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DELIVERING INSECURITY:

E-commerce and the Future of Work in Food Retail

December 9, 2020

Chris Benner and Sarah Mason

with Françoise Carré and Chris Tilly



A report from the
UC Berkeley Labor Center
and Working Partnerships USA

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Executive Summary

Since the start of the coronavirus pandemic, millions of Americans have ordered groceries online for the first time. By some estimates, as many as 45% of all households—55.5 million—ordered groceries online for delivery or pickup during August.¹ Major grocery chains have seen their total revenue from online orders double or even triple from last year. Some surveys show as much as 25% of U.S. grocery sales were ordered digitally during the widespread lock-down period in May, and still nearly 12% in August.² Many customers, understandably nervous about the health implications of leaving their homes and sharing narrow grocery aisles with other shoppers, are exploring new ways of getting food to their homes. This not only has led to the surge in online grocery ordering, but also provided a stimulus to the struggling meal kit industry and expanded home delivery of prepared foods. For elderly customers and those with vulnerable health conditions, the expansion of these new food ordering and delivery channels literally is a lifeline in the context of the pandemic.

The growth of e-commerce sales for food has increased the number of jobs available at a time when unemployment across the U.S. economy has skyrocketed. Grocery workers now are seen as essential workers, even heroes. At times they even have received extra hazard pay. And yet media reports also are full of stories of ongoing low wages and poor working conditions, severe health risks, and employer retaliation against workers who speak out. These challenges are even greater for grocery and delivery workers hired as independent contractors, who have no legal employment protections, unstable earnings and hours, low levels of access to health insurance, challenges obtaining personal protective equipment, and legal and administrative barriers to accessing unemployment insurance should they not be able to work.

What are the broader implications of the recent surge in grocery e-commerce work? Will these jobs continue to expand beyond the pandemic and, if so, by how much? What kinds of wages and working conditions exist in different segments of the industry? What changes should people in more traditional grocery store jobs anticipate? As grocery e-commerce continues to grow, what options exist to improve working conditions for the workers affected by this trend?

Key Findings

“The future is already here—it’s just not very evenly distributed,” says science fiction author William Gibson. While the pandemic has provided a catalyst to the growth of online food ordering, it is simply accelerating trends that already were apparent in the industry before, but just not as widely distributed. In this report, we examine these longer-term, technology-enabled shifts in business processes in the grocery industry, looking both at trends before the coronavirus pandemic and the most recent shifts, to assess the implications for future changes in work. Our conclusions can be summarized thusly:

- *Technological change is leading to new job growth.* In contrast to the widely held belief that new technologies inevitably lead to automation and displacement of workers, in this case the growth of e-commerce actually is leading to the creation of new jobs, as customers now are paying for tasks they used to do themselves for free. This includes:
 - Fulfilling orders, both in grocery stores and fulfillment centers, for both groceries and meal kits.
 - Preparing food in grocery stores, as grocery stores respond to increased demand for semi-prepared foods.
 - Providing curbside pickup.
 - Delivering groceries and prepared foods, as well as increases in delivery of meal kits.
 - Providing skilled technology and data analysis services that enable customers to shop and place orders online.
- *Job quality is a major concern in nearly all of these growing positions.* We should be concerned about the quality of these new jobs being created.
 - Most food delivery and a substantial amount of grocery fulfillment is done by platform-based workers who often are hired as independent contractors, with low wages, no employment protections, and no access to benefits.
 - Independent contractors and in-house employees alike also are subject to increasing surveillance and algorithmic management that can add stress to their jobs.
 - Workers preparing meal kits report unpredictable schedules and earnings, as well as safety and health concerns.³
 - Workers doing food prep in grocery stores also frequently are paid less than workers on the floor.

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- Workers doing skilled technology and data analysis in food retail positions often are paid substantially less than similar positions in other industries, such as financial services or software/information industries.
- *New fulfillment jobs will remain primarily in grocery stores, but slowly move to new fulfillment centers.* Grocery order fulfillment currently happens primarily in existing grocery stores, either by direct store employees or people working for online platforms, like Instacart or Shipt. This is inefficient and costly, so as online ordering increases, this will create pressure to shift fulfillment processes over time, in some cases to labor-intensive “fast-pick” facilities devoted to order fulfillment, and in other cases to semi-automated micro-fulfillment centers and more highly automated warehouse-size fulfillment centers. However, each of these options faces its own set of challenges, so we expect change will be gradual.
- *Cashier positions threatened.* We do see e-commerce contributing to declines in the number of cashier positions going forward, though cashier positions also are threatened by customer self-checkout technologies, which likely will have a bigger impact on cashiers than the growth of online sales.

These changes in work are the result of the ways e-commerce is changing the traditional process by which consumers purchase food to be consumed in the home, which involves four distinct steps:

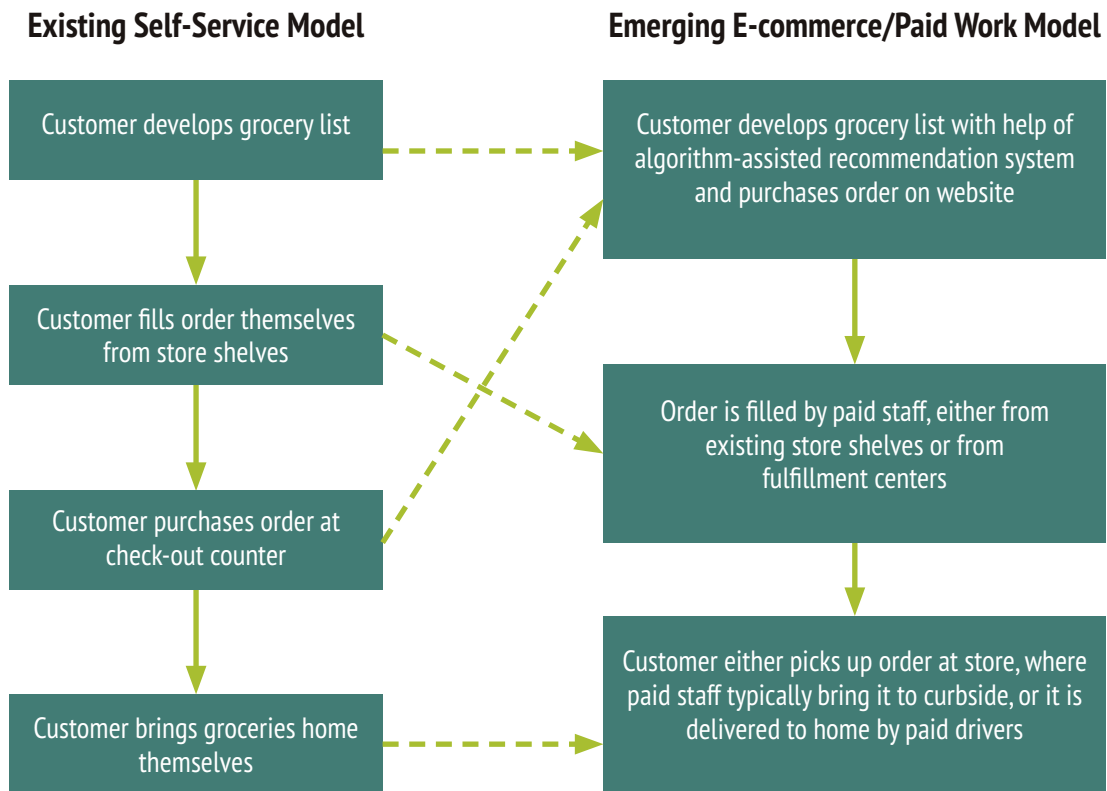
1. Customers develop their grocery list.
2. Customers fill that order themselves from grocery store shelves.
3. Customers purchase that order at a checkout counter.
4. Customers bring that order home themselves.

This traditional process now is being restructured, with three new distinct work processes, each enabled by different clusters of technologies, gaining hold in the industry, as shown in Figure A.

