At the Mercy of the Market? E-Commerce and Warehouse Work in the United States[1]

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Abstract: The popularity of e-commerce has expanded the importance of warehouses while simultaneously reducing the role of brick-and-mortar stores. The authors test the proposition that competition for online consumers translates into harsher work conditions inside the warehouses that make e-commerce possible. They use data from three surveys, one providing a national sample of U.S. warehouse workers and two targeting those at Walmart and Amazon, the country's largest retailers. As predicted, job quality and worker well-being are lower in warehouses engaged in e-commerce compared to traditional warehouses, but this relationship varies across the two firms. The negative effects are most pronounced at Amazon, which follows an e-commerce strategy hinging on speedy delivery. They pale in significance at Walmart, which emphasizes low prices. Future research should explore whether firms vying for e-commerce business are likely to emulate Amazon, converging on a set of labor practices that diminish work conditions in a growing sector.

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Of the many effects wrought by the logistics revolution currently reshaping the U.S. economy, one of the more important consequences has been the reduced role for brick-and-mortar stores in supporting the vascular system on which consumer capitalism now relies. Accelerated by the growing popularity of e-commerce, the result has been transformative for the retail industry. In this paper, we explore what this shift means for the workers who make online shopping possible.

Mounting research suggests that this group's experiences depart in notable ways from the experiences of those who labor in older lines of work. Retail has long been cited as a hub for low-quality jobs, due to fierce competition and narrow profit margins. Meager wages, few opportunities for advancement, and limited hours are common pain points felt by a sprawling frontline workforce that includes cashiers, stockers, and baggers (Tilly and Carré 2017). E-commerce, however, implicates workers in a different sort of workplace and subjects them to new, arguably more intense job pressures. These workers toil behind the scenes, usually inside warehouses and delivery depots. Their employers' dedication to offering cheap goods and responding quickly to continually fluctuating customer orders, along with their use of the latest monitoring technologies, expose jobholders to heightened demands, emanating from both employers and consumers (Gautié, Jaehrling, and Perez 2021; Theodore and Gutelius 2025).

Yet, focused as they are on a single type of workplace or firm, existing studies have been unable so far to pinpoint the sources of declining job quality associated with e-commerce work. As it now stands, the declines might be more attributable to the kinds of workplaces that have been studied (e.g., warehouses or delivery depots) than to the exigencies of online retailing. Or they might owe largely to the specific firms under investigation (e.g., Amazon, which has been the object of much of the prior research). As a result, it is not clear whether the harsh working conditions that have come to be associated with e-commerce, mostly through examinations of

Amazon (e.g., Delfanti 2021; Miszczyński and Zanoni 2025; Vallas, Johnston, and Mommadova 2022), are driven by economic pressures stemming from competition for online consumers or something else. We aim to address this gap by exploring how business-to-consumer distribution systems impinge on job quality in warehousing, a sector that holds great significance for the future of retail work (Litwin et al. 2022), low-wage work more broadly (Gautié and Schmitt 2010), and labor relations in the U.S. and overseas (Alimahomed-Wilson and Reese 2020).

We do so by comparing working conditions within and across different types of warehouses, in what we believe is the first effort of its kind. Our analysis relies on a unique array of survey data drawn from overlapping samples: one representing workers employed in the U.S. warehouse industry generally and a second, company-focused sample representing workers employed by the country's two largest users of warehouse workers: Amazon and Walmart. The first question we pose is whether workers employed in e-commerce facilities (i.e., business-to-consumer warehouses) encounter job conditions that are worse than those found at facilities that serve brick-and-mortar stores or other companies (i.e., business-to-business warehouses). Equally important, we ask whether the effects of e-commerce are consistent across the industry or are instead more pronounced at the most dominant firms, including Amazon (which has aimed at e-commerce since its inception in 1994) and Walmart (which launched online shopping in 2000). We take each company to be emblematic of two central features of e-commerce business models: Amazon is committed to fast delivery, and Walmart is committed to low prices. As such, we view their comparison as a test of whether one of these commitments has a more pronounced negative effect on job quality. All in all, our approach helps us to unravel the potentially competing effects of e-commerce, industry, and company strategy on working conditions.

The results of our analysis are twofold. First, we find evidence in the industry writ large that warehouses devoted to e-commerce impose especially disadvantageous conditions on their workforce. Second, we find that the adverse effects of e-commerce are more pronounced at Amazon than at Walmart. Workers employed at Amazon's business-to-consumer sites experience harsher conditions on multiple indicators of job quality—greater work intensity, poorer access to job rewards, a greater sense of unfairness regarding company practices, elevated risks to worker safety, more severe injuries, and diminished well-being—compared to those who work at other Amazon operations. These effects are largely subdued or even absent at Walmart, where adverse job conditions are prevalent but not rooted in e-commerce as such.

Several implications flow from these findings. We highlight that business models built around online—rather than face-to-face—service provision are likely to erode job quality for frontline workers. The elevation of the consumer, empowered by technologies that enable online shopping, is at the root of this erosion. Usually understood to be dyadic relationship between workers and managers, the employment relationship takes a triangular form in retail and becomes especially pronounced in e-commerce, favoring customers and employers at workers' expense. The contrasting findings between Amazon and Walmart suggests that this imbalance is greatest when speed is an employer's main priority. At the same time, this contrast also suggests firms have not converged on a single way to manage e-commerce operations. The risk, given Amazon's position as the e-commerce leader, is that retailers such as Walmart, Target, Home Depot, and others engaged in the struggle for market share feel compelled to emulate the model that Amazon has pioneered, which implicitly prioritizes consumers above workers in the name of quick delivery. If so, regulatory interventions protecting workers against the worst effects of the on-demand economy, which have begun to appear in several states, will acquire added urgency.

E-commerce and Job Quality

The ascendance of e-commerce has no doubt remade the retail industry. After its rough-and-tumble start during the late 1990s dotcom boom, e-commerce has gained greater acceptance among shoppers, as retailers adapt their online offerings and lure a growing number of customers into making purchases on the internet. In the U.S., e-commerce sales now account for 16% of all retail sales, double the share they did 10 years ago (U.S. Department of Commerce 2024).

One of e-commerce's defining features is the suspension of frictions that previously dampened consumers' leverage over retailers (Borenstein and Saloner 2001). Less constrained by time and space, consumers can turn to the internet on a whim, rather than having to travel to a store during open hours. The relative ease of access has major consequences for consumers and retailers alike. Fewer geographic constraints mean shoppers have significantly more options at their disposal, generating heightened competition among businesses for their cash. By the same token, retailers no longer need to be located in the same geographic area to vie for the same customers, further sharpening competition (Brynjolfsson, Hu, and Rahman 2009; Chava et al. 2024; Forman, Ghose, and Goldfarb 2009). Fewer temporal constraints mean consumers can shop at all hours of the day, whenever they feel the urge. As a result, retailers encounter a greater and more variable flow of demand, both in the time period over which they receive orders—which has shifted from a typical workweek to 24 hours a day, 7 days a week—and in daily, weekly, and monthly fluctuations in order volume (Hübner, Holzapfel, and Kuhn 2015).

This decoupling from time and space alters both consumers' and retailers' behavior. When shopping online, consumers enter the exchange with a new set of expectations, instilled in

part by what e-commerce retailers have offered in a bid to gain more business: they want lower prices, a full and more expansive inventory, and quick delivery (Fernie, Fernie, and McKinnon 2014; Weill and Vitale 2001). Having helped cultivate these expectations, retailers have also built the infrastructure to meet them. "Agile" is an industry watchword (Anderssen, Riederer, and Zaidi 2021), with online sellers prioritizing the provision of a wide range of cheap products, rapid response times—measured sometimes in hours, and openness to frequent product returns, all while extending personalized recommendations, tailored to individual customers (Bijmolt et al. 2021; Colla and Lapoule 2012; Hagberg, Sundstrom, and Egels-Zandén 2016; Melacini et al. 2018). Some of these strategies do not apply to brick-and-mortar settings; those that do are magnified in e-commerce, particularly the commitment to speedy delivery and low prices.

Beholden to these dual commitments, retailers engaged in e-commerce implicitly adopt what Curchod et al. (2020) call "new configurations of power."[2] In many jobs, the most consequential workplace relation is dyadic: that between manager and worker, with the former enjoying primary authority to direct, monitor, discipline, and evaluate the latter to ensure desired levels of performance. In retail and similar forms of service work, the presence of the consumer introduces a new node into employment relationship, creating a "triangle" (Leidner 1993) between workers, managers, and customers. Compared to their brick-and-mortar peers, however, this triangle is weighted even more heavily against e-commerce workers. Here, the workers are the material movers, pickers, packers, and clerks who labor not at stores but behind the scenes, most typically inside warehouses not directly open to the public.[3] Whereas those who work in

[2] Although they are studying a relationship between online sellers and consumers mediated by a third party—e.g., eBay, Airbnb—several of the features of the employment relationship that Curchod et al. (2020) say create asymmetries are also present in direct e-commerce selling.

[3] Authors' calculations using the U.S. Bureau of Labor Statistics Current Population Survey shows that in the warehousing and electronic shopping industries, these are the most common occupations.

brick-and-mortar retail can expect one-on-one interactions with customers, e-commerce workers confront customers *en masse*, sometimes processing more than 100,000 orders a day (Ahire, Malhotra, and Jensen 2015). Because they are physically separated from the source of orders, these workers can do little to directly resist customer demands or collaborate with them in an alliance against their supervisors, strategies that have proved beneficial in face-to-face service work (Lopez 2010). Moreover, the customer bloc that e-commerce workers confront, so much larger in size than that encountered by workers in traditional retail establishments, brings increased leverage to the exchange, leading managers to further subordinate the interests of workers in the name of quick and cheap customer satisfaction, unbalancing the triangle even more so. Their stance conjoins customers and managers vis-à-vis workers in a "coalition of interest" (Curchod et al. 2020), in which firms predominate yet customers figure prominently, however physically distant they may be from the logistics operations involved in order fulfillment. The hyper-dedication to customers, then, should impact the work conditions experienced by those whose job it is to make online shopping possible, meriting investigation into how e-commerce affects job quality in the warehousing industry.

Warehouse Work as Essential to E-commerce

The warehouse industry has more than tripled in size in the past 20 years in the U.S., significantly outpacing growth in the overall labor force (U.S. Bureau of Labor Statistics 2024). This expansion has been driven by competition for control over consumer markets, which has compelled retailers to invest a growing proportion of their resources in their e-commerce divisions (Ratchford et al. 2022). Business-to-consumer (B2C) warehouses, often called fulfillment centers, have proliferated as a result. These serve final customer demand, typically flowing in from online orders rather than other businesses (Boysen, De Koster, and Weidinger

2019). From 2016 to 2019, B2C operations made up more than a quarter of all new industrial leases in the U.S., rising to 40% following the onset of the pandemic (Price 2022).

While modern warehouses have always aimed to "save time," prioritizing low labor costs and the efficient handling of goods (Orenstein 2019), the commitment retailers have made to offer consumers some combination of low prices and quick delivery times sets B2C facilities apart from their traditional business-to-business (B2B) equivalents in a number of ways. This is certainly true when it comes to operations: in B2C facilities, the variety of products in stock is larger; order assembly is more labor intensive; delivery schedules are tighter; customer returns add costs; operational expenses are greater; and demand is more variable (Boysen et al. 2019; Theodore and Gutelius 2025). A number of studies suggest this is also true when it comes to labor practices. In B2C facilities, the pace of work and the tools managers use to enforce it have increasingly involved the application of technologies (including robotics, digital surveillance, and algorithmic scheduling) that entail directing and monitoring worker motions in real-time and pegging mistakes on individuals. These features threaten to expose workers to more punitive policies (Struna and Reese 2020; Vallas et al. 2022), unpredictable schedules (Gent 2024; Kowalski 2022), unsafe working conditions (Burtch, Greenwood, and Ravindran 2025), and monotonous, intensive work tasks (Briken and Taylor 2018; Delfanti 2021; Gautié et al. 2021).

