-based hiring) as an adaptive response to the risks and uncertainties inherent in platform participation. This flexible workforce enables firms to absorb volatility in demand caused by changes in the algorithmic structure, terms of usage, and even direct competition from the platform owner (Curchod et al., 2019), reduce labor costs in pursuit of low-cost production strategies to adapt to changes in the pricing models (Rietveld et al., 2020), and enhance technological responsiveness, ensuring firms can pivot quickly when platform-mandated changes reshape the terms of engagement (Ozalp et al., 2018). By adopting these workforce strategies, firms engaging with digital platforms can thus buffer against platform dependence.

3. Research design

3.1 Setting the scene: the Italian case

To investigate the relationship between digital platforms and firms' structural responses, we focus on the Italian restaurant and hospitality industries. This setting is particularly suitable for testing our theoretical arguments for at least two reasons. First, Italy has recently experienced a rapid and extensive diffusion of digital platforms, especially within the service sector. In these industries, online platforms provide several essential functions, such as reservation management, reviews, payment services, and last-mile logistics (Balsiger et al., 2023; Fradkin, 2017; Guarascio & Sacchi, 2018; Scott & Orlikowski, 2012). As platforms have become increasingly central, firms now face substantial financial and operational dependence on the platforms' decisions. Specifically, they effectively control access to customers— and are able to withhold customer data from the firms—and can even pressure them to modify prices or participate in promotions by rewarding compliance (or punishing defiance) with higher (or lower) online visibility (Stark & Vanden Broeck, 2024; Balsiger et al., 2023; Collison, 2020). Second, over the past two decades, Italy has experienced significant growth NSERs, facilitated by regulatory changes that expanded the types of non-standard contracts and relaxed the restrictions on their use (Barbieri & Scherer, 2009). Both the restaurant and hospitality industries are characterized by a strong reliance on NSERs, partly due to the seasonal variability of demand. These two features—substantial platformization and the widespread use of NSERs—make the Italian restaurant and hospitality sectors a suitable empirical context for examining how firms adapt their employment strategies in response to platform dependencies.

3.2 Data sources and variables

To gather data on the firms in the restaurant and hospitality sectors, we use a unique data source, the Digital Platform Survey (DPS) conducted in 2022 by the Italian Institute for Public Policy Analysis (INAPP). The DPS provides comprehensive data on the entire population of businesses operating in the restaurant and tourism sectors. Specifically, it collected detailed information on firms' access to digital markets, their relationships with platforms or in-house digital infrastructures, as well as performance indicators, organizational features, and the quantity and quality of employment among surveyed firms. While most data refer to 2021, certain variables—including turnover, employment, and investment figures—also include information from 2020 and 2019. After excluding firms with no employees and firms that have existed for less than one year, the final sample includes 20,638 firms operating as hotels, tourist resorts, guesthouses, and bed-and-breakfasts (B&Bs) in the tourism industry, as well as full-service restaurants and take-away food establishments in the restaurant sector. Of these firms, 6,920 (33.5%) have been using digital platforms to sell goods and services for at least one year[2]. The dataset comprises 13,739 observations in the restaurant industry (1,650 of which use platforms, representing 12%) and 6,899 observations in the hospitality sector (5,270 of which use platforms, representing 76.4%). To deepen our analysis, we complement the DPS data with geographic information from the Italian Statistical Atlas of Municipalities (ASC-Istat) and the Italian Ministry of Economics and Finance (MEF) [3].

4. Empirical strategy

To empirically test our theoretical arguments, we follow a two-step approach. First, we present evidence that firms engaging with platforms employ a higher proportion of NSERs compared to non-platform using firms. Next, we conduct various tests to examine the underlying mechanism driving this effect, specifically

[2] This selection is motivated by our interest in examining how the use of digital platforms influences the share of NSERs at the company level in 2021. Therefore, we restrict our analysis to companies that have operated on digital platforms for at least one year (i.e., those that began using a platform no later than 2020). For comparison reasons, we also exclude any companies not working with platforms but that have existed for less than one year (i.e., as well as those established before 20209. Additional analyses (available upon request) confirm that our results hold when also considering companies initially excluded—namely, those that started using platforms in 2021 or 2022, as well as those established after 2020.

[3] While ASC-Istat includes information on population density and other physical characteristics of municipalities, the MEF provides details on average incomes in each area.

the structural responses to uncertainty resulting from platform dependence, focusing exclusively on those companies using platforms to reach customers.

4.1 Step 1- Estimation

As a first step, we estimate the share of NSERs in company *i* as a function of the extent to which the company *i* operates on digital platforms, a vector X_i of firm level controls, and a vector Γ_m of geographical controls. Given that our dependent variable takes values between 0 and 1, we employed a fractional probit model (Papke & Wooldridge, 1996; Villadsen & Wulff, 2021), according to the following specification:

$$Non\ standard\ employment\ relationships_i = \alpha_0 + \beta_1 Plat_i + \beta_2 X_i + \beta_3 \Gamma_m + \theta_r + \delta_s + \epsilon_{imrs} \quad (1)$$

Following prior research (Pfeffer & Baron, 1988), we measure $Non\ standard\ employment\ relationships$ in company *i* as the share of fixed-term, collaboration, and on-call contracts over total employment in 2021[4]. These three are the more common forms of non-standard employment used in Italy and, in particular, in the industries included in the analysis. $Plat_i$ is our main explanatory variable and captures whether or not a firm uses a third-party online platform for sales purposes in 2020. This dummy variable was derived from a specific item in the DPS survey, which asks: "The company sells its products or services through: (a) proprietary digital channels (or those of the group to which the company may belong), such as: website, instant messaging services, WhatsApp, custom mobile app; (b) digital channels owned by other economic operators that facilitate or mediate sales (e.g., Airbnb, Deliveroo, Booking); (c) traditional non-digital channels (store, point of sale, sales agents, or other forms of traditional mediation, including exclusive contracts with a single client, etc.)". Therefore, $Plat_i$ takes a value of 1 if companies selected option b) in response to this question.