The emerging e-commerce-linked trends that are changing the process of obtaining food consumed at home include:

- *Online ordering and payment.* Prior to the pandemic, less than 2% of grocery sales were done online, but this has accelerated. Some estimates are that as much as 10% of grocery sales will be done online after the pandemic; this will be disproportionately concentrated in the major grocery chains in the industry, such as Walmart, Kroger, and Albertsons/Safeway. For the most part, these orders will be fulfilled from existing stores, meaning that brick-and-mortar infrastructure will remain a central component of grocery’s e-commerce strategy for the foreseeable future. Rather than considering e-commerce as something

FIGURE A:
From Self Service to Paid Work



separate from and displacing traditional grocery sales, it is more accurate to consider e-commerce as simply one channel in the omnichannel approach to sales that most companies are pursuing.

- *Fulfilling orders.* Currently in the United States, nearly all order fulfillment is done by people taking goods from existing store shelves, with the exception of Peapod, which has had dedicated warehouse fulfillment systems since 1999. Peapod’s systems are primarily, though not exclusively, “fast-pick” facilities in which the picking still is done by hand, but off of shelves that are optimized for efficiency in online order fulfillment rather than retail customer use. Two new, distinct models of more automated fulfillment systems are growing. One new type is micro-fulfillment centers, which use part of an existing store’s footprint to install semi-automated systems that bring items to pickers rather than pickers going to the items. These systems focus on the most frequently ordered items, with less frequently ordered items still filled from existing store shelves. Takeoff Technologies is

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the lead company in this space, having signed deals with Ahold Delhaize and Albertsons, with functioning models first rolling out in 2019. A second type of automated fulfillment is pioneered by UK-based Ocado, and involves highly automated fulfillment centers handling all items in large, dedicated warehouses. Ocado signed a partnership in 2018 with Kroger to build 20 of these throughout the United States. These are highly automated, though still involve human labor in the picking and packing processes, as well as receiving. Despite growth in these new models, in-store fulfillment is likely to remain the dominant model for the foreseeable future.

- *Food to customers.* At the moment, about half of all online orders are picked up by customers themselves at stores after a person has fulfilled the order in the store; this “click-and-collect” model is likely to remain a substantial part of online grocery delivery going forward, given the higher costs and organizational challenges of home delivery. Actual home delivery now is done largely by platform-based drivers, with Instacart the leader in this space, but the larger grocery firms are developing their own home delivery systems too, which also will grow.

It also is important to recognize that customers purchasing groceries to cook their own food is only one way that customers get food to eat at home. Grocery stores have for many years sold semi-prepared meals (such as premeasured cake mixes or frozen pizza), or fully prepared meals (such as food sold in store-based delicatessens, or rotisserie chickens). New technologies are enabling a wide range of new prepared and semi-prepared food delivery options, which also are transforming traditional grocery work (see Figure B).

There are two growing forms of prepared and semi-prepared food delivery affecting the grocery industry:

- *Meal kits.* The demand for meal kits is growing, though at a slower pace than originally predicted when they first appeared. At the moment there is a high level of customer churn in the home meal kit subscription delivery model, with customer acquisition costs high for standalone meal kit services. As a result, we are seeing more integration between meal kit companies and grocery stores, creating new in-store meal kit offerings as well as home delivery of meal kits via grocery stores.
- *Prepared food delivery.* The growth of new and more convenient ways of getting fully prepared food delivered to the home also is contributing to the long-term shift of food dollars going away from grocery stores to restaurants. Platform-based companies like DoorDash and Uber Eats enable a much wider range of restaurants—from fast food outlets on one end of the industry to white-tablecloth restaurants on the other end—to provide home delivery. This could draw additional revenue from grocery stores going forward, continuing a long-term trend of a lower percentage of consumer food dollars being spent on traditional grocery stores. Yet grocery stores also are taking advantage of this

FIGURE B:
New Delivery Channels for Food Consumed at Home

	TRADITIONAL GROCERY STORES	NEW ONLINE ORDER AND DELIVERY CHANNELS	
FULL MEAL	Customer purchases fully prepared meal (e.g., hot rotisserie chicken or deli item) from grocery store	Customer orders a fully prepared meal (e.g., deli item) and picks up using store's curbside program	Customer orders a fully prepared meal (e.g., deli item) from grocery store through meal delivery platform; item is delivered to home
SEMI-PREPARED	Customer purchases a meal kit from grocery store	Customer orders meal kits and picks up using store's curbside program	Customer orders weekly supply of meal kits to be delivered to home
INGREDIENTS	Customer purchases grocery items from grocery store	Customer orders grocery items online and picks up using store's curbside program	Customer orders grocery items online to be delivered to home
	STORE	STORE PICKUP	HOME DELIVERY (from store or fulfillment center)

new trend by increasing their prepared food selection, and making it available for home delivery. In addition, some of the increase in home delivery of prepared foods constitutes a shift away from customers eating in restaurants, not just a shift from groceries to prepared foods—a trend particularly pronounced during the pandemic.

Implications for Policy and Practice

There is widespread fear across the entire economy about the impacts of technology on jobs. The fear of automation—the robots are coming!!—permeates much of the discussion around technological change. This study of the growth of e-commerce in the grocery industry makes clear that the fear of technology-induced job loss is overblown. E-commerce growth in the industry has been moderate and manageable and, despite the surge caused by a historic pandemic, will remain a modest feature of the industry for the medium-term future. The growth of food-related e-commerce is contributing to job gain rather than job loss, creating new types of jobs and also expanding existing jobs in brick-and-mortar stores.

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Perhaps what is more important than paying attention to the aggregate number of jobs, however, is that we pay attention to the ways technology may be enabling the restructuring of jobs, with implications for job quality for both new and existing positions. It also is important to recognize there is significant variation in the ways technology is linked with changing business practices in the industry, that there is nothing inevitable about these changes, and that there is significant potential for different business strategies and public policies to shape the outcome of these changes for working conditions and workers' livelihoods.

Many new positions in filling orders and home delivery are insecure and low-paid positions. In many cases, people doing this work also are hired through online platforms, often as independent contractors, which denies these workers basic employment protections and benefits. These outcomes are not inevitable—in both order fulfillment and delivery positions, there are clear examples of in-house grocery employees doing the same tasks as workers deployed via platforms, but with greater job security and predictability of income, especially if they are represented by a union. In addition to decisions about whether or how to engage with online platforms, stores face other choices that have consequences for job quality in e-commerce. For instance, stores can leverage e-commerce channels strategically by linking online ordering and in-store offerings, such as expanding prepared food options and providing greater diversity of fresh foods.

Given the competitiveness of the industry and price pressures, however, it is not enough to rely on high-road business strategies to improve working conditions. Improving working conditions in e-commerce jobs will require proactive public policies and stronger systems of worker voice. This is especially urgent for the growing number of people doing fulfillment and delivery work who currently are being hired as independent contractors.

The most important strategy for protecting job quality for fulfillment and delivery workers is to narrow the criteria under which workers can be classified as independent contractors. This is important for ensuring these workers have access to the benefits and rights associated with employment, such as unemployment insurance, workers' compensation, anti-discrimination and other types of legal protections. The passage of Proposition 22 in California, in which platform-based companies spent over \$200 million to exempt themselves from a law designed to ensure platform workers had appropriate employment protections, sets a dangerous precedent of enshrining a new substandard category of employment into state law, underscoring the importance of stronger federal legislation against misclassification. Though far less effective, several interim or alternative strategies may exist where laws addressing misclassification do not (yet) exist, such as specifically including the on-demand workforce in local labor standards policies; creating and enforcing new minimum standards for meal and food delivery workers regardless of employment status that are high enough to ensure workers receive a living wage after accounting for all related business expenses; or requiring licenses for meal and food delivery workers and implementing a regulatory system that could be used to limit the number of workers who can access jobs at any moment in time, ensuring that those who are working can have sufficient earnings.