The evidence that managerial control over workers in e-commerce warehouses has been amplified in the name of customer service is nevertheless limited in several key respects. One, almost all the findings come from studies of Amazon fulfillment centers. Two, perhaps more important, the literature largely neglects the role of the consumer in structuring the organization of warehouse work. As such, it is difficult to say whether any problematic features associated

with this type of work are best attributed to the industry as a whole, e-commerce as a segment of the industry, or the strategies pursued by a particular firm.

We suspect that the triadic relationship linking customers, workers, and managers characteristic of e-commerce is a main culprit for diminished job quality in B2C warehouses. It is well known that the strategy firms choose in response to competition has a primary influence on the working conditions they create (Carré et al. 2012), and when low prices are a key basis of competition, firm leaders often fixate on keeping labor costs low by holding wages down and limiting hours worked (Appelbaum and Schmitt 2009; Carré and Tilly 2017). Already operating in an industry marked by low wages, e-commerce retailers are liable to deploy additional labor practices inside their warehouses, beyond low pay and short hours, that enable them to quickly and cheaply satisfy customer desires at the expense of job quality.

There are a number of reasons to believe that the labor practices they choose will be disadvantageous to the workforce. First, dedication to quick response times is associated with more exacting and more closely scrutinized performance standards, which raise workers' stress levels, compel them to cut corners in ways that compromise safety, and foment conflict with supervisors (Conti et al. 2006; Knights and McCabe 1998; Newsome 2010; Newsome, Thompson, and Commander 2013; Viscelli 2016; Wright and Lund 1996). Second, reliance on digitally-mediated means of evaluation and discipline leads workers to perceive their managers as less trustworthy and supportive and less able to intervene when discipline is unfairly meted out by an algorithm (Lee 2018; Levy 2015). Third, staffing and scheduling practices that handle fluctuating demand by externalizing uncertainty onto workers, either through contingent work arrangements (Gutelius and Theodore 2023; Lautsch 2002; Peck and Theodore 1998) or unpredictable work hours (Heiland 2022; Lambert 2008), pose real difficulties for employees'

non-working lives (Schneider and Harknett 2019). Each of these practices has been shown individually and across multiple industries to lead to decreased job quality. They all come together in B2C warehouses.

To explore whether e-commerce workers are, in fact, at greater risk of encountering stringent job demands, unsafe work environments, and managerial decisions that feel out of their control, we use data gathered in the warehouse industry to explore the forces shaping job quality therein. The specific question we pose is whether warehouse work exhibits more unfavorable qualities when performed in facilities providing e-commerce-oriented B2C services (i.e., shipping to households) as opposed to facilities providing B2B services (i.e., shipping to factories or retail stores) that are at a step removed from the end consumer.

Retail Giants and the Nature of Warehouse Work

While e-commerce is a highly competitive field (Fuller et al., 2022), one company has received much of the attention: Amazon. This comes as no surprise, since Amazon is the dominant player in the market, playing a pivotal role in conditioning consumers to shop online and expect fast, free shipping to their doorsteps (Melnyk and Stanton 2017; Thelen 2025; Wasserman 2012). Walmart, though a distant second, nevertheless stands as a formidable challenger. The discounter remains far and away the largest retailer in the U.S., and it is the fastest-growing online seller (DiPalma 2024; Gray and Lee 2021). The two companies respectively made up 38% and 6% of the U.S. market for online shopping in 2023 (Repko 2023).

Given their size, the way the two firms manage their warehouse operations has important implications for the quality of e-commerce jobs. For one thing, Amazon and Walmart's size means their treatment of employees impacts a substantial share of the workforce engaged in e-commerce: Amazon employs some 650,000 workers in its U.S. warehouses, and Walmart

employs around 100,000.[4] For another, leading firms often provide competitors with templates for running their businesses (Haveman 1993), and so retailers aiming to offer e-commerce services are liable to look to these companies as models of success, emulating their operational choices and labor strategies, recruiting their managerial or professional personnel, and even relying on the same vendors. Which of the two firms they follow most closely should thus shape how they arrange work inside their own e-commerce facilities. This choice is not trivial because the companies have built distinct logistics networks and espoused distinct business strategies.

A first crucial difference lies in the nature of the infrastructures they use to reach consumers. Although Walmart's 4,000 brick-and-mortar locations have made it into the nation's largest employer, the more than 150 distribution centers it maintains across the U.S. have made it into the B2B warehouse operator *par excellence*. Unlike many of its competitors, almost all of Walmart's retail inventory flows through these warehouses before making it to stores (Ghemawat, Bradley, and Mark 2004). This setup allows it to save on trucking costs and to replenish inventory swiftly. One source estimated that, in 2005, a Walmart store located near a distribution center rather than 100 miles away would make $250,000 more in profit each year (Basker 2007). Only in recent years has Walmart shifted towards opening more B2C facilities (Redman 2022): according to industry consultant MWPVL, Walmart operated 41 e-commerce fulfillment centers at the start of 2024. The first of these were opened in the 2010s with an eye toward competing directly with Amazon (Stevens and Nassauer 2016). Walmart's adversary, on the other hand, governs retail transactions primarily through electronic means, connecting end consumers to sellers using an elaborate network of Amazon fulfillment centers, sortation centers, delivery stations, and other facilities. It has also conjured into existence its Delivery Service

[4] Tabulations come from the companies' 2023 self-reported EEO-1 data using the "laborers and helpers" category.

Partners, an array of subcontractors to whom it outsources a substantial portion of its last-mile delivery function. Of all these operations, B2C facilities have been especially crucial to Amazon's e-commerce dominance, with the company maintaining more than 350 fulfillment centers in the U.S. A variety of B2B facilities, including Whole Foods distribution centers and Amazon receiving centers and air hubs, make up the rest of its logistics network. As such, Walmart's network leans toward B2B facilities whereas Amazon's leans toward B2C ones.

A second difference lies in the companies' approaches to attracting online shoppers. Walmart's key value proposition has been its commitment to what has been described as a "brilliant, obsessive focus on a single core value" (Fishman 2006:7): offering low prices. Encapsulated in the company's inaugural slogan "Always Low Prices. Always,"[5] this fixation originated with the company's founder and has continued to inform firm strategy, in both brick-and-mortar and e-commerce establishments. Later leaders, including the founder's son and past chairman Rob Walton, have attributed the company's success in keeping costs down in large part to the vast network of distribution centers at the heart of its logistics system (Walton 2005). In contrast, delivery speed is at the core of the business strategy fueling Amazon's impressive growth (Rossman 2019). While Amazon leaders like to tout their "customer obsession," their method of gaining new customers and keeping them satisfied hinges on fast shipping. Pride over Amazon's ability to get goods to doorsteps quickly is evident in corporate communications: CEO Andy Jassy recently told shareholders that his organization was "breaking multiple company records," including delivering 4 billion items in one day or less in the U.S. in 2023 (Jassy 2024). From early on in the company's ascendancy, this "obsession with on-time delivery" (Mims

[5] Since 2007, the company has promoted the slogan "Save Money. Live Better."

2021:224) shaped the way Amazon organized its warehouses.[6] The obsession was embodied in the initial push to provide two-day delivery to Prime members, a commitment the company met by taking a "lean" approach to warehouse operations, borrowing insights from "just-in-time manufacturing" (Mims 2021; Stone 2013). Since then, a two-day delivery pledge has morphed into ever-faster delivery promises including, in some markets, a matter of hours. Amazon has sought to fulfill this dedication to speed by expanding its network of facilities, introducing more automation (Herrera and Fung 2024), and launching Amazon Flex, an app that engages gig workers as independent contractors to deliver customer packages (Mommadova 2024). In essence, two of the features that likely make e-commerce jobs so challenging—a commitment to low prices and fast delivery times—receive different weights in the retailers' business strategies.

Comparing Amazon and Walmart thus begins to suggest how rival orientations to online retailing are poised to affect the quality of e-commerce jobs, within and without. For this reason, we ask in our second analysis whether each company promotes distinct conditions at their B2C facilities and how these conditions compare to those present in their B2B facilities. By conducting this test, we are able to assess the degree to which firm strategy mediates any adverse effects of e-commerce, something not possible in our first analysis, which does not track individual firms. A finding that catering to e-commerce diminishes job quality in similar ways at both companies would raise the likelihood that the ascent of online shopping will relegate a growing segment of workers to uniformly adverse employment conditions. By contrast, a finding that the "B2C effect" differs across the two companies would suggest that the impacts of e-commerce operations on job quality are shaped to a greater degree by firm strategy.

[6] To be sure, this ethos pervades all areas of the organization: Amazon's first internal motto—espoused by founder Jeff Bezos—was "Get Big Fast" (Stone, 2013).

Data and Research Methods

Data Collection

Our investigation began with the collection of data bearing on the warehouse industry as such. Collaborating with a team of scholars under the auspices of the Worker Empowerment Research Network (WERN, see Kochan et al. 2023),[7] we collected survey data from June through August 2022, generating a sample representing the U.S. population of warehouse workers (one of five low-wage industries of concern to the WERN team). The survey instrument was designed to capture data on several dimensions of workers' jobs, including work intensity, exposure to digital surveillance, and perceived levels of safety. Respondents were recruited from the Qualtrics online panel with the goal of collecting 500 completed surveys for each of the targeted industries, while meeting age, race, and gender quotas to ensure broad representation. This first stage in our research was limited in two respects: first, by the relatively small number of usable warehouse responses (~400), which curtailed statistical power; and, second, by our inability to identify specific employers in the survey. Still, these data provide an initial basis for our inquiry.

The second stage of data collection was more ambitious, involving an effort to capture details on working conditions at the two largest firms competing for market control in retail: Amazon and Walmart. Relying on the sampling strategy refined by Schneider and Harknett (2022), two of the current authors used Facebook ads to target users whose profiles indicated they were Amazon employees, aided by geofencing techniques focusing specifically on frontline warehouse employees. The broader research team then replicated the Amazon survey method for

[7] WERN is an interdisciplinary network of labor market researchers studying worker efforts to achieve greater voice and representation. See Cornfield's (2023) introduction to the *Work and Occupations* special issue on "New Labor Activism" for an overview. Part of the network's efforts included a survey of 2,561 frontline workers in the health care, hospitality, retail, telecommunications, and warehousing industries, described in more detail in Ahlquist, Grumbach, and Thai (2023).

Walmart. In the firm-specific survey instruments, we replicated or approximated several items from the initial industry survey. Given available resources, we sought to reach 1,500 Amazon responses and 500 Walmart responses using surveys in both English and Spanish.[8]

Because the survey items did not overlap perfectly across the industry and company-specific surveys, we analyzed the industry responses separately from the Amazon and Walmart responses, which we combined. Below we present our findings in two distinct subsections.

Sample

Our data includes only hourly workers who are currently employed in warehousing jobs. We excluded any respondents who indicated they were in a supervisory role. So that we could weight respondents, as described below, we kept only those who indicated their gender and race/ethnicity. Responses to the firm-specific surveys were cross-checked based on IP address and facility location; any responses with non-U.S. IP addresses or invalid facility locations were discarded. There were 401 respondents meeting our inclusion criteria in the industry survey, 1,453 in the Amazon survey, and 444 in the Walmart survey.

Weighting

To ensure our sample matched the demographic profile of those who work in the warehousing industry and in warehousing roles at Amazon or Walmart, we weighted each survey respondent in all analyses. Specifically, we employed a raking procedure, whereby each observation was weighted according to its demographic (i.e., race/ethnicity and gender) distribution in the larger population (Gelman and Lu 2003).

[8] Unlike at Amazon, most Walmart workers do not work in warehouses, making it more costly to obtain completed Walmart surveys.

The general procedure was the same for all three surveys, but the weights for each survey were based on different populations. For the industry survey weighting, we relied on the 2021 American Community Survey, downloaded from IPUMS USA (Ruggles et al. 2023). The ACS is a nationally representative survey with a 1-in-100 random sample of the U.S. population. The ACS data provides approximations of the marginal distributions of key demographic groups in the warehousing industry (NAICS: 493). We created our weights using gender (female or male), race (white, black, Hispanic/Latinx, Asian/Pacific Islander, Indigenous, and other), and age (18-24, 35-54, 55+). For the Amazon and Walmart surveys, we relied on the companies' 2021 EEO-1 reports, which allow us to create weights based on gender and race. To keep track of workforce demographics, employers with more than 100 employees are legally required to file this report to the U.S. Equal Employment Opportunity Commission. We used the same race and gender variables as we did in the industry survey to generate weights that matched the marginal distribution of workers employed as laborers or helpers (which captures most warehouse roles) at these companies. We used the pewmethods package in R to perform this procedure (Lau 2020).