At the firm level, we controlled for several characteristics that may affect a firm's employment relationship, such as its size (number of employees in logarithmic form), age, investment amount, and turnover per worker expressed in logarithmic form. We also included controls for the use of proprietary online channels and legal incorporation. To account for demand volatility, we created two specific measures: (i) turnover

[4] We compute total employment by summing both dependent and independent workers, including active company partners and external collaborators.

variation over the two years preceding the survey, and (ii) employment change over the two years preceding the survey, both in in logarithmic form. All variables are lagged to mitigate potential simultaneity issues. All firm-level controls are included in X_i of equation [1], with β_2 representing the respective coefficients. We also control for sub-sectors - δ_s - (hotel, resort, B&B, full-service restaurant, and takeaway-only). Moreover, at the geographical level, we control for elements associated with demand volatility and market uncertainty, for instance whether the company is located in a municipality in a mountain area (above 600 meters in elevation), a beach destination or coastal area, or on an island. Additionally, we account for other contextual factors that may affect firms' access to workers, for instance the population density of the municipality, the average income of the municipality in logarithmic form, and the average rent in the municipality. Given the significant geographical heterogeneity across Italian municipalities in terms of structural and productive characteristics, we also include macro-regional dummies (θ_r). The inclusion of geographical variables necessitates the use of appropriate clustering to avoid Moulton bias (Moulton, 1990). Therefore, standard errors have been clustered at the sectoral (*s*), regional (*r*), and municipal (*m*) levels. The term ϵ_{imrs} represents the error term, capturing residual variables not accounted for in the model.

Descriptive statistics for the main variables used in the analysis are presented in Table 1, while the correlation matrix for the continuous variables is provided in the Appendix (Table A1).

Table 1 - Descriptive statistics

	Total	No platform use	Use of platforms
Observations	20,638 (100.0%)	13,718 (66.5%)	6,920 (33.5%)
Dependent variable			
Fixed-term contract employees, 2021	2.935 (11.119)	2.364 (8.913)	4.066 (14.470)
Collaboration contract employees, 2021	0.162 (1.413)	0.119 (0.886)	0.248 (2.094)
On-call contract employees, 2021	0.090 (1.855)	0.043 (0.385)	0.182 (3.155)
Number of employees, 2021	8.036 (26.462)	6.647 (18.762)	10.790 (37.139)
% of non-standard contracts, 2021	0.315 (0.362)	0.304 (0.355)	0.336 (0.375)
Firm-level controls			
Firm size (Log of number of employees, 2020)	1.655 (0.781)	1.631 (0.704)	1.703 (0.912)
Firm age	16.523 (13.201)	16.140 (12.697)	17.282 (14.116)
Subsectors			
Hotels	(18.3%)	(6.3%)	(42.1%)
Resorts	(0.7%)	(0.5%)	(1.1%)
B&Bs	(14.5%)	(5.1%)	(33.0%)
Restaurants	(55.5%)	(73.6%)	(19.8%)
Take-aways	(11.0%)	(14.5%)	(4.1%)
Legal incorporation of the firm			
Individual enterprise	(37.8%)	(42.0%)	(29.6%)
LLCs, LLPs	(60.8%)	(56.9%)	(68.6%)
PLCs, Inc.s	(0.5%)	(0.2%)	(1.0%)
Cooperatives	(0.9%)	(0.9%)	(0.8%)
Consortia and others	(0.0%)	(0.0%)	(0.0%)
Use of own website	(39.6%)	(22.1%)	(74.3%)
Log of investment per capita 2020 with depreciation	2.132 (3.446)	1.820 (3.157)	2.749 (3.884)
Log of R&D and marketing investment per capita 2020	0.153 (0.957)	0.109 (0.794)	0.240 (1.213)
Log of trademark investment per capita 2020	0.034 (0.441)	0.023 (0.373)	0.054 (0.551)
Log of IT investment per capita 2020	0.465 (1.523)	0.379 (1.371)	0.636 (1.773)

Log of software investment per capita 2020	0.133 (0.847)	0.072 (0.604)	0.255 (1.180)
Log turnover per capita, 2020	9.608 (1.994)	9.574 (1.962)	9.676 (2.055)
Log rate of turnover change, 2019-2021	-0.310 (1.981)	-0.310 (1.957)	-0.310 (2.028)
Log employees change, 2019-2021	-0.041 (0.344)	-0.040 (0.346)	-0.043 (0.340)
Geographical controls			
Log income per capita in municipality, 2021	9.943 (0.192)	9.933 (0.191)	9.963 (0.191)
Log rent per capita in municipality, 2021	7.230 (0.476)	7.161 (0.461)	7.368 (0.475)
Population density	902.594 (1,497.292)	830.125 (1,394.711)	1,046.255 (1,673.109)
Degree of urbanization			
Urban	(27.0%)	(24.3%)	(32.4%)
Semi-peripheral	(43.8%)	(46.6%)	(38.4%)
Rural	(29.2%)	(29.1%)	(29.2%)
Mountain	(14.0%)	(12.6%)	(16.7%)
Beach	(37.4%)	(34.2%)	(43.6%)
Island	(1.1%)	(0.9%)	(1.5%)
Coastal	(41.3%)	(38.7%)	(46.2%)
Geographical area of Italy			
North-West	(20.1%)	(20.9%)	(18.5%)
North-East	(26.3%)	(25.2%)	(28.4%)
Center	(22.2%)	(22.1%)	(22.5%)
South and Islands	(31.4%)	(31.8%)	(30.6%)
Platform-only variables			
Years on the platform			7.640 (5.016)
Multihoming			(42.5%)
Platform used in Restaurants			
Just Eat			(24.8%)
Deliveroo			(18.8%)
Glovo			(6.6%)
The Fork			(6.7%)
Others			(43.0%)
Platform used in Hospitality			
Booking			(89.0%)
Airbnb			(4.1%)
Expedia			(0.8%)
Others			(6.1%)
Platform-related investments			(30.1%)

Standard deviation is reported for continuous variables, while percentages are reported for factor variables. For platform-specific and platform-industry-specific variables, percentages are calculated over the relevant set of observations.

As Table 1 shows, companies using digital platforms have a slightly higher percentage of NSERs (34%) compared to those not using digital platforms (30%). However, it is interesting to note that among precarious forms of employment, companies relying on platforms have nearly double the number of employees on fixed-term and collaboration contracts, and more than four times the number of on-call contracts, which are the most precarious forms of work arrangements. All correlations in the data are reasonably low. We further controlled for multicollinearity using variance inflation factors (VIFs). Results show a mean VIF of 1.9, well below the traditional threshold of 5 (Cohen et al., 2015), and highest VIF value does not exceed 7.06. Thus, multicollinearity is unlikely to influence our analyses.

4.2 Step 1 - Results

Table 2 presents the results of our analysis. We find that, on average, β_1 —the coefficient associated with the use of digital platforms—is positive and significant across all specifications (Model 1-4) indicating that, *ceteris paribus*, firms using digital platforms are more likely to rely on NSERs compared to non-platform using firms. More specifically, holding other control variables constant (Model 2) the use of platforms to reach customers is associated with a 5% higher share of NSERs. Importantly, it is worth note that we include the log change in turnover and employees over the 2019-2021 period as a control variable. Both coefficients are positive and significant (see Table A2 in the Appendix), implying that, as expected, demand dynamics do affect companies' decisions concerning NSERs. Nonetheless, this does not eliminate the significance of platform participation as an additional driver.