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Ultimately, what is needed are more well-developed systems for workers in these new delivery channels to have a voice in company and industry business strategies. Unions have an important role to play in the industry, seeking to ensure that the growth of e-commerce doesn't come at the expense of erosion of wages and working conditions. An estimated 15.1% of workers in the grocery industry were directly covered by a union contract as of 2019, and the number of workers indirectly benefiting from union protections is higher than that, due to some company efforts to more closely match union wages and working conditions to avoid union contracts.⁴ In addition, the United Food and Commercial Workers (UFCW) recently began organizing Instacart workers, but challenges for new union organizing efforts persist. Reforming national labor law to remove obstacles to workers forming unions and engaging in collective bargaining is the most important step to helping more workers gain a voice on the job. Where unions do not currently exist, other organizations representing grocery store workers, like United for Respect, also can play an important role in addressing concerns of in-store employees, while organizations representing so-called gig workers, and other labor rights and labor law advocates, also will be important for addressing misclassification, low wages, and working conditions for platform-based workers.

SECTION ONE:

Introduction

Since the start of the coronavirus pandemic, millions of Americans have ordered groceries online for the first time. By some estimates, as many as 45% of all households—55.5 million—ordered groceries online for delivery or pickup during August.⁵ Major grocery chains have seen their total revenue from online orders double or even triple from last year. Some surveys show as much as 25% of U.S. grocery sales were ordered digitally during the widespread lock-down period in May, and still nearly 12% in August.⁶ Many new customers, understandably nervous about the health implications of leaving their homes and sharing narrow grocery aisles with other shoppers, are exploring new ways of getting food to their homes. This not only has led to the surge in online grocery ordering, but also provided a stimulus to the struggling meal kit industry and expansion of home delivery of prepared foods. For elderly customers and those with vulnerable health conditions, the expansion of these new food ordering and delivery channels literally is a lifeline in the context of the pandemic.

But what are the implications of this trend for the people doing the work of fulfilling online orders and delivering food? Grocery workers now are seen as essential workers, even heroes. At times they even have received extra hazard pay. And yet, media reports also are full of stories of the insecurity of the “gig” work that so many grocery and food delivery workers face, hired as independent contractors with no employment protections, low levels of access to health insurance, inability to get personal protective equipment, and legal challenges of accessing unemployment insurance should they not be able to work.

What is the broader significance for workers of this recent surge in online ordering of food? Will these jobs continue to expand beyond the pandemic and, if so, by how much? What kinds of wages and working conditions exist in these jobs? What does this mean for people in more traditional grocery store jobs? As e-commerce continues to grow in the retail food industry, what options exist to improve working conditions for those affected by the growth in these new channels for getting food to be consumed at home?

To answer these questions, this report provides a systematic analysis of the workforce implications of the growth of e-commerce in the grocery industry. This requires understanding

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the longer-term trends in these technologically enabled business processes before the pandemic, as well as the recent surge. As science fiction author William Gibson likes to say, “The future is already here—it’s just not very evenly distributed,” so understanding the existing trends of e-commerce in the grocery industry before the pandemic can give us important insights into how these trends are likely to evolve in the near future.

This also requires understanding the role of the grocery industry within the broader retail industry, which has been facing significant challenges both before and during the pandemic. By some estimates, as many as 25,000 stores might close in 2020, more than double the nearly 10,000 stores that closed in 2019.⁷ Yet grocery stores were largely resilient to this “retail apocalypse” before the COVID-19 pandemic—the number of new grocery stores actually jumped 30% in 2018, even while e-commerce was increasing in the industry.⁸ Despite the growth of dedicated food fulfillment centers, the vast majority of groceries ordered online still are fulfilled from existing grocery stores, and e-commerce becomes simply one channel in a broader “omnichannel” environment for retail companies to communicate with their customers.

Customers, however, no longer are just getting food at home from grocery stores. Innovations like subscription meal kit offerings from companies like Blue Apron, Plated, and Home Chef are becoming more widespread. Meanwhile, new restaurant delivery platforms like DoorDash and Uber Eats are providing additional competition for grocery stores. These new sources of competition for grocery stores, enabled by new technological developments and the expansion of e-commerce, are pushing traditional grocery stores in a variety of new ways. They are offering new prepared food options and experimenting with an expanded variety of in-store experiences in an effort to hold on to consumer food dollars. Thus, even though e-commerce remains a small minority of total grocery retail sales, it has a more widespread impact on the workforce.

Research Questions and Methodology

The purpose of our research is to gain a better grasp of these changes and to answer the following questions: What are the implications for grocery workers of the rise in e-commerce? What does this mean for their livelihoods, particularly in terms of employment patterns, working conditions, skills requirements, task allocation, and wages? This includes trying to understand how much of the traditional in-store grocery retail industry is likely to be taken over by other delivery channels.

Understanding technological change in the industry is critical for answering these questions. New technologies are important, of course, for enabling online ordering. But what is visible to the consumer is only the tip of the iceberg of the range of technologies involved in not just online commerce, but also in the order fulfillment and delivery process. Understanding new technological capabilities helps us better understand what is possible in online ordering and

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delivery of food consumed in the home. But technological capabilities alone are not enough. Just because a technology exists does not mean it will be adopted widely. There are multiple points at which businesses can choose what technologies to adopt and how they wish to adopt them. Thus, it is important to examine links between new technologies and business practices, to understand the barriers to adopting new technologies, as well as what new technologically enabled business processes are becoming economically feasible. This helps us understand what types of new work are growing, and how existing jobs are being restructured.

Our research methodology draws from an industry studies approach. This approach attempts to straddle the territory between micro and macro analyses, focusing on actual, existing practices. We conducted extensive interviews with more than 60 CEOs, chief technology officers (CTOs), technologists, and industry consultants. Additionally, we attended several key industry trade shows and conferences in 2018–2019. Such events included Groceryshop, the “leading event for grocery & CPG innovation,”⁹ Shoptalk, the “fastest-growing event in retail history,”¹⁰ Home Delivery World, “North America’s most important retail logistics conference and exhibition,”¹¹ and the National Retail Federation’s annual conference, which draws nearly 40,000 participants to the largest retail convention in the country.¹² Our research also relies on data from the U.S. Census and U.S. Department of Labor Bureau of Labor Statistics, company reports, and articles from the business and trade press.

The report will begin with a short background on the grocery industry. Next, we will provide an in-depth analysis of current trends and near-term changes in three components of new grocery delivery: online ordering, fulfillment, and getting food to customers (delivery and pickup). In each case we describe the new and emerging technological capabilities, discuss how the capabilities are unfolding in the industry, and specifically address how the coronavirus pandemic has shaped trends this year and into the near future. We then will turn to an analysis of other new ways customers are getting food consumed at home, including the growing prevalence of home delivery of semi-prepared foods (e.g., meal kits) and prepared foods (deli items and home-delivered meals). This is important for understanding the implications for workers of these changes, which we discuss next. We conclude with a brief discussion of the implications of this research for public policy, labor, and business strategies that could help improve job quality in these new job sectors.