All estimates presented in this paper account for these weights using R's survey package (Lumley 2011).

Variable Construction

Dependent Variables

Our main analysis focused on seven key measures related to job quality. Although job quality is the subject of extensive research, cutting across multiple fields, there is little agreement on how it should be measured. We took as our starting point Appelbaum et al.'s (2010) observation that "job quality is all terms of the employment relationship and working conditions that may have an impact on the well-being of workers" (3). In line with this broad definition, there is consensus

that job quality should be understood as a multi-dimensional construct (Díaz-Linhart et al. 2024; Findlay, Kalleberg, and Warhurst 2013; Goods, Veen, and Barratt 2019; Green 2006).

With these notions in mind, we sought to combine a sufficiently elaborated conception of working conditions with an equally developed conception of how such conditions affect worker well-being. Few studies have satisfied this dual requirement, with many approaches focusing on more objective characteristics of the job—income or job insecurity, as with the expansive literature on precarious or non-standard work (Kalleberg, Reskin, and Hudson 2000)—or else fastening onto the subjective evaluations that workers give to particular types of work, such as the desirability of certain jobs (Jencks, Perman, and Rainwater 1988) or the meaningfulness of their roles (Soffia, Wood, and Burchell 2022). In sorting through the literature, we concentrated on recognized job quality dimensions that overlapped with the most salient features of warehouse work, based on our own and others' research. Using the survey items available to us, we then constructed objective and subjective measures that captured dimensions found across general job quality frameworks while also capturing domain-specific dimensions of warehouse work. These were intensity of *job demands*, access to *opportunity*, *hourly wage* levels, perceived *dignity and fairness* of company practices, and sense of workplace *safety*. We created two other measures, worker *well-being* and the severity of *injuries* experienced on the job, to capture job quality outcomes, given that existing research shows these to be the downstream consequences of working conditions (Barling, Kelloway, and Iverson 2003; Munoz De Bustillo et al. 2011).[9]

Each of these measures is represented by a composite index, constructed by combining scaled, individual survey items. Job demands measures work intensity, including, among other things, the pressure workers feel to move quickly and avoid taking breaks, as well as the degree

[9] Two of these indices—dignity and fairness and injuries—cannot be constructed using the industry survey because it did not ask the underlying questions.

to which they are exposed to various forms of performance monitoring. Displeasure with the latter, constant monitoring, is a common complaint among warehouse workers (e.g., Struna and Reese 2020; Vallas et al. 2022), and recent research shows that, by intensifying job demands, surveillance is detrimental to worker well-being (Glavin, Bierman, and Schieman 2024). Opportunity measures whether workers have a chance to perform a variety of tasks and access to promotions. Hourly wage is a single item measuring how much workers earn for an hour of work. Safety measures whether it is possible for workers to do their jobs without harming themselves. Dignity and fairness measures whether workers feel as if there is favoritism in their workplace and whether they are respected and treated equally. Injuries measures whether different workers have experienced physical ailments in different parts of the body, and, if so, how bad these were. Finally, well-being measures workers' overall assessment of their experiences on the job, based on reported levels of anxiety, burnout, and stress. In a later part of our analysis, we explore the injuries and well-being measures' relations to the other indices.

To test whether our indices appropriately capture relationships among the underlying items, we performed confirmatory factor analysis, the results of which met common guidelines for good fit (results available on request). The precise items as well as the reliability coefficients for the resulting scales are given in Appendix A.

We structured each index to range from 0 to 1. The outcomes were scaled such that more positive values indicate a greater degree of each measure. For example, higher job demands values indicate that the job is more demanding, and higher fairness values indicate that the job is fairer; we would consider higher values on the first measure as signaling lower job quality and on the second, higher job quality. Note that these indices are not strictly comparable between the industry and Amazon/Walmart surveys because of imperfect overlap on survey items.

Independent Variables

We constructed a binary variable, *warehouse type*, designating a warehouse as B2C or B2B based on where it sends the orders its employees have filled. B2C warehouses prepare and ship orders to households or businesses that have been received online. These warehouses largely consist of fulfillment centers, so we take them as an indicator of whether respondents are engaged in e-commerce work. B2B warehouses are involved in a host of activities. They may prepare and ship inventory to brick-and-mortar retail establishments, other businesses with which they have regular contracts, or other firms that will use the materials as inputs in their own products. They may also serve as mid-points along the supply chain, temporarily storing or rerouting products on their way to their final destinations. These warehouses include distribution centers, returns processing centers, import and sortation centers, and cross-docks. Hence, we consider workers in B2B warehouses as not engaged in e-commerce jobs.

The data available to construct this binary variable differ across the two samples. In the industry survey, we designated a warehouse as B2C if a respondent reported that the facility in which they worked prepared orders destined for "Consumers at home" as opposed to "Other businesses, like factories" or "Retail stores." In the Amazon and Walmart surveys, we designated a warehouse as B2C using a two-step procedure. First, drawing on terminology commonly used by these companies, we included a question listing several facility types that would be familiar to employees. That is, we asked whether a respondent worked in an "E-commerce fulfillment center" versus another type of facility operated by their employer (e.g., a "Regional Distribution Center (RDC)" or "Delivery station"). Second, we validated responses by comparing what was reported against the facility types published by MWPVL, a consulting firm that tracks the location of Amazon and Walmart warehouses. In the company surveys, respondents reported

their facility code, which we used for this triangulation. When there was a mismatch between the surveys and MWPVL, we looked at publicly available company documents to adjudicate.

This approach indicated that 46% of the industry, 72% of Amazon, and 13% of Walmart respondents worked in facilities that were B2C. The company breakdown is not surprising because Amazon primarily operates e-commerce fulfillment centers, whereas Walmart primarily operates distribution centers serving its brick and mortar establishments. It is important to note, though, that despite its e-commerce focus, Amazon does not only operate B2C warehouses but also maintains other support facilities, including sortation, delivery stations, and returns processing centers that we categorize as B2B.

Control Variables

We controlled for a set of variables that are likely associated with the working conditions each respondent experiences as well as their perceptions of them. These were permanent or temporary employment status, full-time or part-time status, number of jobs held, gender, race/ethnicity, age, educational attainment, and state in which the respondent's workplace is located.

Multiple Imputation

To preserve as much data as possible and to avoid biasing our estimates, we relied on multiple imputation to predict the missing values (Van Buuren 2018). Doing so improves accuracy and statistical power relative to other missing data techniques, such as listwise or pairwise deletion. We performed this procedure using R's mice package (Van Buuren and Groothuis-Oudshoorn 2006). In short, we generated 20 new datasets, estimating new missing values each time based on existing responses. We then estimated our parameters of interest using each new dataset

individually before combining them to calculate point estimates and standard errors according to Rubin's rules. As a robustness check, we have replicated the findings of our analysis with and without multiple imputation methods and using unweighted data; these results do not vary substantially from the ones we report below.

Results

Job Quality across Warehousing: Industry-wide Data

In the first stage of the analysis, we use the industry-wide survey to explore whether job quality differs depending on whether the facilities in which respondents work are oriented to e-commerce. Because this sample is representative of the U.S. hourly warehouse workforce, we also use it to establish a picture of working conditions across U.S. warehouses, which have not been comprehensively documented despite the industry's substantial growth.

Table 1 presents summary statistics. Several observations stand out. The majority of respondents are full-time (73%) and permanent employees (92%). Compared to the U.S. labor force as a whole, a disproportionate share (62%) are BIPOC (black, indigenous, and people of color) workers. Most (65%) are male. While warehouse work is often physically taxing and hard on workers' bodies, almost 50% of this workforce is 35 years or older.

--- Insert Table 1 about here ---

The job conditions found inside warehouses likely create hardships for respondents. The average reported wage is around $19.64/hour, earnings that position workers near the bottom of the income distribution, if slightly above the most prevalent alternatives (such as food service or

retail) available to workers with a high school education or less (as is true of 85% of our respondents). The great majority (80%) of our industry respondents report taking home less than $50,000 annually. In addition to challenging economic circumstances, workers report regularly confronting a sense of urgency whereby their moves are heavily monitored via digital technologies, such as bar code scanners and cameras, leaving them little room to make decisions about how to do their jobs or when to reduce their pace. For example, 56% of respondents agree that their jobs require very fast work. About 52% say monitoring through electronic means, such as tracking via a scan gun, is used to control or discipline employees in their workplace (only 15% disagree). And 33% say their work usually, almost always, or always makes it hard for them to take a break to use the bathroom.

These aggregate statistics do not distinguish between warehouses that serve different end users. When we examine these differences, we find that the share of workers reporting difficult working conditions inside their workplaces is consistently higher among respondents employed in B2C facilities. For example, while 16% of respondents in B2B warehouses disagreed with the statement that safety remains a priority when they are behind schedule, 26% of respondents in B2C warehouses disagreed. Looking at our index variables to get an overall picture, an initial difference in means test, displayed in Table 2, suggests that for two of our four measures of job quality, conditions are less favorable in warehouses servicing e-commerce demand. Well-being, our job quality outcome measure, is also significantly lower in e-commerce warehouses.

--- Insert Table 2 about here ---

To further examine the relationship between job quality and e-commerce, we use sampling-weighted least squares regression with robust standard errors to estimate the effects of B2C operations on the five indices we constructed in the industry sample, net of controls: the intensity of job demands, access to opportunity, hourly pay, exposure to unsafe working conditions, and worker well-being. Results are presented in Table 3.

--- Insert Table 3 about here ---

On balance, workers employed at e-commerce warehouses face more challenging conditions on three of the five measures. Specifically, workers employed at B2C sites experience significantly higher job demands as well as exposure to situations that jeopardize their safety. When it comes to well-being, B2C workers are also significantly worse off. Two of the dimensions—opportunity and wages—do not vary significantly across site type, indicating that B2C warehouse workers do not receive a premium for taking on tougher jobs.[10]

In our conceptualization, well-being is an outcome of job quality and hence a consequence of the other four dimensions of job quality we have analyzed. To test the validity of this stance, we performed a mediation analysis, examining the extent to which these other dimensions (especially the two significant predictors, job demands and unsafe conditions) explain the observed negative relationship between e-commerce and well-being. Table 4 shows the percentage of the total effect that can be accounted for by each of the mediators (job demands, safety, opportunity and hourly wage) for the well-being outcome. We present the point

[10] Given that Amazon workers make up a sizable share of all U.S. warehouse workers, we ran a sensitivity analysis to see what would happen if we assumed a certain portion of our industry-wide sample worked at Amazon. The procedure and results are outlined in Appendix C. Our conclusions do not change in light of this analysis.

estimate of the mediation percentage as well as a test for whether this percentage is different from zero, based on bootstrap standard errors (Shrout and Bolger 2002). The analysis was carried out using R's laavan package (Rosseel 2012).

--- Insert Table 4 about here ---

The results show that job demands (indirect effect = -0.033, p = 0.008) and safety (indirect effect = -0.029, p = 0.031) substantially and significantly mediate the relationship between e-commerce and well-being, respectively accounting for 55% and 49% of the total B2C effect. The other measures do not mediate this relationship. Higher job demands and reduced safety arguably stem from a commitment to fast delivery times, whereas limited opportunity and low wages stem from a commitment to low prices. Hence, one way to interpret the mediation results would be as a sign that speedy delivery, more so than low prices, make for especially low-quality jobs in e-commerce, a point that has relevance for the next stage of our analysis.