An important concern is that, ideally, we would need to compare the employment decisions of highly similar companies both on and off digital platforms. However, companies do not join platforms randomly and consequently there are likely significant differences between firms operating on platforms and those that do no. Therefore, to increase the confidence in our results, we restrict the analysis on firms having a common support after matching procedure without replacement performed through a matching within the radius caliper of 5% and weight observations according to the quality of the matching (Rosenbaum & Rubin, 1983; Abadie & Imbens, 2016).[5] As the propensity score model reports (Model 3), β is still positive and significant, suggesting that the differences between firms using or not using platforms is not driving our results[6]. Finally, to rule the possibility that our results are distorted by the Covid-19 pandemic, we used the share of non-standard employment in 2019 as dependent variable and a subset of controls referring to 2019 and previous years. Model 4 replicates our results focusing on the pre-Covid period.

[5] Firms were matched based on the following characteristics: number of employees in 2020 (logarithmic form), firm age, revenue per employee in 2020 (logarithmic form), per capita income in the municipality in 2021 (logarithmic form), per capita rent in the municipality in 2021 (logarithmic form), urban area, rural area, mountain area, coastal and beach area, population density, and geographic location (North-West, North-East, and Southern Italy). The kernel density distributions of treated and untreated firms before and after matching are presented in the Appendix (Figures A1 and A2).

[6] This result remains consistent even when we exclude a percentage of treated observations with the lowest propensity score density (trimming procedure). In this case, the number of observations is reduced to 19,891, and the coefficient remains marginally significant ($p = 0.059$) and positive ($\beta_1 = 0.04$)

Table 2 - Effect of platform adoption on the firm-level share of non-standard employment relationships

	(1)	(2)	(3)	(4)[a]
Use of platforms	0.0891***	0.0509*	0.0574*	0.0659*
	(0.0152)	(0.0216)	(0.0227)	(0.0275)
Firm-level controls	No	Yes	Yes	Yes
Geographic controls	No	Yes	Yes	Yes
Constant	-0.513***	3.305***	3.632***	4.034***
	(0.00871)	(0.870)	(0.997)	(0.934)
Observations	20,472	20,331	20,325	16,715
χ^2	34.56	1576	1343.47	1164
Adjusted R^2	0.000837	0.0468	0.0542	0.0542
Base log-pseudolikelihood	-12749	-12663	-10906	-10448
Log-pseudolikelihood	-12738	-12070	-8132	-9882
# clusters		5549	5,547	5142

p-value: *** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses. Standard errors are clustered at the municipality, region, area, industry level.
[a] The population for 2019 excludes those firms that are born after 2018. All firms which joined platforms after 2018 are likewise excluded. Controls for 2019 are either time-invariant or simultaneous due to data availability. Firm-level controls are: sub-sectors, log of number of employees 2019, firm age, legal incorporation, use of website, log of turnover per capita 2019. Geographic controls do not change.

4.3 Step 2- Estimation

Thus far, we have established that firms operating on digital platforms tend to rely more heavily on NSERs than those whose activities are not intermediated by platforms. In the next step, we analyze the underlying mechanisms driving this relationship. We have already ruled out the possibility that this effect is primarily, and simply, driven by demand volatility, having controlled for fluctuations in turnover over the previous two years. Instead, we have argued that this association reflects a coping response to the uncertainty and vulnerability endemic to the techno-economic structure of digital platforms. To test this, we identify key variables that moderate the power asymmetries experienced by platform-dependent firms, thereby also affecting the direct effect of platform participation on reliance on NSERs. Specifically, we examine *firm size*, *firm multihoming*, *firm engagement with platform leaders*, *platform-specific investments* as potential moderators. This selection is grounded in the notion that the degree of techno-economic dependence on platforms and the resulting risks vary based on firms' structural, competitive, and contextual characteristics (Cutolo & Kenney, 2021; Hurni et al., 2022; Rietveld et al., 2020; Uzunca, Sharapov, & Tee, 2022). Consequently, if the positive relationship observed in the first step is indeed a function of platform-induced risks, we expect it to be more pronounced under conditions of greater dependence, and reduced when firms can more effectively mitigate platform power.

Firm size is the first variable considered. Smaller firms tend to have lower bargaining power vis-a-vis the platform, which limits their ability to negotiate more favorable commissions with platforms and/or be shielded from exploitative platform behaviors (Balsiger et al., 2023; Uzunca et al., 2022). Their constrained resource availability further diminishes their capacity to maintain strategic autonomy by investing in the promotion of alternative channels. In contrast, larger firms often benefit from stronger brand recognition that reduces reliance on platform intermediation. For instance, in 2019, Hilton's president and CEO, Chris Nassetta, announced that 75% of Hilton's overall business originated from its direct channels. As a result, we anticipate a stronger positive association between platform participation and NSER reliance among smaller firms, given their comparatively limited capacity to resist or mitigate platform power.

Previous research shows that relationship-specific investment is a central element in the theory of the firm (Hart, 1995). Platform participation often requires specific investments, such as acquiring specialized technological knowledge, certifications, or infrastructure (Engert, Evers, Hein, & Krcmar, 2022; Wareham et al., 2014). For instance, in the hospitality sector, hotels often buy new software (e.g., channel managers, CM) with direct interfaces to specific platforms. These investments, while important to support a firm's performance on a specific platform, become obviously significantly less valuable outside it. Consequently, making such investments can likely deepen firms' lock-in and increase their vulnerability (Dyer, Singh, & Hesterly, 2018). Therefore, we expect a stronger correlation between platform use and NSERs reliance in the presence of platform-specific investments.

Following the same logic, we also expect this effect to be attenuated when firms are better positioned to manage platform dependence. Among the various strategies firms can deploy to mitigate platform power, platform scholars have emphasized the important role of multihoming—the participation in multiple platforms simultaneously (Gastaldi et al., 2023; Hagiu & Wright, 2021). Multihoming enables firms to diversify risk and broaden their market reach, thereby reducing dependence on any single platform (Cutolo & Kenney, 2021; Nzembayie, Evers, & Urbano, 2024). Accordingly, we anticipate that firms engaging with multiple platforms will exhibit a weaker relationship between platform participation and NSER reliance.

Another key factor influencing firms' experience of platform induced risk is the competitive dynamics of the platform. Prior research suggests that as platforms mature and consolidate their market dominance, they increasingly prioritize profit-maximizing strategies that often come at the expense of firms operating within their ecosystems (Gawer, 2022; Rietveld et al., 2020). This shift in governance practices heightens uncertainty and precariousness for participating businesses. Accordingly, we expect that engagement with platforms holding substantial market shares will be positively associated with NSER reliance.