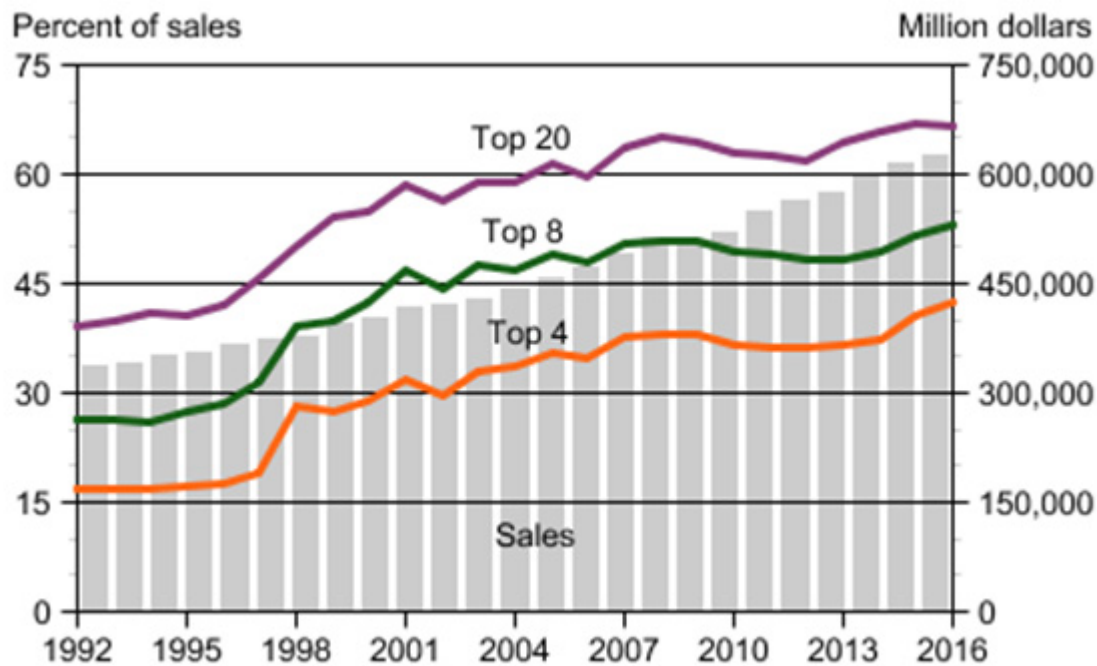
SECTION TWO:

Background on the Grocery Industry

To understand the growth in e-commerce-related jobs, it is important to have an understanding of where food retail fits within the overall economy. Retail is a critical sector, accounting for 10% of all U.S. employment. Of that, grocery workers (approximately 3.2 million, including both those working in grocery stores and some working in general merchandise stores like Walmart and Costco) account for 20% of all retail employees—making grocery the largest employment sector of the retail industry. While wages vary according to job and region, the average pay for all grocery workers is about \$15 an hour.¹³ This is higher than many retail subsectors, due in large part to grocery having a relatively high density of union membership, with approximately 15% of grocery store workers represented by a union, compared with a unionization rate of 6.2% across all private-sector workers.¹⁴ Unionized workers in grocery primarily are represented by the United Food and Commercial Workers (UFCW), the largest private-sector union in the United States. The UFCW says it represents 1.3 million workers (60% of whom work in grocery), negotiating contracts with Albertsons, Vons, Kroger, Safeway, Stop & Shop, Peapod, and more.

The grocery industry is dominated by a few large companies. In 2017, Walmart, the industry's largest firm, enjoyed 26% of all sales, followed by Kroger (10%), Albertsons (5%), and Ahold Delhaize (4%).¹⁵ The grocery sector has become increasingly concentrated over time through a combination of mergers, acquisitions, divestitures, and internal growth, particularly in the 1990s, but continuing more recently. By 2016, the top four players accounted for nearly 45% of total grocery sales (see Figure 2.1).¹⁶ The competitive strategies of these top firms have an important impact on the industry as a whole, and our analysis will focus in part on changes occurring within the dominant companies. At the same time, since grocery stores exist in nearly every community across the country, the grocery industry has a very "long tail," with a wide diversity of local stores, strong regional firms, and various niche market outlets, which combined employ hundreds of thousands of workers and serve millions of customers—so we also examine the ways in which smaller firms are responding to the growth of e-commerce as well.

FIGURE 2.1:
Top Four, Eight, and 20 Firms' Share of U.S. Grocery Store Sales, 1992–2016



Source: ESDA Economic Research Service, Retail Trends Overview¹⁷

Overall growth in the grocery industry in part is dependent on how much of consumers' overall food dollar is spent on food consumed at home. Here, the grocery industry has been losing market share. For several decades, consumers increasingly have been choosing to consume food away from home, at restaurants and fast food locations. In fact, food consumed at home accounted for only 46% of total food expenditures in 2019, down from 53% in 1999.¹⁸ This poses a formidable challenge to grocery stores struggling to outcompete the convenience offered by prepared meals.

In addition to this trend, the boundaries between groceries and food consumed away from home is blurring. Grocery stores, in an attempt to offer the ease and convenience of restaurant-prepared meals, are developing and expanding full-service delicatessens and an assortment of prepared meal items. Restaurants, on the other hand, are experimenting with expanded delivery options, making it easier to have fully prepared meals delivered directly to the home.

In addition to these changing trends in consumer behavior, private equity investors recently have been playing a significant role in reshaping the grocery industry. This is particularly the case in regional supermarket chains, with sometimes very negative consequences for grocers and their employees. Between 2015 and 2018, seven grocery chains employing more than

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125,000 workers filed for bankruptcy due to the actions of private equity owners.¹⁹ Private equity firms, Batt and Appelbaum argue, have little concern for the long-term viability of the companies they purchase, and primarily are concerned about shorter-term returns for their investors. They typically make purchases using a leveraged buyout model, which can saddle the purchased company with high levels of debt. For grocery stores, high debt loads make it difficult to either cut prices to compete with low-cost chains or have the resources to compete with upscale markets.²⁰

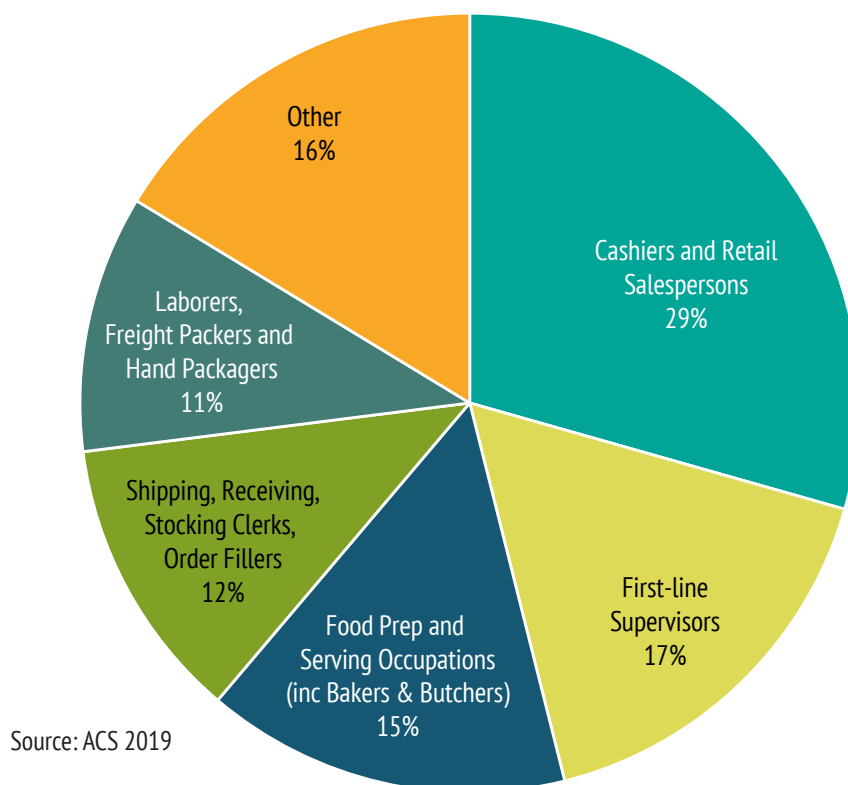
Private equity is not only a concern of small and regional chains. Albertsons, the second-largest grocery chain in the country, employing nearly 300,000 full-time and part-time workers, was held by the private equity firm Cerberus Capital Management until June 2020. Consistent with the private equity business model outlined above by Batt and Appelbaum, Albertsons has a history of leveraged buyouts that burdened the grocer with as much as \$12 billion in debt. Cerberus' efforts to realize financial gain from this investment included two failed IPO attempts (in 2015 and 2018) and a failed merger with Rite Aid, before its lackluster IPO in June 2020, which was described as "shrunken, below-range" in the business press.²¹

Occupations in Grocery Stores

In looking at how work is likely to change as a result of the growth of e-commerce and new delivery channels, it is important to look at current employment patterns in the industry, and to understand how work currently is organized by task along occupational lines. This is because, while it is highly unlikely that certain occupations will be eliminated completely, it is probable that certain tasks will be reduced or replaced with different kinds of work.