Variations in Job Quality by Company: Evidence from Walmart and Amazon

The industry-wide data suggest that e-commerce does indeed drive harsher and more dangerous working conditions, impelled perhaps by the more time-sensitive pressures to which workers are exposed. Yet, as we have noted, these data do not permit us to specify whether this effect varies by or interacts with particular firms. Nor can we say with confidence whether the prioritization of quick delivery under e-commerce is a greater force for low-quality jobs than the prioritization of low prices. To investigate these questions, we turn to the Walmart and Amazon survey data.

To begin, it is important to note differences in the workforces employed by the two firms (see summary statistics in Table 5). Initially, Walmart warehouses appear more like those found

in the industry sample. For one, more Amazon respondents are full-time (79%) than those at Walmart, which has a share (73%) closer to that present in the industry survey. Amazon also has a higher share of permanent employee respondents (97%) than Walmart (91%), which is nearer the share reported in the industry survey.[11] Amazon respondents are also more likely to be female (50%) than at Walmart or in the industry survey. This demographic leaning makes sense given the composition of Amazon's warehouse types: B2C facilities, which house smaller items and prepare smaller orders, tend to employ more females than B2B facilities, likely because they reduce the gendered need for heavy lifting (Gutelius and Theodore 2019; Reese 2020).

--- Insert Table 5 about here ---

At the same time, respondents at both companies differ from the industry respondents in notable ways. Amazon respondents are less likely to be white than industry respondents, whereas Walmart respondents are much more likely to be white, perhaps reflecting the location of their facilities. Both Amazon and Walmart respondents are also more likely to be over 45 than in the industry as a whole. Amazon respondents also report a lower average hourly wage ($18.57) than their industry and Walmart counterparts, with the latter's hourly wage averaging around $23.91. This reflects the substantially higher mean tenure at Walmart, with 50% of respondents working at the company for 3+ years, compared to only 25% at Amazon and in the industry overall. At first blush, Walmart respondents' higher wages ($23.91 versus the industry's $19.64) and longer

[11] Note, however, that temporary employees were less likely to be captured in the Amazon and Walmart surveys because the respondents would have had to self-identify as employees of these companies rather than of the staffing agencies to which they belong.

tenure contrast with the company's reputation for treating its retail workers poorly, making it appear to stand out as an above-market employer in the warehouse industry.

These differences aside, respondents at both companies report harsh working conditions, just as industry respondents do. On the individual survey items, around 40% of workers at both companies say they always feel a sense of pressure to work faster; around 30% say they always feel anxious about meeting their production standards; and around 25% say they always find it difficult to use the bathroom. Half of workers (52%) agree that technology is a disciplinary device at their company rather than a means of helping workers, and half (51%) report that they are burned out from their jobs.

The key question at hand, however, concerns the differences between B2B and B2C facilities, both across and within the companies. As with our analysis of the industry-wide data, we use sampling-weighted least squares regression with robust standard errors, predicting the seven indicators of job quality in the combined (Walmart and Amazon) samples. This enables us to examine the effects of both e-commerce and company on the outcome measures, net of the controls. Our regression models include the same explanatory variables as in the industry-wide sample (as displayed in Table 3), but now with the addition of a categorical variable indicating whether the respondent is employed by either Amazon or Walmart. To ease the interpretability of these results (Verhagen 2022), we present predicted value plots in Figure 1. (The underlying regression results are contained in Appendix B, Table B.1.) The plots display the average predicted values across all B2C observations compared to the values predicted across all B2B observations, holding company constant. The results can thus be understood as showing the average effect of e-commerce across all Amazon and Walmart warehouses in our sample.

Looking at Figure 1, we find a pattern fully consistent with and even more pronounced than the industry survey revealed. Warehouses geared to e-commerce are worse on every indicator of job quality. Specifically, workers at B2C facilities encounter jobs that are significantly more demanding, less rewarding, lower paid, and perceived as less fair and less safe. Reported levels of well-being and injuries are also markedly worse in the B2C sites. All these differences are significant at the 0.01 level except for dignity and fairness, which is significant at the 0.05 level.

--- Insert Figure 1 about here ---

The results depicted in Figure 1 represent the pooled effects of facility type; they control for the effects of the company (Amazon versus Walmart), but they cannot show whether the effects of e-commerce are constant across the two firms. Nor do they capture the effects of the specific companies on the outcome measures. We turn now to these issues.

Figure 2 displays the average model-based predicted values across Amazon compared to the average model-based predicted values across Walmart, independent of facility type. These may be understood as showing the company effect. Here there seems to be little distinction between Walmart and Amazon. Net of controls, the only significant difference between the two employers occurs when it comes to higher injuries at Amazon ($p = 0.012$) and higher hourly wages at Walmart ($p < 0.001$). These regression results indicate that, compared to each other, one company does not systematically create overall worse warehouse conditions than the other.

--- Insert Figure 2 about here ---

The question then becomes whether the effects of e-commerce—the differences between B2C and B2B sites—hold constant across firms. The data in Table 6 present an initial foray into this query, depicting a simple difference in means test showing the effects of facility type within each firm. These results suggest that the effects of e-commerce vary significantly across the two firms. Put differently, e-commerce labor practices and company interact. Working at B2C sites versus B2B sites operated by Amazon exposes workers to sharply worse job conditions on all seven outcomes. This is not the case for Walmart. There, facility type makes no difference.

--- Insert Table 6 about here ---

The predicted value plots depicted in Figure 3 (representing regression results given in Appendix Table B.2 that include an interaction between company and facility type; Appendix Table B.3 tests whether the predicted values are different) confirm these latter results and further point to a complex relationship between firm and e-commerce. First, Walmart and Amazon appear to take different approaches to managing their e-commerce workforces. Looking only at B2B warehouses, we find that Walmart's jobs, which make up the bulk of the company's warehouse workforce, are significantly worse than the comparable Amazon jobs on every dimension of quality but wages, which are higher at Walmart, and injuries, which are no different between the two companies. Inside B2C warehouses, the relationship is reversed. Amazon's B2C jobs, which make up the bulk of its warehouse workforce, are largely worse than the comparable Walmart jobs. The point estimates suggest that this is the case for all outcomes, but given the large confidence intervals around the Walmart B2C estimates, the differences are

only significant for well-being, injuries, and hourly wages. These results are consistent with each company "squeezing" more intensely workers positioned closer to its core operations, resulting in relatively worse B2C jobs at Amazon and worse B2B jobs at Walmart.

--- Insert Figure 3 about here ---

The data depicted in Figure 3 also show that the effects of facility type differ sharply between Walmart and Amazon. Put simply, e-commerce has an especially pronounced and adverse effect on workers at Amazon. On all seven dependent variables, workers employed at Amazon's B2C sites experience conditions that are significantly worse than those experienced at Amazon's B2B sites. Specifically, Amazon B2C workers are more likely to report higher job demands, less opportunity, lower wages, greater unfairness, and more challenges related to safety, well-being, and injuries. In this way, Amazon exhibits a heightened version of the disparity between B2C and B2B warehouses documented in the industry overall. Interestingly, there are few significant differences in job quality across Walmart's logistics segments, though this may be because the smaller sample size limits our power to detect differences. The exceptions are injuries, which are lower in Walmart's B2C segment. Hence, Walmart does not appear to differentiate its labor practices based on the end users its warehouses serve, instead pursuing a more consistent low-road strategy across different market segments.

All in all, these results indicate that e-commerce facilities operated by Amazon are home to the least desirable warehousing jobs in this sample. Compared to e-commerce jobs at Walmart, Amazon's B2C workforce reports significantly lower well-being, lower pay, and more injuries. The point estimates suggest they are more demanding, less opportune, less fair, and less

safe as well. The negative relationship between e-commerce and job quality documented in the industry as whole exists at Amazon but not at Walmart. Given Amazon's commitment to quick delivery, we take this as a further sign that speed and responsiveness to customers are what make for the most challenging warehouse jobs. It is also likely that "pure" e-commerce retailers like Amazon are prone to worse working conditions than those that sell goods in person and online.

To conclude, we perform a mediation analysis as above. In addition to well-being, we consider injuries to be another consequence of poor job quality. Table 7 shows the percentage of the total effect that can be accounted for by each of the five mediators (job demands, opportunity, hourly wage, dignity and fairness, and safety) for each of the two outcomes, injuries and safety. To test for mediation, we split the sample, running separate analyses for Walmart and Amazon workers.

--- Insert Table 7 about here ---

In line with the above findings, the results show e-commerce plays a crucial role in reducing job quality at Amazon but not at Walmart. It does this at Amazon by elevating job demands, reducing opportunity, undermining dignity and fairness, and creating unsafe work conditions, all of which explain a substantial and significant proportion of the effect of B2C on well-being and injuries. The biggest impact operates through job demands, which explain 89% and 96% of e-commerce's effect on injuries and well-being at the company, and opportunity, which explains 55% and 67% of e-commerce's effect on injuries and well-being. None of these dimensions mediates the relationship between e-commerce and job quality at Walmart. To be sure, all measures of job quality apart from wages have a significant direct effect on both well-

being and injuries at Walmart, but not through facility type. This is additional evidence suggesting that Walmart does not distinguish its labor strategy between B2B and B2C warehouses, a distinction that Amazon does make.

Discussion and Conclusion

Our analysis began by scrutinizing data on warehouse work in the industry writ large. Here, our findings suggested that warehouses serving e-commerce provide a significantly lower quality of employment than their business-facing counterparts. In B2C warehouses, managers evidently use a set of labor practices that diminish job quality relative to B2B warehouses, as we hypothesized. Given the rising prevalence of online shopping, these findings are cause for concern.

Behind this divergence lies the fact that the two warehouse types are situated differently in the consumer economy. B2C facilities experience sharper pressures than B2B facilities, including exposure to tighter deadlines, less predictable order volume, and more volatile consumer demand, all occurring at a moment when competition for market share has grown considerably. In this environment, e-commerce retailers operating B2C warehouses have prioritized some combination of quick delivery times and low prices. One way e-commerce warehouse managers handle B2C-specific pressures is to impose additional demands on their subordinates, expecting and enforcing performance levels that erode job quality without offering corresponding rewards for increased intensity. Qualitative studies of warehouses that draw on first-person accounts or field observations in particular facilities show that managers in e-commerce facilities scrutinize productivity and work hours in a bid to extract maximum effort from workers and to ensure that delivery deadlines are met (Kowalski 2022; Struna and Reese

2020; Vallas et al. 2022). Our quantitative findings on conditions in the industry and its two leading firms are consistent with such practices being widespread in B2C warehouses.

What is distinctive in our analysis is the emphasis placed on consumers' role in shaping job quality. The labor practices we have identified replicate a broader pattern in which employers have externalized the business risk and uncertainty tied to consumers' changing preferences by shifting it onto employees (Hacker 2006; Kalleberg and Vallas 2017). Common means of risk-shifting include a greater reliance on contingent workers, variable pay, and just-in-time schedules (Bidwell et al. 2013; Lambert 2008). We have argued that the use of such practices increases as consumers become closer to and more demanding of workers, essential features of e-commerce transactions. Our results show that, like those in many retail and gig economy settings (Johnston et al. 2023; Leidner 1996; Rubery and Grimshaw 2001), workers in warehouses more proximate to consumers experience more challenging conditions. Though B2C warehouse workers do not directly interact with customers, the performance levels demanded of them are largely governed by customers' desires, interests, and rhythms. In this way, customers serve as "agents in the management circuit" (Fuller and Smith 1991:11) used to discipline those working in service of e-commerce. Added to the already variegated list of controls in place at e-commerce warehouses (Vallas et al. 2022), then, might be a de facto form of "consumer control," which operates to degrade employment conditions.[12] This preferencing of consumer convenience at the expense of worker well-being creates "new configurations of power" (Curchod et al. 2020) embodied in the triadic employment relationship that we have claimed is prevalent across e-commerce facilities.

[12] An example from Amazon makes the point clear: When fulfillment centers encounter urgent deadlines, managers often declare a "power hour," in which workers are expected to work at an especially frenetic pace, often with prizes offered for the top-performing workers (Vallas and Kronberg 2023).

Broadly speaking, we might expect a slide in working conditions in any job in which the internet draws consumers and workers closer together.