To summarize, we hypothesize that firms' engagement with platform market leaders, and platform-specific investments will amplify (i.e., positively moderate) the relationship between platform participation and reliance on NSERs, whereas multihoming and firm size will mitigate (i.e., negatively moderate) this effect. Table 3 summarizes the variables we considered to examine the dependence mechanisms underlying the association between platform participation and reliance on NSERs.

Table 3 - Summary of tests and associated predictions to support the dependence mechanisms driving the positive association between a firm's engaging with digital platforms and the share of NSERs

Variable	Operationalization	Rationale	Prediction on NSERs
Size	Categorical variable based on the OECD size classes by number of employees. 1= Micro firms (1-9 employees) 2= Small firms (10-49) 3= Medium-sized firms (more than 50).	Smaller firms are more prone to dependence.	Positive relationship between micro firms (compared to small ones) and use of NSERs, and negative for medium firms (compared to small ones).
Multihoming	Binary variable: 1 if a firm undertakes multihoming, i.e., using more than one third-party online platform at the same time; 0 otherwise (Based on Specific DPS information regarding the name of the main platforms companies rely on.)	Firms using multiple platforms to access their customers reduce their overall level of dependence.	Negative correlation between the use of multihoming and NSERs.
Engagement with platform market leader	Binary variable: 1 if firm engage with the leading platform (Booking.com in hospitality and Just Eat in restaurants), 0 otherwise. (Market leaders are identified leveraging specific DPS information regarding the name of the main platforms companies rely on.)	Firms operating on dominant platforms experience a higher level of dependence.	Positive correlation between the use of dominant platforms and reliance on NSERs.
Platform specific investment	Binary variable: 1 if the company has undertaken specific investments to work with a platform (e.g., equipment, advertising, visibility in online rankings); 0 otherwise. (Based on specific DPS item)	Firms making platform-specific investments are more locked-in, therefore experience higher levels of dependence.	Positive correlation between platform-specific investment and wider use of NSERs.

To test the specific mechanisms that can increase or reduce companies' exposure to higher or lower levels of dependence, we estimate equation [2], focusing exclusively on companies using digital platforms and concentrating our attention on four key mediating factors that we expect to either mitigate or reinforce firms' dependency on platforms.

$$Non\ standard\ employment\ relationships_i = \alpha_0 + \beta_1 MediatingFactor_i + \beta_2 X_i + \beta_3 \Gamma_m + \theta_r + \delta_s + \epsilon_{imrs} \quad (2)$$

The variable $MediatingFactor$ alternately takes the value of 1 in the following cases: if the platform-dependent company is a micro-firm (0 otherwise); if the firm adopts a multihoming strategy (0 otherwise); if the firm operates on a dominant platform (0 otherwise); and if the firm has made platform-specific investments (0 otherwise). Firm level - X_i – and geographical controls - Γ_m – are the same as those included in equation [1], as well as sub-sectors δ_s and macro-regional θ_r dummies.

4.4 Step 2 - Results

Table 4 presents the results of our analyses.

Table 4 - Effect of platform adoption on the firm-level share of non-standard employment relationships – Mediating factors

	(5)	(6)	(7a)Restaurants	(7b)Hospitality	(8)
Firm size: Micro-firms	0.229***				
	(0.0476)				
Medium firms	-0.502***				
	(0.0813)				
Multihoming		-0.0677***			
		(0.0262)			
Using platform market leader			-0.00934	0.156***	
			(0.0502)	(0.0519)	
Investments on the platform					0.0744***
					(0.0274)
Firm-level controls	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes
Constant	3.697***	4.136***	1.953	4.812***	4.253***
	(1.332)	(1.334)	(2.122)	(1.610)	(1.338)
Observations	6,830	6,830	1,622	5,208	6,830
χ^2	801.4	790.7	123.5	763.1	795.0
Adjusted R^2	0.0676	0.0653	0.0238	0.0863	0.0653
Base log-pseudolikelihood	-4358	-4358	-1037	-3321	-4358
Log-pseudolikelihood	-4064	-4074	-1013	-3035	-4074
# clusters	2184	2184	697	1487	2184

p-value: *** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses. Standard errors are clustered at the municipality, region, area, industry level.
Base category for firm size is Small firms

Model 5 examines the relationship between company size and the share of NSERs among platform dependent firms. As predicted, we find that micro-firms (fewer than nine employees) are more likely than small firms (10–50 employees) to rely on NSERs ($\beta = .229$, $p < .001$). Specifically, micro-firms have, on average and ceteris paribus, a 22% higher share of NSERs. By contrast, the coefficient for medium firms (more than 50 employees) is negative and significant, supporting our hypothesis that the size of a company operating on platforms affects the degree experiencing greater dependence on platforms.

Model 6 examines the impact of multihoming. As hypothesized, when companies use more than one digital platform, their reliance on NSERs is reduced: on average and ceteris paribus, multihoming firms have 6% fewer NSERs compared to those using a single platform. Notably, multihoming appears to weaken the relationship between platformization and the use of NSERs, suggesting that this strategy may reduce their dependency on any single platform, and consequently the need to rely on NSERs.

We also find that companies relying on dominant platforms (i.e JustEat in the restaurant sector, model 7a, and Booking in the hospitality industry Model 7b) exhibit a relatively higher share of NSERs. However, the coefficient is positive and statistically significant only for the hospitality sector, where companies engaging with the market-leading platform are associated with a 15% higher share of NSERs compared to those working with other platforms. This finding supports the idea that dependence tends to be stronger when platform services are concentrated in the hands of one or a few dominant platforms. Another explanation for the significance in the hospitality sector is that while platforms in the restaurant industry tend to specialize in specific functions (e.g., Yelp for reviews, The Fork for reservations, and Takeaway for delivery), in hospitality, functional integration prevails (e.g., Booking.com integrating marketplace, reviews, and reservations), thereby increasing the power asymmetries.

Lastly, Model 8 presents the results for firms that have made platform-specific investments. On average and *ceteris paribus*, these firms exhibit a 7% higher share of NSERs compared to other companies also engaging with platforms but without undertaking such investments. Therefore, we can assess that platform-specific investments may create a lock-in effect, leading to an even stronger reliance on NSERs as an adaptive response to platform dependency.