According to U.S. Census data from 2019 (see Figure 2.2), the occupational distribution in grocery primarily is divided between cashiers (29%), first-line supervisors (17%), food preparers (15%), shipping and receiving clerks (12%), and freight packers (11%). The demographics of workers varies along occupational lines, with women overwhelmingly filling cashier positions and men dominating more physical work like stocking, shipping, and fulfilling orders (see Figure 2.3). Approximately 66% of cashiers are women, while 74% of shipping and receiving clerks and 65% of freight packers are men. There also are some racial differences across employment categories in the industry. First-line supervisors are disproportionately non-Hispanic white, while Hispanic and Black workers are disproportionately concentrated among cashiers and stocking, shipping, and order fulfillment positions. Hispanic workers also are disproportionately concentrated in food prep and serving positions in the industry, accounting for 23% of all food prep workers in the grocery industry, despite accounting for only 20% of all workers in the industry, and 18% of workers across all industries. Across all occupations, grocery workers are a relatively young workforce. The vast majority of workers in this sector are between the ages of 18 and 44. In terms of education, nearly all workers have attained less than a college degree.

FIGURE 2.2:
Occupational Distribution, Grocery Stores and Specialty Food Retail, 2019



The major work responsibilities of these primary occupations in the industry include the following:

- *Cashiers*, the largest occupation in grocery, primarily are responsible for the following tasks: they receive payment by cash, check, credit cards, vouchers, or automatic debits; issue receipts, refunds, credits, or change due to customers; count money in cash drawers at the beginning of shifts to ensure that amounts are correct and that there is adequate change; help customers sign up for store rewards programs or credit cards; maintain clean and orderly checkout areas; and identify prices of goods.²² Moreover, in grocery stores with separate “self-checkout” lanes, cashiers must verify that the items have been paid for before the customer leaves the store and, if needed, assist the customer in completing the transaction.
- *Stockers* are responsible for a number of tasks including ensuring that product is within date (not expired), rotating and displaying product according to the appropriate store planograms, counting inventory, answering customers’ questions and assisting with

SECTION TWO: Background on the Grocery Industry

FIGURE 2.3:
Select Demographic Characteristics by Occupation, Grocery and Specialty Food Store Workers, 2019

	In Grocery Industry					All Grocery	All Industries
	Cashiers and Retail Salespersons	First-Line Supervisors	Food Prep & Serving Occupations (inc Bakers & Butchers)	Shipping, Receiving, Stocking Clerks, Order Fillers	Laborers, Freight Packers and Hand Packagers		
Gender							
Male	34%	56%	50%	74%	65%	51%	53%
Female	66%	44%	51%	26%	35%	49%	47%
Age							
Less than 18	8%	0%	2%	5%	13%	5%	1%
18 to 24	34%	8%	20%	30%	30%	24%	12%
25 to 44	18%	24%	21%	22%	18%	21%	23%
35 to 44	12%	23%	17%	14%	12%	15%	21%
45 to 54	11%	22%	17%	12%	11%	15%	21%
55 to 64	11%	19%	17%	14%	11%	15%	17%
65 and over	6%	4%	7%	4%	6%	6%	6%
Race category							
Non-Hispanic white	56%	67%	57%	59%	62%	60%	62%
Hispanic	21%	16%	23%	21%	21%	20%	18%
Non-Hispanic Black	13%	8%	12%	13%	9%	12%	12%
Non-Hispanic API	7%	8%	5%	4%	4%	6%	6%
Other	3%	2%	2%	4%	3%	3%	2%
Educational Attainment							
Less than high school	19%	8%	18%	17%	26%	16%	9%
High school graduate/ GED	37%	35%	43%	42%	43%	38%	24%
Some college or Associate Degree	35%	39%	31%	33%	24%	34%	31%
Bachelor Degree	8%	15%	7%	8%	5%	10%	22%
Graduate Degree	2%	3%	1%	1%	1%	2%	13%

Source: ACS 2019

SECTION TWO: Background on the Grocery Industry

retrieving certain items, assisting in unloading product from trucks, organizing the stockroom, cleaning cases and shelves, and mopping and sweeping the sales floor, stock rooms, and dairy coolers.²³

- *Prepared food workers* include deli clerks, bakers, and kitchen support staff who are responsible for completing a number of tasks, including cleaning and sanitizing work areas, equipment, utensils and dishes; storing food in designated containers and storage areas to prevent spoilage; preparing a variety of foods, such as meats, vegetables, or desserts; keeping records of the quantities of food used; taking and recording temperature of food and food storage areas (i.e., refrigerators and freezers); replenishing out-of-stock items; packaging takeout food; and weighing and/or measuring ingredients for purchase.²⁴

With this background information on the structure and employment characteristics of the grocery industry, we now turn to an analysis of emerging, new technologically enabled business practices in e-commerce, and other forms of home delivery of food.

SECTION THREE:

E-commerce and New Business Processes

The recent growth of e-commerce in grocery, in which customers pay for other people to fulfill their order and bring it to them, seems new, but actually was the dominant model 100 years ago, though it looked a little different. Back then, general stores and markets were staffed by clerks who fulfilled grocery orders with inventory that was kept behind the counter. Consumers would hand a list of items to a clerk, who then would measure out each product and fill the order by hand.²⁵ However, the labor cost of employing clerks could be expensive. Thus, when Clarence Saunders opened the first self-service Piggly Wiggly grocery store in Memphis, Tennessee, in 1916, it revolutionized the industry. In this model, rather than keep the inventory behind the counter, Piggly Wiggly allowed shoppers to freely traverse aisles of merchandise, filling up their own shopping baskets (another innovation at the time) with items that enticed them. Before exiting, a cashier would tally up their items and accept payment.²⁶ Even now, more than 100 years later, this basic self-service model still dominates the food retailing landscape.

The growth of e-commerce has yet to displace this dominant self-service model, but it is leading to the development of new patterns of consumer behavior and associated business processes and labor demands. To understand these changes, it is valuable to recognize that this self-service process of getting food to be consumed at home actually involves four distinct steps:

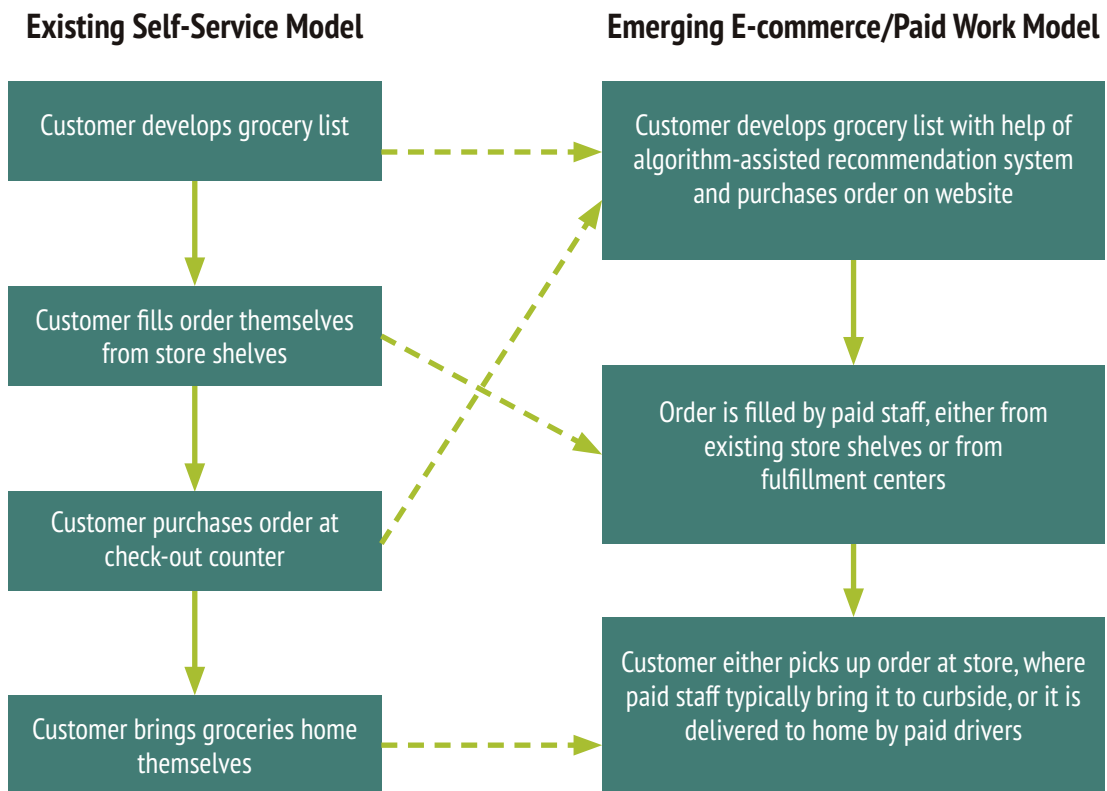
1. Consumers develop their grocery list, which could include fully prepared meals (i.e., hot rotisserie chicken), semi-prepared meals (e.g., frozen pizza), as well as basic grocery items.
2. Consumers fill their own order, in the store, by selecting items from the shelves or deli.
3. Consumers check out with the help of a cashier and bagger—the only part of the self-service model that still involves paid labor.
4. Consumers bring their order home themselves and use its contents to prepare and consume their own meals.

SECTION THREE: E-commerce and New Business Processes

However, with the rise of online ordering, the traditional process is being disaggregated and recombined in different ways, leading to the creation of three primary new labor processes, each with its own cluster of accompanying technologies and business practices:

1. Customers put items into a digital shopping cart online and pay online. This is still self-service, but involves a wide range of new jobs in building the customized digital infrastructure.
2. The customer's order is filled by paid workers picking items either from existing grocery store shelves, increasingly guided by custom apps directing them to improve efficiency, or from a number of different options for dedicated order fulfillment facilities with various levels of assistance from new automated technologies.
3. Customers either pick up their order at the grocery store, which typically involves paid workers bringing the order out to customers' cars, or the food is delivered to customers' homes by paid workers, though automated delivery systems are in early stages of deployment across the country as well.

FIGURE 3.1:
From Self Service to Paid Work



SECTION THREE: E-commerce and New Business Processes

These new jobs and processes in the grocery industry, however, are not the only new way that customers are getting the food they eat at home. Another major new development is the expansion of the **meal kit industry**. Meal kits involve preselected and premeasured ingredients linked with specific recipes that ease the shopping and cooking process for consumers. Meal kits are most commonly experienced as subscription-based home-delivery services, developed by companies such as Blue Apron or Plated. The work involved in this model includes new food-processing jobs in meal kit packaging facilities, as well as new jobs in delivering the meal kits to customers' homes. Meal kits also can be purchased in a grocery store; major grocery chains have purchased meal kit companies (Home Chef for Kroger, Plated for Albertsons) to expand their offerings in this product line. Full meal kits that customers cook themselves are in many ways a simple evolution of similar offerings that grocery stores long have stocked—everything from baking kits, to premarinated meats, to full frozen meals.

Finally, customers also are increasingly getting food at home through **digital platforms to facilitate home delivery of fully prepared meals**. When these new online platforms initially launched, they didn't offer their own delivery services, but just provided a new aggregator service for ordering food from restaurants that already offered their own delivery services (for example, this is the way GrubHub got started). But this rapidly evolved to the now familiar app-based ordering services that also provide delivery, with DoorDash now the industry leader. This has opened delivery options to a wide range of new restaurants—from fast food outlets to white-tablecloth restaurants—though simultaneously undermining restaurants' direct relationship with their customers and potentially shifting power within the industry to these new aggregators. It also has sparked the growth of "ghost kitchens"—restaurants that produce food solely for delivery without any physical retail presence.

All of these new food delivery channels, all ordered online, are represented graphically in the second and third columns in Figure 3.2. The bottom row represents groceries, the middle row meal kits, and the top row fully prepared meals. In all cases, in these new food delivery channels, ordering is done online, but customers either can get their order by picking it up at the store, or have it delivered to their home.

In the following sections we look at ordering, fulfillment, and delivery processes in the grocery industry, first describing the new technology-enabled processes in more detail, then providing an assessment of how widely and rapidly they are being adopted in practice, both before and after the start of the coronavirus crisis, and then providing some predictions of near-future patterns. In the subsequent section, we turn to the meal kit industry and platform-based restaurant delivery systems.

FIGURE 3.2:
New Delivery Channels for Food Consumed at Home

	TRADITIONAL GROCERY STORES	NEW ONLINE ORDER AND DELIVERY CHANNELS	
FULL MEAL	Customer purchases fully prepared meal (e.g., hot rotisserie chicken or deli item) from grocery store	Customer orders a fully prepared meal (e.g., deli item) and picks up using store's curbside program	Customer orders a fully prepared meal (e.g., deli item) from grocery store through meal delivery platform; item is delivered to home
SEMI-PREPARED	Customer purchases a meal kit from grocery store	Customer orders meal kits and picks up using store's curbside program	Customer orders weekly supply of meal kits to be delivered to home
INGREDIENTS	Customer purchases grocery items from grocery store	Customer orders grocery items online and picks up using store's curbside program	Customer orders grocery items online to be delivered to home
	STORE	STORE PICKUP	HOME DELIVERY (from store or fulfillment center)

Online Ordering of Groceries

Key trends: While substantial barriers to online grocery ordering remain, the pandemic has dramatically accelerated a pre-COVID trend of increasing customer acceptance of online ordering, with e-commerce potentially accounting for up to 10% of total groceries sales in the next few years. For most companies, this will be a complement to in-store shopping, rather than a complete substitute.

Technologies and New Processes

Online ordering of groceries actually involves a number of different digital technologies and services that allow for a food order to be fulfilled. Online ordering systems are reliant on an integrated, top-to-bottom website and increasingly sophisticated user-interface systems, including the visual design elements, the functional interactivity, and the means through which a user can interact with the ordering system (e.g., mobile, keyboard/touch screen, voice recognition, etc.)

SECTION THREE: E-commerce and New Business Processes

Over the last few years, online ordering technologies have gone far beyond simply clicking on individual items on a website to add them to a shopping cart. A wide range of related services have emerged, or are on the near horizon. For example, recipe-based shopping list generation, now available through a variety of recipe and cooking websites and apps, allows you to add multiple items to a shopping cart with a single click. Wireless item ordering and automatic replenishment systems have been developed. Amazon, for example, introduced Amazon Dash buttons for individual products from more than 100 brands; these devices were a small Wi-Fi-connected button that allowed people at home to one-click order replacements when needed.

The service was discontinued in 2019, but Amazon continues to experiment with Wi-Fi-enabled devices that can detect remaining supplies of select products and automatically reorder them when they run low. Products like smart refrigerators, which use artificial intelligence (AI) to recognize the food inside your refrigerator, and can be programmed to detect when items run low and automatically add them to a digital grocery list, are becoming a reality.²⁷ Voice assistant-enabled ordering, offered by Amazon Alexa and Google Assistant, can use machine learning and voice recognition technology, allowing consumers to use their smart devices to compile shopping lists or place orders for single items, directly, by speaking commands into a speaker.²⁸ At the moment, the number of consumers using any of these devices remains small, but improvements in these customer-facing technologies could be important, because they lower barriers to adoption (discussed more below) and increase customer use.