In the second stage of our analysis, we found that the degree to which consumers impinge on the employment relationship in e-commerce nonetheless appears to depend in important ways on the firm in charge. The negative and apparently injurious effects of e-commerce are most pronounced at Amazon, the company that has played the largest role in ratcheting up consumer expectations around delivery speed. There B2C workers experience significantly worse jobs than those at B2B sites, culminating in greater damage to their mind and bodies. In contrast, working conditions in Walmart's B2C sites appear no worse than those in its B2B sites. To be sure, this contrast does not imply that Walmart's e-commerce segment offers high-quality jobs. Rather, it suggests that there is nothing intrinsic about e-commerce that means retailers *must* pressure their B2C workers more intensely than workers in their other operations. Amazon appears to have made the choice to heighten the externalization of risk in its B2C facilities; Walmart has not.

Whether e-commerce retailers do, in fact, promote poor working conditions stems in part from their strategic commitments. Amazon leaders largely fixate on speed; Walmart leaders focus more squarely on cost. Their respective business strategies appear as manifestations of distinct ideas about the best way to run a retailing operation—in Fligstein's (1993) parlance, different "conceptions of control." As organizing assumptions about the world, conceptions of control permeate all levels of organizational decision-making, from choices about which products to sell to how to interact with regulators, shaping what managers see as the appropriate course of action and business strategy to get there. Conceptions of control also impact a company's choice of labor practices (Fligstein 2001), and Walmart and Amazon have each

gained widespread notoriety for the way they manage their workforces, though little attention has been paid to whether these practices differ across their business segments.

Though our data cannot address the roots of the divergent patterns we have found between Amazon and Walmart, we suspect that their contrasting e-commerce pursuits stem from their particular histories and customer bases. For one thing, the two firms have long aimed their appeals to different regions of the social world: Walmart has traditionally grown by appealing to less affluent households located in rural or exurban locales, proximate to its elaborate system of brick and mortar stores. Its entry into e-commerce has apparently led it to apply a logistics approach that has been honed by serving its own brick-and-mortar stores. In this context, Walmart's core business strategy, resting on a B2B model, has continued to emphasize the extraction of value as established in its traditional retail operations. By contrast, Amazon's success stems from its origins as a bookseller, which served to establish its presence among relatively affluent urban dwellers for whom online shopping had a distinct appeal and for whom convenience is a selling point. The more adverse outcomes for those working in Amazon's B2C warehouses likely flow from the firm's founding pursuit of ever greater efficiency in the e-commerce domain. The paths the two companies have pursued have led them to adopt different orientations toward their customers and the operations that serve them.

In one important way, this is a promising observation for e-commerce workers because it shows that market pressures are not an inevitable determinant of job quality. Contra arguments that certain sectors of the economy are destined to offer bad jobs (Osterman, 2018), our results support the claim that competing firms can settle on different ways of managing their workforce (Carré and Tilly 2017; Rahmandad and Ton 2020). Yet, no less important, we do not take these results as signaling that good jobs are likely under e-commerce—indeed, the industry sample still

shows they are, on average, worse—but only that a more direct (and asymmetrical) relationship between workers and consumers does put job quality at risk.

This openness raises a key question regarding the future of e-commerce work: whether Amazon's strategy, which favors the convenience of consumers despite clear negative effects on workers, is likely to migrate beyond the boundaries of that firm. Amazon has the traits—rapid growth, extraordinary scale, market power, and prestige—that may favor such a mimetic trend (Haunschild and Miner 1997). Moreover, it remains the biggest employer in the warehouse industry, despite Walmart's sizable investments in warehousing. There are signs that, once having shopped at Amazon, consumers become more impatient, expecting faster service from other retailers (Daugherty, Bolumole, and Grawe 2019; Vollero, Sardanelli, and Siano 2023). Competitors seem to have taken note, copying some of Amazon's logistics practices (Smith 2019; Taylor 2016). The company has also done much to cultivate its image as a visionary tech company, an archetype for startups and companies looking to innovate. If these traits translate into "best" practices, the danger is that Amazon's conception of control over e-commerce operations will increasingly come to dictate the industry norm.

There are also reasons to expect that Amazon and Walmart's e-commerce operations may become more alike as the two major firms borrow from one another's playbooks. Amazon has recently recognized that speed may not be everything: it is reportedly exploring ways to offer cheaper goods that take days longer to be delivered than its typical offerings (Matsakis 2024). Walmart, on the other hand, is investing in its supply chain with an eye toward reducing delivery times (Lee 2023). It has undertaken a capital investment strategy based on the construction of large "next generation" fulfillment centers that use automated distribution and retrieval systems—a key part of Amazon's strategy—to provide next- or two-day shipping to customers

across the U.S. (Lalley 2023). Perhaps more important, both companies are now vying for the same markets. Recognizing that membership in Amazon Prime (an important source of the firm's revenues) had reached saturation among affluent households in 2017, Amazon introduced discounts for lower-income households, Walmart's traditional strength (Molla 2017; Weise 2017). The program, dubbed "Prime Access," provides the benefits of Prime membership to households that are receiving assistance under several federal assistance programs and who can use their Electronic Benefit Transfer (EBT) cards for shopping. For its part, Walmart attributes the expansion of its online sales operations to its success in appealing to higher-income consumers (Repko 2024), with sales of home and sporting goods added to Walmart's strength in the grocery market. As customers from a variety of income levels grow more accustomed to speedy delivery, it remains to be seen whether Amazon's paradigm will predominate.

We hasten to add that the answer is not likely to depend on business strategies alone. Indeed, institutional forces can play an important role in counterbalancing the pernicious features of e-commerce work. The labor practices of Walmart and Amazon have attracted substantial attention from activists, trade union leaders, and state and national legislatures, with effects that have directly impacted firm operations (Reich and Bearman 2018; Wood 2020).

Yet both firms have proved difficult arenas in which to mobilize support for better working conditions. There were abortive attempts to organize Walmart distribution centers in the 1970s (Wartzman 2022). In recent years, organizing activity has been comparatively higher at Amazon, the site of several union drives, including one successful vote in Staten Island in 2022—though the company has refused to negotiate a contract with this union (Hussain 2025). But Amazon has effectively stifled other efforts, relying on numerous tactics to interfere with collective action, including hiring police to follow and intimidate workers (Lee et al. 2024),

using digital media to flood workers with anti-union messaging (Wiggin 2025), and locating in high unemployment areas where workers have limited outside options (Kassem 2022). A point made elsewhere (Vallas et al. 2022) and supported by our results is that the headwinds to unionization are woven into the labor practices that Amazon deploys inside its B2C warehouses.

Some policymakers have tried to offset this imbalance. Amazon's labor practices, in particular, have prompted several state governments to adopt legislative strategies to better protect warehouse workers, many of which are specifically aimed at the worst features we have identified in its B2C sites. Such measures, passed in California, Illinois, Minnesota, New York and Oregon, typically grant workers the right to written notification regarding production quotas the firm expects them to meet, the right to refuse quotas that would require them to violate safety standards, and the right to petition regulators to intervene when their employers violate the law.[13] In tandem with organizing, regulation remains pivotal to improving e-commerce job quality.[14]

A final though unproven force for change may reside in the consumers whose taste for speed and low prices bears heavily on the intensity of e-commerce working conditions. Online shopping platforms tend to obscure the arduous labor required to handle customer orders. If, as our analysis implies, the e-commerce economy has served to widen the gulf between workers and consumers, sensitizing customers to the consequences of unbridled shopping could play a role in protecting workers against the most abusive conditions. How successful labor activists are in bridge-building may be critical to reshaping the future of work in digital commerce.

[13] The first such law was California's AB 701, signed into law in December 2022 (Hussain 2021; Roosevelt 2021); other states have largely built on its example.

[14] It should not be surprising that both Amazon and Walmart have mobilized customers to oppose laws that would help workers (Thelen 2025), another sign of the coalition of interest linking e-commerce employer and consumer.

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Tables and Figures

Tables

Table 1: Summary statistics for industry sample

Variable	Mean	SE
IVs		
B2B	0.498	0.030
B2C	0.502	0.030
Full-time	0.727	0.026
Part-time	0.273	0.026
Permanent	0.915	0.017
Temp	0.085	0.017
Does not work second job	0.843	0.022
Works second job	0.157	0.022
Female	0.354	0.029
Male	0.646	0.029
White	0.379	0.026
Asian or PacIslnd	0.036	0.012
Black	0.257	0.026
Indgns	0.021	0.009
Latinx	0.278	0.030
Other/multiracial	0.028	0.011
Age: 18 - 24	0.151	0.022
Age: 25 - 34	0.367	0.029
Age: 35 - 44	0.274	0.026
Age: 45 - 54	0.118	0.018
Age: 55 - 64	0.076	0.010
Age: 65 and over	0.014	0.004
Education: No degree or diploma	0.029	0.011
Education: High school or GED	0.410	0.029
Education: Associates degree	0.114	0.018
Education: Some college	0.294	0.026
Education: Bachelor's degree	0.123	0.020
Education: Master's degree/advanced degree	0.030	0.011
DVs		
Job demands	0.487	0.012
Opportunity	0.624	0.015
Safety	0.747	0.014
Hourly wage	19.64	0.239
Well-being	0.633	0.013
N	401	

Table 2: Job quality by warehouse type, industry sample

	B2B		B2C		
Variable	**Mean**	**SE**	**Mean**	**SE**	**Difference in means**
Job demands	0.446	0.015	0.527	0.018	***
Opportunity	0.613	0.020	0.635	0.021	n.s.
Safety	0.778	0.016	0.716	0.023	**
Hourly wage	19.95	0.335	19.33	0.345	n.s.
Well-being	0.666	0.016	0.601	0.019	***
N	205		196		

Difference in means compares dependent variables at B2B and B2C facilities. Significance levels determined from a bivariate regression of each outcome on warehouse type using robust standard errors. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Effect of warehouse type on job quality, industry sample

	Job demands	Opportunity	Hourly wage	Safety	Well-being
(Intercept)	0.532***	0.552***	16.570***	0.835***	0.652***
	(0.140)	(0.131)	(1.604)	(0.083)	(0.098)
B2C	0.073***	0.028	-0.481	-0.057**	-0.044*
	(0.022)	(0.029)	(0.488)	(0.026)	(0.025)
Part-time	0.029	0.042	-0.539	-0.003	0.023
	(0.025)	(0.032)	(0.583)	(0.034)	(0.027)
Temp	0.005	-0.083*	0.185	-0.031	-0.095**
	(0.036)	(0.045)	(0.948)	(0.045)	(0.039)
Works second job	0.036	0.084**	-0.677	0.016	-0.007
	(0.032)	(0.036)	(0.706)	(0.040)	(0.031)
Male	-0.051**	0.035	0.969*	0.005	0.048*
	(0.023)	(0.033)	(0.511)	(0.029)	(0.025)
Asian or PacIslnd	-0.085	0.116	2.223	0.038	0.080
	(0.074)	(0.074)	(1.640)	(0.064)	(0.070)
Black	0.020	-0.003	-0.351	-0.061*	0.002
	(0.027)	(0.039)	(0.564)	(0.036)	(0.030)
Indgns	0.134**	0.127	-0.167	-0.061	0.055
	(0.055)	(0.096)	(2.357)	(0.152)	(0.047)
Latinx	-0.031	0.094***	0.088	-0.058	0.070**
	(0.029)	(0.036)	(0.666)	(0.035)	(0.035)
Other/multiracial	-0.089	-0.186*	0.446	-0.188	0.058
	(0.078)	(0.111)	(1.504)	(0.126)	(0.078)
Age: 18 - 24	0.025	0.022	-0.691	0.004	0.018
	(0.035)	(0.046)	(0.794)	(0.044)	(0.037)
Age: 35 - 44	-0.061**	0.045	1.061	0.056	0.060*
	(0.028)	(0.039)	(0.658)	(0.037)	(0.033)
Age: 45 - 54	-0.112***	0.065	-0.185	0.082**	0.082**
	(0.039)	(0.049)	(0.649)	(0.038)	(0.042)
Age: 55 - 64	-0.044	0.074*	2.260***	0.132***	0.068*
	(0.038)	(0.042)	(0.770)	(0.038)	(0.037)
Age: 65 and over	-0.202***	0.001	1.826	0.114*	0.154**
	(0.077)	(0.107)	(1.171)	(0.063)	(0.066)
Education: High school or GED	-0.009	-0.039	2.558*	-0.045	-0.154*
	(0.133)	(0.115)	(1.333)	(0.060)	(0.084)
Education: Associates degree	0.003	-0.054	3.006**	-0.067	-0.207**
	(0.134)	(0.118)	(1.468)	(0.067)	(0.085)
Education: Some college	0.014	-0.092	2.496*	-0.122**	-0.217***
	(0.130)	(0.113)	(1.336)	(0.061)	(0.084)
Education: Bachelor's degree	0.006	-0.073	3.036**	-0.056	-0.173**
	(0.136)	(0.121)	(1.483)	(0.065)	(0.087)
Education: Master's degree/advanced degree	0.266*	-0.144	-0.239	-0.098	-0.361***
	(0.156)	(0.135)	(1.816)	(0.075)	(0.108)
State level FEs?	401	401	401	401	401
N	20	20	20	20	20