5. Discussion

Over the past three decades, digital platforms have become significant forces in an increasing number of industries and economic sectors, developing into the "dominant institutional form of the digital age" (Gawer, 2022). As a result, for many firms, engaging with digital platforms is no longer a matter of choice but rather a competitive necessity. Existing research has already shown the transformative impact of platforms' infrastructural power on firms' competitive strategies (Cutolo et al., 2021; Hagiu & Wright, 2021), highlighting the importance of both harnessing a platform's resources and mitigating its power (Kude & Huber, 2025). This study provides the first evidence that the dynamics of "platformization" also affect firms' structural organization—specifically, their employment relationships. Our analysis indicates that firms using platforms are approximately 5% more likely than comparable businesses not using platforms to adopt NSERs, such as the use of temporary workers, collaboration, and on-call workers. We further demonstrate that this shift can be interpreted as a response to the vulnerabilities and risks engendered by platforms' power asymmetries. Indeed, factors that heighten a firm's dependence on a given platform (e.g., platform-specific investments or engagement with dominant platform) amplify the relationship between platform participation and the use of NSERs, while strategies that reduce platform dependence (e.g., multihoming or the size of a firm) attenuate the effect.

Our work makes several important contributions.

First, we advance growing management and organizational literature exploring the challenges faced by existing firms as they interact with and through platforms to deliver their offerings to users (Cenamor, 2021; Cutolo & Kenney, 2021; Hänninen & Smedlund, 2021; Kude & Huber, 2025; Nambisan & Baron, 2019; Zhu & Liu, 2018). This growing body of work highlights that platform-organized markets are precarious for participants due intense competitive dynamics (Boudreau, 2012), fast-evolving users' preferences (Panico & Cennamo, 2022; Rietveld & Eggers, 2018), and, perhaps most importantly, the contradictory logics and power asymmetries that characterize their relationship with the platform owner (Curchod et al., 2020; Hurni et al., 2022; Jacobides et al., 2024). In this regard, prior work explicitly recognizes the increasing need for firms to develop strategic responses that mitigate the vulnerabilities and the risks endemic to platform participation (Gastaldi et al., 2023; Nzembayie et al., 2024; Wang & Miller, 2020; Wen & Zhu, 2019). Yet, this growing stream of research has largely concentrated on competitive responses and how they affect firms' financial or innovative performance, overlooking the internal mechanisms a firm may deploy to mitigate these uncertainties.

Our work directly contributes to a better understanding of "the digital platform battlefield and the power dynamics that will continue to shape their societal impacts" (Hunt et al., 2025, p. 266), by showing that traditional workforce strategies play a critical role in responses to the uncertainties created in platform-mediated markets. Platform dependent firms in fact repurpose established employment strategies to address new forms of instability and precarity stemming from that dependence. Our findings thus point to the incompleteness of extant focus on strategic positioning and competitive decisions to understand the consequences of platform power and the responses of platform participants (Hurni et al., 2022; Kude & Huber, 2025), underscoring the need for a more integrated perspective that also take into account the internal adaptations that firms undertake to operate in platform-organized markets.

Moreover, while our findings support the notion that platform participation constitutes an existential experience of uncertainty for firms (Curchod et al., 2020; Cutolo & Kenney, 2021), our empirical evidence indicates that the precarious conditions associated with platform dependence do not manifest uniformly. The differential effects observed in our analysis of the mechanisms suggest that, although all firms relying on platforms are, to some extent, exposed to the threat of platform dependence, the risks and challenges they face vary significantly due to firm-level characteristics, strategic choices, and contextual conditions. This insight adds to recent research aimed at refining our understanding of the features and circumstances that render firms more or less dependent on platforms (Gastaldi et al., 2023; Nzembayie et al., 2024; Rietveld et al., 2020), by suggesting that this dependence is best conceptualized as a multidimensional continuum—or "grayscale"—rather than a singular, monolithic state of precariousness.

This paper also offers important insight for studies centred on the impact of platforms on labor (Aloisi & De Stefano, 2022; Cirillo, Guarascio, & Parolin, 2023; Garcia Calvo et al., 2023; Kuhn & Maleki, 2017; Vallas & Schor, 2020). While much has been written about the contingent and precarious nature of platform-mediated labor (Schor & Attwood-Charles, 2017), and how platforms' infrastructural characteristics steer and constrain the agency of platform workers (Cameron, 2022; Curchod et al., 2020), there has been far less study of whether the instability brought by platform environments has consequences in terms of employment relationships for the constellation of firms engaging with digital platforms. This indirect effect becomes particularly significant as a growing number of traditional industries are intermediated by platforms (Kenney et al., 2021): our findings suggest that this continued expansion is likely to further increase the number of workers integrated into NSERs—and, consequently, intensify precarity.

Of course, while such strategies can bolster adaptability and mitigate some of the risks inherent in platform participation, they also prompt concerns about broader labor market implications (Kalleberg, 2000). Historically, these types of NSERs were largely concentrated in industries already marked by high volatility; yet the indirect effects of platformization now appear to be increasing the amount temporary, contingent, and otherwise precarious work across an expanding array of sectors. This trend suggests that, as platforms continue to mature and become ever more constitutive of the modern economy (Kenney & Zysman, 2016; Parker et al., 2016), the relationships between platforms and their broader socio-economic environment will likewise evolve. Although platforms are often viewed as private, closed, managed economic spaces (Altman et al., 2022; Boudreau & Hagiu, 2009), the effects of platformization reverberate well beyond their immediate boundaries, affecting industries, labor markets, and society at large (Srnicek, 2017). Understanding this is essential to developing strategies and tools to properly address the distribution of risk and benefit between the platform owners and the rest of participants (Jacobides & Lianos, 2021).

This directly brings us to the policy implications of our study. Our findings echoes previous works emphasizing the need for well-designed competition policies to limit the power of platforms without compromising the positive effects they have on existing businesses(Cusumano, Gawer, & Yoffie, 2021; Jacobides & Lianos, 2021). To address techno-economic dependence and its unintended organizational and structural consequences to materialize, various policy instruments can be considered. Cross-platform competition could be favoured by limiting the share of services (e.g., reservations, marketplace) managed by a single platform in the industry. This would make easier to multihome which, as our results have shown, could reduce the uncertainty that platform-dependent firms face. Likewise, measures directed at ensuring algorithmic transparency are crucial to prevent platforms from abusing the power stemming from their control of digital infrastructures and information. In this regard, the EU Digital Markets Act may serve as an effective regulatory anchor, requiring platforms to: provide transparency on the criteria used to manage and adjust rankings and ratings; ensure that companies have access to the input data used to determine these rankings; and refrain from penalizing firms that operate on other platforms or their own proprietary websites. To make sure that such policies are implemented in a timely and effective manner, sector-specific regulatory bodies, including members of employer association and trade unions, could prove very helpful as the nature of firm-platform relationships (and related policy problems) tend to vary significantly across industries.