New developments in back-end systems also are important. The vast collection of data enabled by online ordering systems and their machine learning components may be used by stores to glean better customer insights, which in turn can lead to price optimization programs or dynamic pricing, sophisticated promotion targeting and customer loyalty programs, assortment planning (product selection to maximize sales and profits for a specified time), and personalized in-store marketing. Price optimization and related strategies involve mathematical modeling programs that calculate how demand varies at different price levels and for different customer segments, while comparing in real time with competitor pricing. Given the complexity involved in pricing thousands of items in rapidly changing market conditions, the insights from these dynamic modeling systems can have a major impact on pricing and promotion strategies, inventory, and customer satisfaction.²⁹

The use of AI-driven price optimization technology is new for the grocery industry, which traditionally has made widespread use of regression models to inform pricing in loyalty programs and consumer coupon strategies. Given food retail's narrow profit margins, price optimization is a particularly appealing technology. Undoubtedly, their interest in this technology stems from a desire to compete with companies who specialize in e-commerce and thus have been able to use customer and competitor data to experiment with optimized pricing for years.³⁰ In a press release discussing its recent partnership with Northern California and Nevada grocer Raley's, AI company Eversight confirmed this, saying, "This [price optimization

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technology] gives brick-and-mortar retailers the same power to optimize price that is available to pure-play e-commerce retailers, enabling them to compete in an entirely new way.”³¹

While not yet widespread, the implications of technology-enhanced ordering are potentially important to the industry. This is largely due to the large-scale data-collecting capabilities. As one industry consultant argues, “If I know who you are as a customer, if I know what you buy, why should I continue with a business model where you come to my store and shop? It’s better if I anticipate what you need and push it to you....They want customers to shop less and confirm more.”³² At the National Retail Federation conference, David Marcotte of Kantar Consulting described this trend as a shift toward “predictive fulfillment.”³³ Food retailers have utilized data on their customers to drive marketing and product pricing decisions for many years, but the increased use of data, analytics, and machine learning algorithms opens up new opportunities and insights.

Taking advantage of these new technological capabilities is harder for smaller chains without well-developed internal technological capabilities. Thus, another important development is the growth of integrated retail-as-a-service (RaaS) offerings from high-tech heavyweights like Microsoft, IBM, and Google. These integrated, cloud-based systems help lower barriers to accessing cutting-edge big data analytics and inventory management systems, which is important in the grocery industry, especially for stores and chains without significant internal capacities.

The labor involved in developing these multitude of online ordering systems and related services is primarily in technologically skilled computer science, engineering, and data analytics positions, which can be performed either by employees in house to the grocery companies, or by contracting with other companies to provide those services.

Adoption of Technology and Roll-out of New Practices

Online ordering of groceries seems to have reached a take-off phase with the pandemic, but it is important to understand its history, since it helps illustrate the multiple challenges that exist to expanding e-commerce, even once the technological capabilities are developed. Online ordering of groceries has been available since at least 1989, with the founding of Peapod, the first successful grocery store with online ordering in the United States. Starting with a four-year test pilot program of 400 households in Evanston, Illinois, Peapod grew modestly over the next 10 years, expanding to operate in a dozen major cities across the United States and counting more than 100,000 subscribers.³⁴

Initially, Peapod employees would pick the order at an existing Jewel-Osco grocery store, a supermarket chain headquartered in central Illinois, before delivering groceries directly to the customer’s home.³⁵ Peapod’s use of Jewel-Osco to fulfill orders is an example of how even early

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digital models often integrated with existing brick-and-mortar infrastructure as a core part of their business operations. Peapod opened its first dedicated fulfillment center in 1999, a 70,000-square-foot warehouse that consolidated fulfillment from 12 Jewel-Osco locations into one centralized picking facility. Then, when Peapod merged with Ahold Delhaize in 2001, it began to develop “fast-pick warerooms,” or dedicated areas attached to actual supermarkets, where workers could fulfill orders more efficiently.

Another early e-commerce pioneer in groceries provides a more cautionary tale. Webvan was founded in 1996 and began making its first deliveries in June 1999. Rather than Peapod’s labor-intensive and incremental development, however, Webvan pursued a more capital intensive and technologically sophisticated approach to grocery e-commerce and delivery services, resulting in what one financial news outlet called “that great symbol of excess during the dot-com boom.”³⁶ It invested heavily in large, highly automated fulfillment warehouses and delivery fleets. At its peak, it delivered to 10 urban markets. Though Webvan had ambitious plans to “revolutionize the delivery of groceries” by offering online ordering and free delivery within 30 minutes, execution and adoption proved to be more difficult. Despite tremendous hype and an IPO of \$4.8 billion, customer acceptance of online ordering was slow, and revenue growth lagged far behind predictions. By 2001, Webvan had gone completely bankrupt. The company shut down and liquidated its assets soon thereafter.

Amazon began testing its Amazon Fresh service in 2007, arguably the next significant phase of internet grocery and online ordering. Amazon Fresh is an online grocery service that allows members to order groceries to be delivered directly from Amazon fulfillment centers, bypassing traditional brick-and-mortar infrastructure.³⁷ It was significant because of Amazon’s dominant presence in the overall online retail industry, but it has struggled in the grocery sector and, as of early 2020, Amazon Fresh was only available in less than two dozen metropolitan areas in the country, and a few international locations.³⁸

Today, the most prominent pure online ordering service is Instacart, a same-day grocery delivery platform founded in 2012. Instacart allows customers to order their groceries online for home delivery and/or in-store pickup. Prior to the pandemic, it had partnerships with more than 350 national, regional, and local food retailers, serving more than 25,000 stores in more than 5,500 cities across the United States and Canada, with an ability to reach more than 80% of U.S. households.³⁹ Approximately 70,000 “personal shoppers” had signed up to work for Instacart, with some hired as part-time employees and others classified as independent contractors, though the legality of this status is heavily contested.

Much of Instacart’s growth and current prominence can be attributed to Amazon’s acquisition of Whole Foods in 2017, which sparked significant concern in the grocery industry. For many of the smaller chains, which lack their own online ordering and delivery systems, partnering with Instacart was seen as a means to immediately compete with Amazon.⁴⁰ For larger chains, including Safeway, Kroger, and Ahold Delhaize, who already had online ordering systems,

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partnering with Instacart also could bring cost-savings advantages, particularly with Instacart's use of independent contractors lowering labor costs. However, with these partnerships, concern is growing that customer loyalty may be in jeopardy, as consumers primarily interact with the third-party service rather than the grocers themselves.⁴¹ Additionally, as industry specialist Brittain Ladd has argued, Instacart now has access to millions of customers' data. Access to this data may give Instacart access to supplier advertising dollars and potentially increase direct-to-consumer sales from suppliers. As a result, many retailers are seeking out ways to reduce or eliminate their reliance on the third-party company.⁴²

Based on our extensive interviews with business leaders and consultants, it was clear even before the pandemic that major grocery companies now are investing significantly in building out their own online ordering systems as a means to establish a direct relationship with their customers online and collect their own data, rather than depending on Instacart or other third-party delivery companies.

Overall, as online ordering architectures evolve, technological barriers seem to be eroding steadily. We are observing a move away from large, integrated websites toward more modular sites, with separate modules for search, recommendations, catalog, promotions, cart and checkout, inventory, loyalty programs, pricing, order management systems, and customer service representatives.