Results come from a sampling-weighted least squares regression of each outcome on warehouse type, full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education, and state of work. The reference category for race is white; for age, 25 - 34; for education, no degree or diploma. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Mediation of association between well-being and warehouse type, industry sample

	Job demands	**Opportunity**	**Hourly wage**	**Safety**
Well-being	0.55***	0.11	0.02	0.49**

Estimates are proportion of the total effect of warehouse type on well-being mediated by each job quality measure. All models are estimated with sampling weights using imputed data and include controls for full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education and state of work. The standard errors used to test for significance are generated using 500 bootstrap iterations. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Summary statistics for Amazon-Walmart sample

	Amazon		Walmart	
Variable	**Mean**	**SE**	**Mean**	**SE**
IVs				
B2B	0.277	0.013	0.866	0.020
B2C	0.723	0.013	0.134	0.020
Full-time	0.789	0.013	0.727	0.027
Part-time	0.211	0.013	0.273	0.027
Permanent	0.967	0.006	0.907	0.013
Temp	0.033	0.006	0.093	0.013
Does not work second job	0.851	0.012	0.824	0.024
Works second job	0.149	0.012	0.176	0.024
Female	0.501	0.015	0.307	0.024
Male	0.499	0.015	0.693	0.024
White	0.277	0.011	0.423	0.026
Asian or PacIslnd	0.090	0.009	0.028	0.011
Black	0.321	0.015	0.259	0.031
Indgns	0.011	0.002	0.010	0.004
Latinx	0.266	0.013	0.248	0.020
Other/multiracial	0.034	0.005	0.032	0.012
Age: 18 - 24	0.166	0.011	0.113	0.017
Age: 25 - 34	0.241	0.013	0.304	0.026
Age: 35 - 44	0.245	0.013	0.241	0.023
Age: 45 - 54	0.186	0.011	0.196	0.021
Age: 55 - 64	0.139	0.010	0.133	0.020
Age: 65 and over	0.023	0.004	0.013	0.007
Education: No degree or diploma	0.078	0.008	0.073	0.015
Education: High school or GED	0.362	0.015	0.467	0.029
Education: Associates degree	0.103	0.009	0.082	0.014
Education: Some college	0.255	0.013	0.227	0.023
Education: Bachelor's degree	0.160	0.012	0.138	0.021
Education: Master's degree/advanced degree	0.041	0.006	0.013	0.007
DVs				
Job demands	0.642	0.007	0.633	0.012
Opportunity	0.575	0.010	0.579	0.019
Hourly wage	18.57	0.061	23.91	0.164
Dignity	0.586	0.008	0.586	0.015
Safety	0.716	0.010	0.716	0.019
Injuries	0.368	0.007	0.333	0.013
Well-being	0.476	0.008	0.490	0.014
N	1453		444	

Table 6: Job quality by warehouse type, Amazon-Walmart sample

	Amazon					Walmart				
	B2B		B2C			B2B		B2C		
Variable	Mean	SE	Mean	SE	Difference in means	Mean	SE	Mean	SE	Difference in means
Job demands	0.580	0.012	0.665	0.008	***	0.633	0.013	0.634	0.039	n.s.
Opportunity	0.652	0.019	0.545	0.012	***	0.572	0.020	0.625	0.057	n.s.
Hourly wage	18.80	0.134	18.47	0.067	*	23.99	0.169	23.38	0.538	n.s.
Dignity	0.626	0.015	0.570	0.010	***	0.582	0.016	0.608	0.050	n.s.
Safety	0.771	0.017	0.695	0.012	***	0.715	0.020	0.721	0.052	n.s.
Injuries	0.331	0.013	0.382	0.008	***	0.340	0.014	0.288	0.034	n.s.
Well-being	0.529	0.014	0.456	0.009	***	0.483	0.015	0.533	0.037	n.s.
N	384		1069			389		55		

Difference in means compares dependent variables at B2B and B2C facilities operated by the same company. Significance levels determined from a bivariate regression of each outcome on warehouse type using robust standard errors. * p < 0.1, ** p < 0.05, *** p < 0.01

Table 7: Mediation of association between injuries and well-being and warehouse type, Amazon-Walmart sample

7a: Amazon

	Job demands	Opportunity	Hourly wage	Dignity and fairness	Safety
Injuries	0.89***	0.55***	0.01	0.45***	0.46***
Well-being	0.96***	0.67***	0.01	0.49***	0.51***

Estimates are proportion of the total effect of warehouse type on well-being mediated by each job quality measure. All models are estimated with sampling weights using imputed data and include controls for full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education and state of work. The standard errors used to test for significance are generated using 500 bootstrap iterations. * p < 0.1, ** p < 0.05, *** p < 0.01

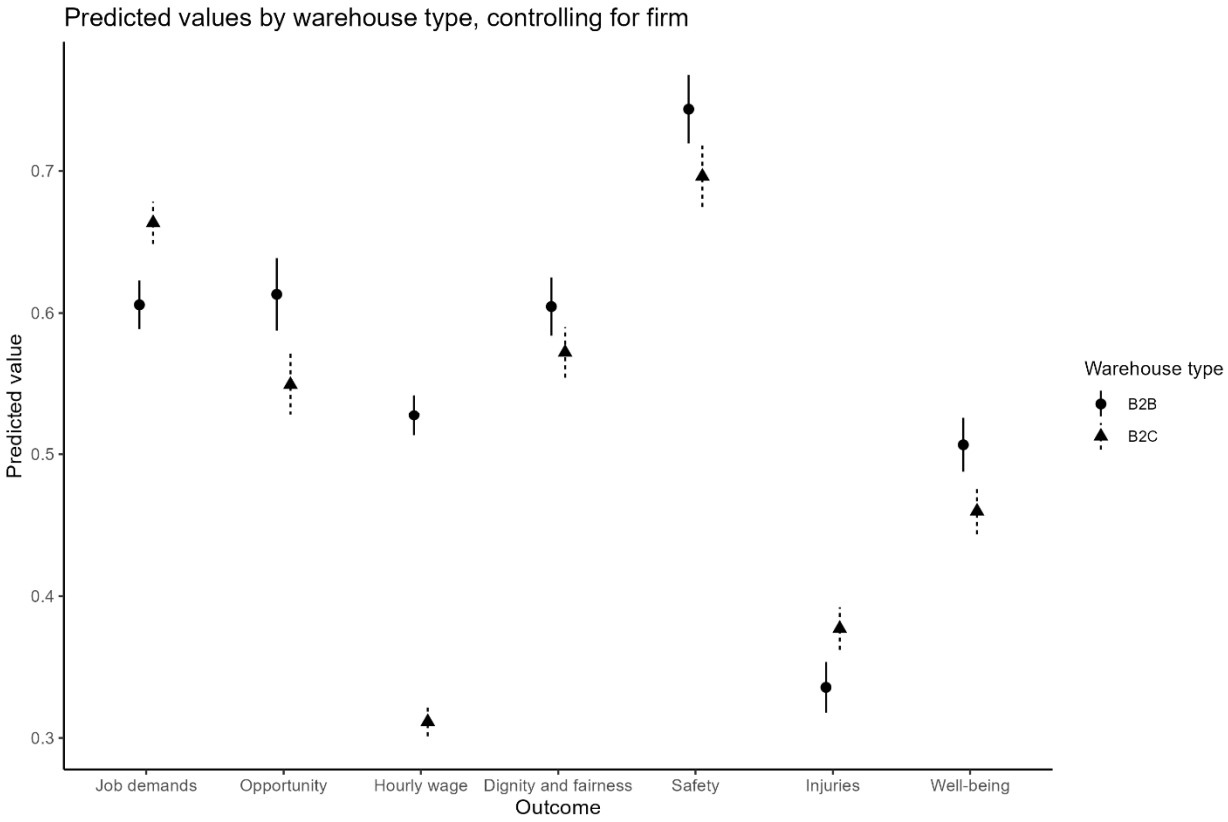
7b: Walmart

	Job demands	Opportunity	Hourly wage	Dignity and fairness	Safety
Injuries	0.01	0.18	0.13	0.15	0.03
Well-being	0.03	0.51	0.08	0.36	0.07

Estimates are proportion of the total effect of warehouse type on well-being mediated by each job quality measure. All models are estimated with sampling weights using imputed data and include controls for full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education and state of work. The standard errors used to test for significance are generated using 500 bootstrap iterations. * p < 0.1, ** p < 0.05, *** p < 0.01

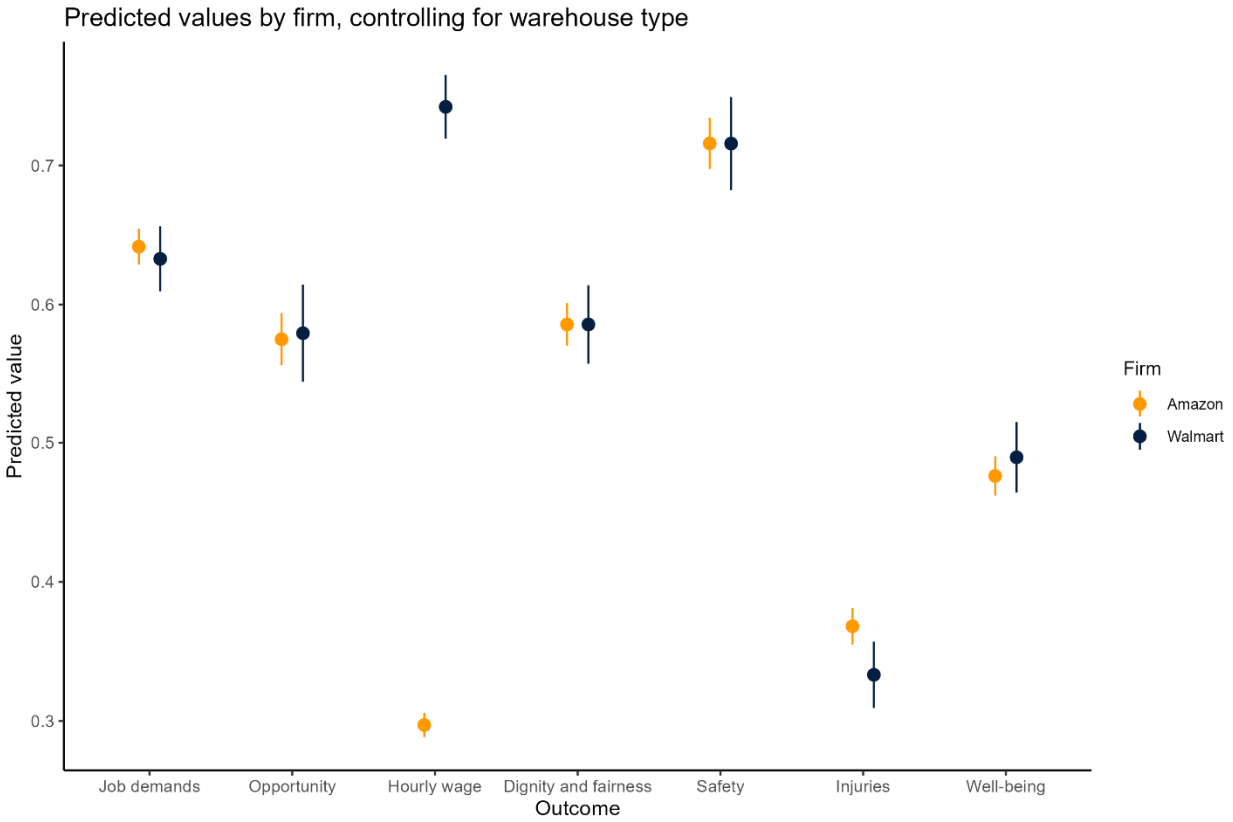
Figures

Figure 1: E-commerce effects on job quality, net of firm



With the Amazon-Walmart sample, these figures are generated using predicted values from a sampling-weighted least squares regression of each outcome on warehouse type, firm, full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education, and state of work. The predicted values are then averaged by warehouse type. The predicted values are different for B2C and B2B warehouses at the 0.01 significance level for all outcomes except dignity and fairness, which is significant at the 0.05 level.