Moreover, as one of the consequences of platform dependence could be an excessive diffusion of NSERs which, in turn, may lead to a generalized worsening of the quality of employment with potentially negative social and macroeconomic implications, labour policy can also play an important role. Specifically, measures that limit companies' reliance on NSERs can help prevent excessive workforce precarity, especially in industries characterized by high uncertainty. A similar objective might be achieved by restricting the number of times a temporary contract can be renewed for the same worker.

So far, companies have taken relatively little legal action against digital platforms, as they voluntarily accept their terms and conditions and, in theory, always have the option to leave. On the other hand, a number of policy initiatives aimed at countering the power of platforms have been put forth, particularly in Europe (e.g., the DMA, the Digital Service Act). Yet, to what extent such measures will be actually able to avoid situations of techno-economic dependence remains open question. As discussed, governments should actively safeguard the independence of small-scale producers and, relatedly, counteract the potential indirect effects of platform power on their workforce. This is a crucial point, as the pervasive growth of NSERs can have negative implications from a micro (i.e., non-standard workers tend to face greater uncertainty and this may negatively affect their propensity to consume or to invest in training), macro (i.e., a high incidence of non-standard work can have a negative impact on aggregate demand and, hence, on growth) and social (i.e., non-standard work is not rarely associated with situation of social hardship, including difficulties to meet essential needs at the individual as well as at the household-level) point of view.

5.1 Limitations & Future Research

Naturally, our study has some limitations that offer opportunities for future research. First, one potential limitation arises from the specific setting in which it was conducted. While we believe our findings generalize to other contexts, cross-country as well as sectoral heterogeneities need to be systematically investigated. Platforms tend to operate differently according to the peculiar structural/institutional context they are dealing with (i.e., relevance of digital vs non-digital channels, country and industry-specific norms protecting non-platform incumbents, data-related regulations imposing algorithmic transparency). As a result, it would be important to empirically assess how companies' adaptive strategies in platform-organized sectors vary depending on country- and industry-specific characteristics, as well as factors such as the level of unionization, workers' bargaining power, and government interventions. For instance, Spain recently introduced a reform aiming at curbing the use of temporary contracts for workers. Does the presence of different regulations affect firms' internal adjustment to platform uncertainty? Such comparative evidence could be very useful in providing policy advice. Beyond sector-specificities, we can expect that the theoretical mechanisms outlined in this analysis may be generalized to other sectors that have recently experienced similar dynamics, such as, firms selling through a platform, though in each sector there should be specific peculiarities.

Second, while our analysis provides robust evidence accounting for various confounding factors and self-selection, a key improvement would be to strengthen the causal plausibility of our findings. This could be achieved by explicitly addressing unobserved heterogeneity through the inclusion of firm-level fixed effects. In this regard, the availability of longitudinal data can give a substantial help. For instance, this may allow using the Covid-19 pandemic as an exogenous shock to test whether companies facing a different degree of dependency vis-à-vis platforms tend to adopt heterogeneous adaptive strategies, that include managing internal employment relationships. No less important, longitudinal data would enable exploration of the dynamic nature of the firm-platform relationship, in line with one of the key hypotheses put forth by Cutolo and Kenney (2021), which suggests that as time progresses, the uncertainty firms face when interacting with platforms increases.

Lastly, it would be crucial to complement quantitative evidence—possibly based on high-quality administrative data on hiring and labor contract separations—with qualitative studies involving in-depth sectoral and firm-level analyses. This would help further validate our predictions and identify underlying dynamics that quantitative survey data may not be able to adequately capture.

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APPENDIX

Table A.1 –Correlations matrix – Continuous variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Fixed-term, 21	-															
2. Collaboration, 21	0.047	-														
3. On-call, 21	0.021	0.036	-													
4. Employees, 21	0.784	0.111	0.111	-												
5. Firm Size	0.436	0.144	0.083	0.507	-											
6. Firm age	0.046	0.032	-0.001	0.052	0.130	-										
7. Log investment	0.106	0.034	0.014	0.102	0.155	0.055	-									
8. Log R&D investment	0.021	0.036	0.003	0.025	0.045	- 0.009	0.272	-								
9. Log trademark investment	0.121	0.015	0.012	0.107	0.071	0.000	0.140	0.229	-							
10. Log IT investment	0.066	0.017	0.011	0.070	0.084	0.046	0.468	0.225	0.131	-						
11. Log software investment	0.077	0.046	0.005	0.090	0.107	0.016	0.274	0.332	0.206	0.299	-					
12. Log turnover per capita, 20	0.057	0.007	-0.014	0.062	0.115	0.044	0.171	0.024	0.031	0.088	0.046	-				
13. Log income in municipality	0.024	0.016	0.021	0.082	0.139	0.009	0.010	-0.003	0.011	0.033	0.026	0.060	-			
14. Log rent in municipality	0.057	0.035	0.012	0.058	0.080	0.052	0.057	0.017	0.012	0.049	0.040	0.062	0.499	-		
15. Population density	0.026	0.007	0.023	0.083	0.114	-0.080	-0.041	-0.010	0.012	-0.019	0.019	0.009	0.451	0.319	-	
16. Log change in turnover, 19-21	0.026	0.000	0.000	0.017	0.028	-0.018	0.054	0.018	0.011	0.019	0.013	0.157	-0.043	-0.040	-0.038	-
17. Log change in personnel, 19-21	0.068	0.005	0.018	0.053	-0.000	-0.033	0.077	0.032	0.001	0.045	0.014	0.057	-0.042	-0.044	-0.046	0.273

Table A.2 - Effect of platform adoption on the firm-level share of non-standard employment relationships