Figure 2: Firm effects on job quality net of warehouse type



With the Amazon-Walmart sample, these figures are generated using predicted values from a sampling-weighted least squares regression of each outcome on warehouse type, firm, full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education, and state of work. The predicted values are then averaged by firm. The predicted values are different for Amazon and Walmart at the .05 significance level for injuries and at the 0.01 level for hourly wages.

Figure 3: Combined effects of firm and warehouse type on job quality

With the Amazon-Walmart sample, these figures are generated using predicted values from a sampling-weighted least squares regression of each outcome on warehouse type, firm, warehouse type x firm, full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education, and state of work. The predicted values are then averaged by warehouse type and firm. Table B.3 in Appendix B displays tests of whether there are significant differences across the predicted values by warehouse type and firm.

Appendices

Appendix A

Table A.1 Index construction: Industry survey

Index	Questions
Job demands Cronbach's alpha: 0.83	● My job requires very fast work ○ *Disagree strongly/Disagree somewhat/Neither agree nor disagree/ Agree somewhat/Agree strongly* ● How often does your production standard or rate make it hard for you to take time to use the bathroom? ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always* ● My work pace is ranked and compared with the pace of my co-workers. ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always* ● It is difficult to deal with family or personal matters during working hours at my job ○ *Never True/Sometimes True/Often True/Always True* ● I work with a hand-held scanner. ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always* ● How fast I work is measured in great detail. ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always* ● The system can tell if I am not actively engaged in my work. ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always* ● The company posts measures of worker performance for all workers to see. ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always*
Opportunity Cronbach's alpha: 0.67	● The company I work for provides workers like me with many opportunities for promotion. ○ *Disagree strongly/Disagree somewhat/Neither agree nor disagree/Agree somewhat/Agree strongly* ● Anybody can get to the top in my warehouse if they have ability and work hard. ○ *Disagree strongly/Disagree somewhat/Neither agree nor disagree/Agree somewhat/Agree strongly*
Hourly wage	● At your primary job, what are your typical hourly earnings, including tips and overtime?
Safety Cronbach's alpha: 0.58	● I can meet my performance objectives without risking my safety or health ○ *Disagree strongly/Disagree somewhat/Neither agree nor disagree/Agree somewhat/Agree strongly* ● Have you experienced a dangerous or unsafe work environment in the past six months? ○ *Yes/No* ● Safety remains a priority even when we are behind schedule. ○ *Disagree strongly/Disagree somewhat/Neither agree nor disagree/Agree somewhat/Agree strongly*
Well-being Cronbach's alpha: 0.68	● I am completely satisfied with my job. ○ *Disagree strongly/ Disagree somewhat/Neither agree nor disagree/Agree somewhat/Agree strongly* ● I look forward to coming to work every day. ○ *Disagree strongly/ Disagree somewhat/Neither agree nor disagree/Agree somewhat/Agree strongly* ● How often do you feel anxious about your production standard or rate? ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always* ● My job causes extra stress for me and my family. ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always*

Table A.2 Index construction: Amazon and Walmart survey

Index	Questions
Job demands Cronbach's alpha: 0.76	● How often does your production standard or rate make it hard for you to take time to use the bathroom? ○ *Never/Rarely/Sometimes/ Always/Most of the Time* ● You feel a sense of pressure to work faster. ○ *Never/Rarely/Sometimes/ Always/Most of the Time* ● Keeping up with [company's] pace of work/making rate is hard. ○ *Disagree/Agree* ● You're able to take breaks when you need to. ○ *Disagree/Agree* ● How fast you work is measured in detail by company technology. ○ *Never/Rarely/Sometimes/Always/Most of the Time* ● The system can tell if I am not actively engaged in my work ○ *Never/Rarely/Sometimes/Always/Most of the Time* ● Your work pace is ranked and compared with the pace of your co-workers ○ *Never/Rarely/Sometimes/Always/Most of the Time* ● You talk to your coworkers less than you want to, because you're concerned you're being monitored. ○ *Disagree/Agree* ● Have you experienced any monitoring or surveillance by any of the following while working at [company]? Supervisors/Loss prevention personnel/Security guards/Video cameras/Technology or computers/Police (Sum score) ○ *Does Not Apply/Applies*
Opportunity Cronbach's alpha: 0.72	● I have an opportunity to develop my own special abilities. ○ *No/Yes* ● I get to do a number of different things on my job. ○ *No/Yes* ● My chances for promotion are good. ○ *No/Yes*
Hourly wage	● What is your hourly wage at [company]?
Dignity and fairness Cronbach's alpha: 0.79	● Are you treated with respect by [company]? ○ *No/Yes* ● Are you treated fairly by your main supervisor(s) at [company]? ○ *No/Yes* ● Do you think [company] unfairly favors certain workers? ○ *No/Yes* ● Promotions are handled fairly by the company. ○ *No/Yes* ● Do you think workers at [company] are afraid to raise questions about company practices because of what management might do? ○ *No/Yes* ● Have you experienced any of the following in your work at [company]? Warned or disciplined unfairly/Unfair job assignments/Denial of job accommodations/Idle time unfairly enforced/Had your concerns dismissed/Unwanted sexual advances or harassment/Verbal abuse (Sum score) ○ *Does Not Apply/Applies*
Safety Cronbach's alpha: 0.77	● I can meet my performance objectives without risking my safety or health ○ *Disagree strongly/Disagree somewhat/Neither agree nor disagree/Agree somewhat/Agree strongly* ● The safety of workers is a high priority. ○ *Disagree/Agree* ● I feel free to report health and safety concerns or violations. ○ *Disagree/Agree*

Injuries Cronbach's alpha: 0.85	● During the past 3 months, have you experienced any of the following because of your job at [company]? Back pain/aching; Shoulder or neck pain/aching; Hand, wrist, or arm pain; Leg, knee, or foot pain; Physical exhaustion; Heat stress; Dehydration (Sum score) ○ *No, none at all/Yes, it was mild/Yes, it was moderate/Yes, it was severe*
Well-being Cronbach's alpha: 0.80	● How often do you feel anxious about your production standard or rate? ○ *Never/Rarely/Sometimes/Usually/Almost Always/Always* ● I feel burned out from my work at [company]. ○ *Disagree/Agree* ● How often do you find your work stressful? ○ *Never/Hardly Ever/Sometimes/Often/Always* ● Over the last 2 weeks, how often have you felt anxious or depressed? ○ *Not at all/Several Days/More than Half the Days/Nearly Every Day* ● Generally, how has working at [company] affected your mental health? ○ *Negative impact on your mental health/No impact on your mental health/Positive impact on your mental health* ● Generally, how has working at [company] affected your physical health? ○ *Negative impact on your physical health/No impact on your physical health/Positive Impact on your physical health*

Appendix B

Table B.1: Effect of warehouse type and firm on job quality, Amazon-Walmart sample

	Job demands	Opportunity	Hourly wage	Dignity	Safety	Injuries	Well-being
(Intercept)	0.602***	0.593***	0.184***	0.599***	0.649***	0.593***	0.432***
	(0.036)	(0.052)	(0.027)	(0.046)	(0.056)	(0.052)	(0.041)
B2C	0.065***	-0.062***	-0.017	-0.029	-0.044**	-0.062***	-0.041**
	(0.015)	(0.023)	(0.013)	(0.019)	(0.021)	(0.023)	(0.017)
Walmart	0.031*	-0.008	0.465***	0.012	-0.011	-0.008	-0.004
	(0.018)	(0.027)	(0.019)	(0.022)	(0.025)	(0.027)	(0.020)
Part-time	-0.010	0.011	0.016	0.035*	0.040*	0.011	0.033*
	(0.015)	(0.023)	(0.013)	(0.019)	(0.021)	(0.023)	(0.017)
Temp	-0.059**	0.033	-0.031	0.015	0.072**	0.033	0.062**
	(0.024)	(0.039)	(0.026)	(0.031)	(0.034)	(0.039)	(0.027)
Works second job	0.043**	-0.050*	-0.010	-0.071***	-0.083***	-0.050*	-0.027
	(0.017)	(0.026)	(0.014)	(0.022)	(0.028)	(0.026)	(0.020)
Male	-0.014	0.082***	0.037***	0.014	0.051***	0.082***	0.037***
	(0.012)	(0.018)	(0.008)	(0.014)	(0.017)	(0.018)	(0.013)
Asian or PacIslnd	-0.045*	0.075**	-0.039*	0.079***	0.077**	0.075**	0.074***
	(0.024)	(0.036)	(0.022)	(0.030)	(0.036)	(0.036)	(0.028)
Black	-0.024	0.082***	-0.042***	0.058***	0.107***	0.082***	0.060***
	(0.016)	(0.023)	(0.013)	(0.019)	(0.022)	(0.023)	(0.017)
Indgns	-0.051	-0.081	-0.051	-0.011	0.028	-0.081	0.042
	(0.050)	(0.073)	(0.040)	(0.059)	(0.066)	(0.073)	(0.052)
Latinx	-0.030*	-0.007	-0.037***	0.032*	0.008	-0.007	0.033*
	(0.015)	(0.023)	(0.011)	(0.018)	(0.023)	(0.023)	(0.017)
Other/multiracial	-0.050	0.132**	0.003	0.094**	0.051	0.132**	0.066
	(0.037)	(0.052)	(0.027)	(0.048)	(0.056)	(0.052)	(0.044)
Age: 18 - 24	0.013	0.029	-0.029**	-0.007	0.024	0.029	-0.004
	(0.019)	(0.029)	(0.015)	(0.025)	(0.028)	(0.029)	(0.021)
Age: 35 - 44	-0.016	0.008	0.022	-0.012	-0.011	0.008	0.037*
	(0.017)	(0.025)	(0.013)	(0.020)	(0.025)	(0.025)	(0.019)
Age: 45 - 54	-0.010	-0.030	0.020	-0.027	-0.029	-0.030	0.038*
	(0.018)	(0.026)	(0.013)	(0.021)	(0.026)	(0.026)	(0.020)
Age: 55 - 64	-0.042**	0.000	0.000	0.027	0.046*	0.000	0.090***
	(0.020)	(0.029)	(0.014)	(0.022)	(0.026)	(0.029)	(0.021)
Age: 65 and over	-0.038	-0.094	0.083**	-0.023	0.018	-0.094	0.075*
	(0.037)	(0.069)	(0.033)	(0.047)	(0.054)	(0.069)	(0.042)
Education: High school or GED	0.044*	-0.056*	0.025	-0.063**	0.011	-0.056*	-0.005
	(0.026)	(0.031)	(0.017)	(0.028)	(0.037)	(0.031)	(0.027)
Education: Associates degree	0.052*	-0.101**	0.056***	-0.074**	-0.017	-0.101**	-0.032
	(0.030)	(0.041)	(0.021)	(0.035)	(0.043)	(0.041)	(0.033)
Education: Some college	0.049*	-0.098***	0.044**	-0.078***	-0.044	-0.098***	-0.034
	(0.027)	(0.033)	(0.018)	(0.030)	(0.039)	(0.033)	(0.029)
Education: Bachelor's degree	0.085***	-0.082**	0.022	-0.067**	-0.039	-0.082**	-0.064**
	(0.029)	(0.037)	(0.022)	(0.033)	(0.042)	(0.037)	(0.031)
Education: Master's degree/advanced degree	0.057	0.020	0.060	0.037	0.117**	0.020	0.022
	(0.040)	(0.055)	(0.039)	(0.045)	(0.052)	(0.055)	(0.042)
N	1897	1897	1897	1897	1897	1897	1897
State level FEs?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Results come from a sampling-weighted least squares regression of each outcome on warehouse type, firm, full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education, and state of work. The reference category for race is white; for age, 25 - 34; for education, no degree or diploma. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table B.2: Interaction effect of warehouse type and firm on job quality, Amazon-Walmart sample