	(1)	(2)	(3)	(4)
Use of platforms	0.0891***	0.0509*	0.0574*	0.0659*
	(0.0152)	(0.0216)	(0.0227)	(0.0275)
Resorts		-0.151	-0.103	-0.127
		(0.0939)	(0.0950)	(0.0977)
B&Bs		-0.322***	-0.330***	-0.175***
		(0.0365)	(0.0378)	(0.0389)
Restaurants		-0.0151	0.00783	-0.000885
		(0.0331)	(0.0348)	(0.0350)
Take-aways		-0.154***	-0.102*	-0.0954*
		(0.0397)	(0.0429)	(0.0433)
Log rate of turnover change, 2019-2021		0.0245***	0.0267***	
		(0.00468)	(0.00531)	
Log employees change, 2019-2021		0.245***	0.230***	
		(0.0263)	(0.0288)	
Log of number of employees, 2020 (size)		0.232***	0.207***	
		(0.0128)	(0.0136)	
Log of number of employees, 2019 (size)				0.336***
				(0.0144)
Firm age		-0.00548***	-0.00458***	-0.00603***
		(0.000608)	(0.000666)	(0.000671)
LLCs, LLPs		0.0746***	0.138***	-0.0146
		(0.0191)	(0.0232)	(0.0200)
PLCs, Inc.s		-0.368***	-0.302**	-0.459***
		(0.111)	(0.117)	(0.110)
Cooperatives		-0.00623	-0.00440	-0.118
		(0.0830)	(0.0931)	(0.0937)
Consortia and others		0.434	0.514	0.174
		(0.297)	(0.332)	(0.286)
Website		0.113***	0.126***	0.0791***
		(0.0180)	(0.0197)	(0.0208)
Log of investment per capita 2020		0.00486	0.00471	
		(0.00251)	(0.00281)	
Log of R&D and marketing inv. per capita 2020		0.0127	0.0142	
		(0.00825)	(0.00904)	
Log of trademark investment per capita 2020		0.0330*	0.0264	
		(0.0160)	(0.0162)	
Log of IT investment per capita 2020		-0.00749	-0.00817	
		(0.00539)	(0.00601)	
Log of software investment per capita 2020		-0.0164	-0.0136	
		(0.00942)	(0.0103)	
Log turnover per capita, 2020		0.00228	-0.000412	
		(0.00417)	(0.00472)	
Log turnover per capita, 2019				-0.0165***
				(0.00451)
Log income per capita in municipality, 2021		-0.544***	-0.587***	-0.619***
		(0.0888)	(0.101)	(0.0966)
Log rent per capita in municipality, 2021		0.170***	0.179***	0.176***
		(0.0260)	(0.0297)	(0.0281)
Urban		-0.0926**	-0.0982**	-0.106**
		(0.0307)	(0.0338)	(0.0352)
Rural		0.0103	0.0115	0.0184
		(0.0238)	(0.0286)	(0.0248)
Mountain		0.185***	0.197***	0.186***
		(0.0311)	(0.0359)	(0.0331)
Beach		0.0639	0.0823	0.0367
		(0.0426)	(0.0521)	(0.0473)
Island		0.192**	0.166	0.164*
		(0.0885)	(0.0887)	(0.0969)
Coastal		0.0170	-0.0100	0.0502
		(0.0421)	(0.0528)	(0.0466)
Population density		-4.43e-05***	-4.83e-05***	-3.79e-05**
		(1.21e-05)	(1.22e-05)	(1.28e-05)
North-West		0.0447	0.0854*	0.0311
		(0.0347)	(0.0391)	(0.0331)
North-East		0.0637*	0.0912*	0.0676*
		(0.0328)	(0.0367)	(0.0323)
South and Islands		-2.74e-06	0.0385	-0.0194
		(0.0319)	(0.0367)	(0.0326)

Constant	-0.513***	3.305***	3.632***	4.034***
	(0.00871)	(0.870)	(0.997)	(0.934)
Observations	20,472	20,331	20,325	16,715
χ^2	34.56	1576	1343.47	1164
Adjusted R^2	0.000837	0.0468	0.0542	0.0542
Base log-pseudolikelihood	-12749	-12663	-10906	-10448
Log-pseudolikelihood	-12738	-12070	-8132	-9882
# clusters		5549	5,547	5142

Robust standard errors in parentheses, p-value: *** p<0.001, ** p<0.01, * p<0.05. Standard errors are clustered at the municipality, region, area, industry level. Base categories are: Small firms, Individual enterprise, Semi-peripheral urbanization, Center.

[a]The population for 2019 excludes those firms that are born after 2018. All firms which joined platforms after 2019 are likewise excluded. Controls for 2019 are either time-invariant or simultaneous due to data availability. Firm-level controls are: sub-sectors, log of number of employees 2019, firm age, legal incorporation, use of website, log of turnover per capita 2019. Geographic controls do not change.

Table A.3 - Effect of platform adoption on the firm-level share of non-standard employment relationships – Mediating factors

	(5)	(6)	(7a -Restaurants)	(7b -Hospitality)	(8)
Micro-firms	0.229***				
	(0.0476)				
Medium firms	-0.502***				
	(0.0813)				
Multihoming		-0.0677**			
		(0.0262)			
Not using platform market leader			-0.00934	0.156**	
			(0.0502)	(0.0519)	
Investments on the platform					0.0744**
					(0.0274)
Resorts	-0.00216	-0.0338		-0.0606	-0.0255
	(0.122)	(0.119)		(0.122)	(0.121)
B&Bs	-0.233***	-0.272***		-0.192***	-0.279***
	(0.0409)	(0.0403)		(0.0427)	(0.0403)
Restaurants	0.0209	0.0280			0.0382
	(0.0419)	(0.0417)			(0.0422)
Take-aways	0.0812	0.0961	-0.0790		0.102
	(0.0771)	(0.0764)	(0.0672)		(0.0765)
Log rate of turnover change, 2019-2021	0.0347***	0.0352***	0.0374**	0.0361***	0.0357***
	(0.00790)	(0.00784)	(0.0143)	(0.00908)	(0.00788)
Log employees change, 2019-2021	0.259***	0.262***	0.151*	0.329***	0.263***
	(0.0442)	(0.0443)	(0.0629)	(0.0592)	(0.0445)
Log of number of employees, 2020 (size)	0.308***	0.168***	0.0696**	0.209***	0.161***
	(0.0314)	(0.0185)	(0.0252)	(0.0241)	(0.0184)
Firm age	-0.00215*	-0.00194	-0.00753***	-0.00120	-0.00180
	(0.00102)	(0.00101)	(0.00217)	(0.00118)	(0.00102)
LLCs, LLPs	0.219***	0.246***	-0.0341	0.346***	0.241***
	(0.0398)	(0.0397)	(0.0549)	(0.0496)	(0.0397)
PLCs, Inc.s	-0.132	-0.172	-0.982***	-0.135	-0.193
	(0.134)	(0.135)	(0.285)	(0.144)	(0.134)
Cooperatives	0.0202	0.0727	-0.152	0.171	0.0712
	(0.168)	(0.166)	(0.289)	(0.198)	(0.167)
Consortia and others	0.855*	0.835		0.887	0.846
	(0.499)	(0.592)		(0.620)	(0.584)
Website	0.124***	0.142***	0.0857	0.150***	0.119***
	(0.0318)	(0.0320)	(0.0450)	(0.0439)	(0.0322)
Log of investment per capita 2020 with depreciation	0.00339	0.00302	-0.000180	0.00403	0.00269
	(0.00399)	(0.00398)	(0.00758)	(0.00459)	(0.00400)
Log of R&D and marketing investment per capita 2020	0.0126	0.0135	0.00808	0.0152	0.0127
	(0.0115)	(0.0115)	(0.0210)	(0.0137)	(0.0116)
Log of trademark investment per capita 2020	0.0308	0.0290	0.0558*	0.0262	0.0287
	(0.0207)	(0.0206)	(0.0310)	(0.0256)	(0.0206)
Log of IT investment per	-0.00428	-0.00533	0.0226	-0.0111	-0.00585

capita 2020					
	(0.00864)	(0.00860)	(0.0148)	(0.0104)	(0.00866)
Log of software investment per capita 2020	-0.0107	-0.00884	-0.0176	-0.0110	-0.0115
	(0.0130)	(0.0129)	(0.0242)	(0.0151)	(0.0130)
Log turnover per capita, 2020	-0.00363	-0.00411	0.000589	-0.00814	-0.00497
	(0.00694)	(0.00691)	(0.0120)	(0.00806)	(0.00688)
Log income per capita in municipality, 2021	-0.667***	-0.665***	-0.311	-0.792***	-0.682***
	(0.140)	(0.140)	(0.229)	(0.169)	(0.140)
Log rent per capita in municipality, 2021	0.229***	0.224***	0.108	0.259***	0.220***
	(0.0415)	(0.0416)	(0.0864)	(0.0469)	(0.0412)
Urban	-0.0962	-0.0942	-0.124	-0.0935	-0.105*
	(0.0494)	(0.0492)	(0.0667)	(0.0641)	(0.0498)
Rural	-0.0340	-0.0378	-0.139	-0.0102	-0.0388
	(0.0448)	(0.0449)	(0.0891)	(0.0512)	(0.0449)
Mountain	0.257***	0.250***	0.376***	0.232***	0.259***
	(0.0545)	(0.0546)	(0.109)	(0.0624)	(0.0543)
Beach	-0.0309	-0.0247	-0.000900	-0.0532	-0.0200
	(0.0853)	(0.0854)	(0.158)	(0.0995)	(0.0854)
Island	0.274*	0.273**	0.225	0.231	0.280**
	(0.115)	(0.115)	(0.470)	(0.121)	(0.114)
Coastal	0.0587	0.0542	0.0317	0.0824	0.0536
	(0.0848)	(0.0851)	(0.158)	(0.0997)	(0.0850)
Population density	-4.93e-05**	-4.94e-05**	-3.87e-05**	-5.82e-05*	-5.00e-05**
	(1.87e-05)	(1.83e-05)	(1.48e-05)	(2.89e-05)	(1.83e-05)
North-West	0.0604	0.0550	0.0164	0.0530	0.0578
	(0.0466)	(0.0467)	(0.0817)	(0.0559)	(0.0469)
North-East	0.0738	0.0687	0.0351	0.0782	0.0762*
	(0.0455)	(0.0458)	(0.0776)	(0.0552)	(0.0463)
South and Islands	0.0593	0.0542	-0.00735	0.0611	0.0509
	(0.0488)	(0.0492)	(0.0864)	(0.0584)	(0.0492)
Constant	3.697**	4.136**	1.953	4.812**	4.253***
	(1.332)	(1.334)	(2.122)	(1.610)	(1.338)
Observations	6,830	6,830	1,622	5,208	6,830
χ^2	801.4	790.7	123.5	763.1	795.0
Adjusted R^2	0.0676	0.0653	0.0238	0.0863	0.0653
Base log-pseudolikelihood	-4358	-4358	-1037	-3321	-4358
Log-pseudolikelihood	-4064	-4074	-1013	-3035	-4074
# clusters	2184	2184	697	1487	2184

Robust standard errors in parentheses, p-value: *** p<0.001, ** p<0.01, * p<0.05. Standard errors are clustered at the municipality, region, area, industry level. Base categories are: Small firms, Individual enterprise, Semi-peripheral urbanization, Center.

Figure A1 – Kernel densities of the propensity score, before matching

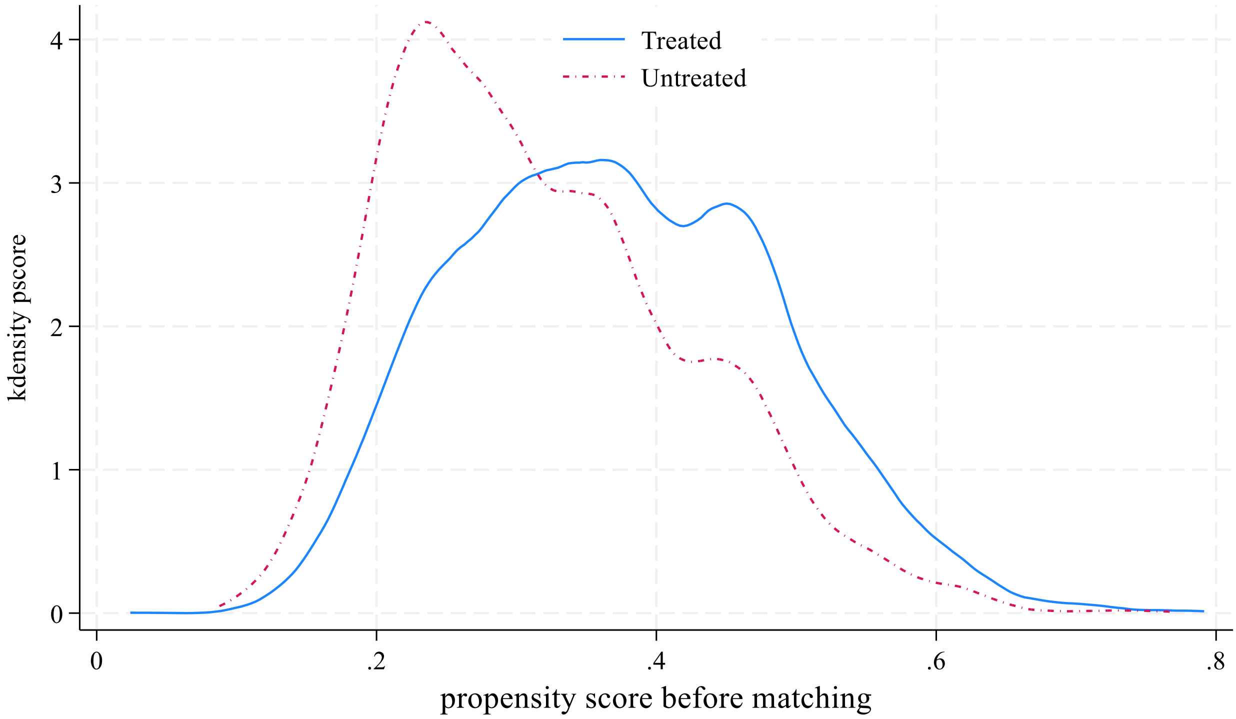

Figure A2 – Kernel densities of the propensity score, after matching