	Job demands	Opportunity	Hourly wage	Dignity	Safety	Injuries	Well-being
(Intercept)	0.591***	0.610***	0.179***	0.606***	0.656***	0.384***	0.446***
	(0.036)	(0.052)	(0.027)	(0.046)	(0.056)	(0.038)	(0.041)
B2C	0.079***	-0.084***	-0.011	-0.038*	-0.053**	0.052***	-0.060***
	(0.016)	(0.024)	(0.012)	(0.020)	(0.022)	(0.017)	(0.018)
Walmart	0.052***	-0.042	0.475***	-0.002	-0.025	0.020	-0.033
	(0.020)	(0.029)	(0.018)	(0.023)	(0.027)	(0.021)	(0.022)
B2C x Walmart	-0.089**	0.138**	-0.042	0.056	0.057	-0.107***	0.118***
	(0.041)	(0.063)	(0.049)	(0.052)	(0.057)	(0.037)	(0.043)
Part-time	-0.009	0.009	0.016	0.034*	0.039*	0.003	0.032*
	(0.015)	(0.022)	(0.013)	(0.019)	(0.021)	(0.016)	(0.017)
Temp	-0.057**	0.029	-0.030	0.014	0.071**	-0.048*	0.059**
	(0.024)	(0.039)	(0.026)	(0.031)	(0.034)	(0.027)	(0.027)
Works second job	0.044**	-0.051**	-0.009	-0.072***	-0.083***	0.019	-0.028
	(0.017)	(0.026)	(0.014)	(0.022)	(0.028)	(0.018)	(0.020)
Male	-0.015	0.084***	0.037***	0.015	0.052***	-0.075***	0.039***
	(0.012)	(0.018)	(0.009)	(0.014)	(0.017)	(0.012)	(0.013)
Asian or PacIslnd	-0.042*	0.071**	-0.037*	0.078**	0.075**	-0.032	0.070**
	(0.024)	(0.036)	(0.022)	(0.030)	(0.036)	(0.027)	(0.028)
Black	-0.020	0.077***	-0.041***	0.055***	0.104***	-0.026	0.055***
	(0.016)	(0.023)	(0.013)	(0.019)	(0.022)	(0.017)	(0.017)
Indgns	-0.046	-0.089	-0.049	-0.014	0.025	-0.055	0.035
	(0.049)	(0.073)	(0.040)	(0.058)	(0.066)	(0.045)	(0.051)
Latinx	-0.029*	-0.008	-0.037***	0.032*	0.008	-0.050***	0.032*
	(0.015)	(0.023)	(0.011)	(0.018)	(0.023)	(0.015)	(0.017)
Other/multiracial	-0.051	0.134**	0.002	0.095**	0.052	-0.046	0.067
	(0.037)	(0.053)	(0.027)	(0.048)	(0.056)	(0.039)	(0.044)
Age: 18 - 24	0.012	0.030	-0.030**	-0.006	0.024	0.036*	-0.002
	(0.019)	(0.029)	(0.014)	(0.025)	(0.028)	(0.020)	(0.021)
Age: 35 - 44	-0.017	0.010	0.021	-0.011	-0.010	-0.014	0.039**
	(0.017)	(0.025)	(0.013)	(0.020)	(0.025)	(0.018)	(0.019)
Age: 45 - 54	-0.011	-0.028	0.020	-0.026	-0.028	-0.001	0.040**
	(0.018)	(0.026)	(0.013)	(0.021)	(0.026)	(0.018)	(0.020)
Age: 55 - 64	-0.043**	0.002	-0.001	0.028	0.047*	-0.018	0.091***
	(0.020)	(0.029)	(0.014)	(0.022)	(0.026)	(0.020)	(0.021)
Age: 65 and over	-0.036	-0.097	0.084**	-0.024	0.016	0.034	0.073*
	(0.035)	(0.065)	(0.033)	(0.046)	(0.053)	(0.037)	(0.040)
Education: High school or GED	0.042*	-0.054*	0.024	-0.062**	0.012	-0.008	-0.003
	(0.025)	(0.030)	(0.017)	(0.028)	(0.037)	(0.025)	(0.027)
Education: Associates degree	0.052*	-0.100**	0.056***	-0.074**	-0.016	0.037	-0.031
	(0.029)	(0.040)	(0.021)	(0.034)	(0.043)	(0.031)	(0.032)
Education: Some college	0.048*	-0.097***	0.043**	-0.077***	-0.044	0.055**	-0.033
	(0.026)	(0.032)	(0.017)	(0.030)	(0.039)	(0.026)	(0.028)
Education: Bachelor's degree	0.085***	-0.081**	0.022	-0.066**	-0.039	0.083***	-0.064**
	(0.029)	(0.037)	(0.022)	(0.033)	(0.042)	(0.029)	(0.030)
Education: Master's degree/advanced degree	0.057	0.020	0.060	0.037	0.117**	-0.031	0.022
	(0.040)	(0.055)	(0.039)	(0.045)	(0.052)	(0.045)	(0.041)
N	1897	1897	1897	1897	1897	1897	1897
State level FEs?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Results come from a sampling-weighted least squares regression of each outcome on warehouse type, firm, warehouse type x firm, full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education, and state of work. The reference category for race is white; for age, 25 - 34; for education, no degree or diploma. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table B.3: Tests of differences in predicted values by warehouse type and firm, Amazon-Walmart sample

	Difference in predicted values	SE	p-value	
Job demands				
B2B, Amazon - B2B, Walmart	–0.053	0.017	0.003	***
B2B, Amazon - B2C, Amazon	–0.085	0.014	0.000	***
B2B, Amazon - B2C, Walmart	–0.053	0.036	0.138	
B2B, Walmart - B2C, Amazon	–0.032	0.015	0.029	**
B2B, Walmart - B2C, Walmart	–0.001	0.036	0.983	
B2C, Amazon - B2C, Walmart	0.032	0.035	0.363	
Opportunity				
B2B, Amazon - B2B, Walmart	0.080	0.026	0.002	***
B2B, Amazon - B2C, Amazon	0.107	0.021	0.000	***
B2B, Amazon - B2C, Walmart	0.027	0.057	0.634	
B2B, Walmart - B2C, Amazon	0.027	0.022	0.217	
B2B, Walmart - B2C, Walmart	–0.053	0.057	0.353	
B2C, Amazon - B2C, Walmart	–0.080	0.055	0.148	
Hourly wage				
B2B, Amazon - B2B, Walmart	–0.432	0.015	0.000	***
B2B, Amazon - B2C, Amazon	0.028	0.011	0.011	**
B2B, Amazon - B2C, Walmart	–0.381	0.045	0.000	***
B2B, Walmart - B2C, Amazon	0.459	0.012	0.000	***
B2B, Walmart - B2C, Walmart	0.051	0.045	0.264	
B2C, Amazon - B2C, Walmart	–0.409	0.044	0.000	***
Dignity and fairness				
B2B, Amazon - B2B, Walmart	0.044	0.021	0.039	**
B2B, Amazon - B2C, Amazon	0.056	0.017	0.001	***
B2B, Amazon - B2C, Walmart	0.018	0.047	0.699	
B2B, Walmart - B2C, Amazon	0.012	0.018	0.497	
B2B, Walmart - B2C, Walmart	–0.026	0.046	0.582	
B2C, Amazon - B2C, Walmart	–0.037	0.045	0.406	
Safety				
B2B, Amazon - B2B, Walmart	0.056	0.025	0.024	**
B2B, Amazon - B2C, Amazon	0.076	0.020	0.000	***
B2B, Amazon - B2C, Walmart	0.049	0.049	0.316	
B2B, Walmart - B2C, Amazon	0.020	0.022	0.352	
B2B, Walmart - B2C, Walmart	–0.006	0.050	0.897	
B2C, Amazon - B2C, Walmart	–0.027	0.048	0.578	
Injuries				
B2B, Amazon - B2B, Walmart	–0.009	0.018	0.631	
B2B, Amazon - B2C, Amazon	–0.051	0.015	0.001	***
B2B, Amazon - B2C, Walmart	0.043	0.030	0.145	
B2B, Walmart - B2C, Amazon	–0.042	0.015	0.007	***
B2B, Walmart - B2C, Walmart	0.052	0.030	0.083	*
B2C, Amazon - B2C, Walmart	0.094	0.028	0.001	***
Well-being				
B2B, Amazon - B2B, Walmart	0.047	0.019	0.017	**
B2B, Amazon - B2C, Amazon	0.074	0.016	0.000	***
B2B, Amazon - B2C, Walmart	–0.003	0.037	0.925	
B2B, Walmart - B2C, Amazon	0.027	0.016	0.094	*
B2B, Walmart - B2C, Walmart	–0.050	0.037	0.172	
B2C, Amazon - B2C, Walmart	–0.077	0.035	0.027	**

Significance levels determined by a hypothesis test of whether the predicted values for one warehouse type x firm combination equal to another warehouse type x firm combination. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	Difference in predicted values	SE	p-value
Job demands			

Appendix C

Amazon workers represent around 29% of all warehouse workers in the U.S. Our industry survey sample cannot identify workers by company, but it is likely that some respondents do work for Amazon. To see if our conclusions about the industry would change if we excluded potential Amazon workers from the industry sample, we performed a sensitivity analysis. The procedure went as follows:

1. For each round of our 20 imputations, we combined the industry sample with the Amazon sample.
2. Within each imputation, we performed nearest neighbor matching to identify which industry survey respondents were most similar to Amazon survey respondents. Specifically, we matched workers across the two samples accounting for age, race, gender, education, holding two jobs, temporary status, and full-time status. We specified that to be considered a match, the workers must be employed in the same state and in the same type of warehouse. We used R's matchit package to do this (Ho et al. 2011).
3. We then discarded all workers from the Amazon sample and from the industry sample if they exceeded a threshold that indicated they were similar to Amazon respondents. Specifically, if an industry sample respondent's propensity score for working at Amazon was 0.77 or greater, we excluded them from this sample. This threshold led us to throw out roughly 29% of respondents from the industry sample, which is the share we would expect to work at Amazon if we could survey the entire warehouse worker population. In

effect, this left us with a sample of 281 warehouse workers who had a lower likelihood of being employed by Amazon. We then re-ran our industry analysis on this subsample.

Table C.1 displays the main coefficients from regressions using this subsample. The results do not differ materially from the results using the full industry sample, displayed in Table 3. In sum, this analysis is consistent with e-commerce having an "industry effect" that is not exclusive to Amazon: job quality is lower in B2C warehouses that are not likely operated by Amazon.

Table C.1: Effect of warehouse type on job quality, industry survey excluding possible Amazon workers

	Job demands	**Opportunity**	**Wages**	**Safety**	**Well-being**
B2C	0.069**	-0.021	-0.005	-0.079**	-0.070**
	(0.028)	(0.035)	(0.585)	(0.032)	(0.029)
N	281	281	281	281	281

Results come from a sampling-weighted least squares regression of each outcome on warehouse type, full-time status, permanent employment status, whether the respondent holds another job, race/ethnicity, age, education, and state of work. Robust standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01

References

E. Ho, K. Imai, G. King, and E. A. Stuart. MatchIt: Nonparametric preprocessing for parametric causal inference. *Journal of Statistical Software*, 42(8):1–28, 2011.