Since Amazon's acquisition of Whole Foods, grocery stores have grown increasingly interested in RaaS. Kroger, for example, signed a three-year partnership with Azure, Microsoft's cloud business and competitor to Amazon Web Services (AWS), to create a pair of high-tech grocery stores in Monroe, Ohio (near Kroger headquarters), and Redmond, Washington (near Microsoft headquarters). The experimental stores are reported to be equipped with digital shelf labels, image recognition cameras, and an app that directs customers around the store to find items on their shopping list.⁴³ "When they reach the correct aisle," the Verge's Jon Porter explains, "digital shelf signs show a personalized symbol to show them the item they need. The app or terminal can then be used to scan the item, before directing them to the next entry on the list."⁴⁴ Cameras are able to track impressions, or detect and log "dwell time," or how long customers linger at a product display, which then can drive online advertising. Kroger also is looking to use the digital signage to sell targeted ads to specific customer demographics. Both Albertsons and Walmart have partnered with Azure as well, making it grocery's "preferred public cloud."⁴⁵ While Whole Foods uses AWS, Target recently migrated to Google Cloud, though it is unclear what services it is using.⁴⁶ IBM contracts with a number of food retailers to provide blockchain technology for inventory tracking and sales.

Overall, even before the pandemic, e-commerce clearly was growing. In the first quarter of 2020, e-commerce accounted for 11.8% of all retail sales, up from 10.5% just the year before. Since 2010, total e-commerce retail sales have grown consistently between 13% to 16% a year, compared with total retail sales growth of 2% to 5% a year. At this pace—again, prior to the

SECTION THREE: E-commerce and New Business Processes

pandemic—e-commerce was on a pace to reach 20% of all retail sales by 2025 or 2026. In understanding the implications of these figures, it is important to recognize that, while some retailers selling online have no physical store presence, for many retailers, e-commerce simply is one means of communicating with customers in a broader omnichannel environment. Even Amazon, the largest driver of e-commerce, is investing in physical brick-and-mortar stores through at least three brands in the grocery industry: Whole Foods grocery stores, Amazon Go stores (which provide more convenience food), and a new format, Amazon Fresh brand, launched with a store in Woodland Hills, California, in August 2020. This new store format uses smart shopping carts, and combines online ordering and in-store shopping, allowing people to order standardized items ahead of time online, while shopping themselves for produce and more personalized items in the store.⁴⁷

Compared with general retail, the grocery industry is far behind the e-commerce curve. According to the latest (2018) official Census retail e-commerce figures by retail subsector, e-commerce in food and beverage stores was only 0.6%, compared with 9.9% in all retail.⁴⁸ Estimates from grocery industry analysts are substantially higher than these official government statistics, with some estimating close to 2%,⁴⁹ and others as high as 6.3%.⁵⁰ The higher estimates from industry analysts likely represent some level of overestimation based on more limited surveys and methodologies that might overemphasize digital trends; studies from consultants are worth particular scrutiny. But these higher percentages may reflect more the reality of dominant grocery retailers, rather than the industry as a whole. Kroger, for example, reported digital sales amounting to 4.1% of total revenue in 2018.⁵¹ Walmart's e-commerce sales were estimated to be 8% of total revenue in 2019, though this is across all items, not just grocery.⁵²

The slow growth in grocery e-commerce is due to very significant barriers to ordering food online. First, there are challenges to developing an efficient and intuitive user interface to handle the number and diversity of potential items that go into a typical grocery order, which is much more complicated than ordering single items or more standardized items. As numerous interviewees stated, shoppers want online ordering experiences that are easy, fast, reliable, and convenient. From page design and layout, to image selection and item categorization, to personalization capabilities, building a usable user interface that can guarantee such an experience requires companies to invest in hiring and retaining a team of skilled professionals to deliver it. Integration between physical inventory and online inventory is another obstacle. Instacart users, for example, routinely are contacted by personal shoppers to opt for substitutions when an item they ordered online is out of stock in the store.

Another barrier to online ordering is customers' continued preference for selecting their own produce and meat. Companies are responding to this barrier by developing technologies like Walmart's "Fresh Online Experience," which would allow customers to purchase items like produce and meat by looking at actual images of the items in the store or warehouse.⁵³ So far, this technology only exists as a patent, and is not expected to roll out anytime soon.

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Internal organizational tensions also play a role in limiting the adoption of online ordering technologies. As one interviewee stated, while chief technology officers often see the benefits of investing in new technologies, operations departments are less convinced of the benefits of making the large capital expenditures required. While major capital expenditure decisions are made at executive levels or in finance departments, in such a narrow margin industry, organizational agreement is important for decision makers to authorize major capital expenditures.

Finally, there is the barrier of the additional costs. In one way or another, customers have to pay an additional charge for the costs of fulfillment and delivery. Specific charges vary over time, as retailers experiment with different strategies, but at the time of writing, Walmart's "Delivery Unlimited" program costs users \$98 per year or \$12.95 per month, while Amazon Fresh used to charge \$14.99 per month until it became free in 2019 for Amazon Prime members, though with a minimum order amount of \$35 in most places. Instacart delivery prices start at \$3.99 per order, or free on orders more than \$35 with a \$99/year membership in Instacart Express. In the short term, companies may undercharge for their delivery services in order to gain market share in this new delivery channel—a strategy that is more possible for venture capital-funded firms like Instacart, and for Amazon because of its dominance in e-commerce and ability to subsidize delivery with revenue from other business channels such as Amazon Web Services—but ultimately, moving away from a self-service model to an e-commerce-based order-and-delivery model will cost consumers more.

The Pandemic and Beyond

There are clear signs that the COVID-19 pandemic has accelerated the move to online grocery ordering, with leading grocery companies reporting truly remarkable figures on the growth of online orders. Albertsons reported a 276% annual increase in digital sales in the quarter ending June 2020, and 243% annual increase in the quarter ending September 2020, with delivery now available at more than 90% of its 2,252 stores, and curbside pickup reaching 1,600 stores.⁵⁴ Kroger's digital sales grew 107% in the first two quarters of 2020 compared with the previous year.⁵⁵ Ahold Delhaize reported a 114.7% growth in online sales in the third quarter in the United States, with online sales now representing 4.6% of total sales.^{56,57} Amazon online grocery sales tripled in the 2nd quarter of 2020 compared with the previous year, while its delivery capacity grew by 160%; Amazon tripled the number of grocery pickup locations as well, at its Whole Foods stores.⁵⁸

This surge has been beneficial particularly for Instacart. Compared with other major players in the online grocery business (Walmart, Amazon, Shipt, FreshDirect, and Peapod), Instacart jumped from a roughly 30% share pre-COVID to a peak of 57% share in April, displacing Walmart as the industry leader, at least in one prominent industry survey.⁵⁹ The number of people working on Instacart's platform rose from 180,000 to 500,000 in eight weeks at the

SECTION THREE: E-commerce and New Business Processes

beginning of the shelter-in-place orders. The company generated its first monthly profit in April, and estimated it would process more than \$35 billion in grocery sales in 2020 which, if true, would represent roughly 4% of all grocery sales.⁶⁰

Trends in these leading companies seem to be reflected across the industry, though perhaps to a lesser extent. Industrywide, estimates of e-commerce levels are based typically on consumer surveys—and thus are less reliable than company-specific financial reports—and vary substantially. At the lower end, Coresight Research estimated in May 2020 that online grocery orders would grow 40% in the industry overall in the year, rising to \$38 billion or 3.5% of total sales by the end of the year.⁶¹ Meanwhile, in its June Online Grocery Scorecard, industry analyst Brick Meets Click estimated \$7.2 billion in online sales in the previous 30 days alone, up from \$4.0 billion in March, which would represent more than 8% of total grocery sales.⁶² This represents an acceleration of two to three years from pre-pandemic predictions.⁶³ Their survey found that 35% of all households had ordered groceries online in the previous 30 days, reaching a total of 45.6 million.

This growth has come despite the uneven experience customers have had, especially early in the pandemic. As companies tried to adjust to the surge in orders, delays in order fulfillment and delivery were common, along with increased need for substitutions and incomplete orders. For example, in one survey of U.S. adults' experience digitally ordering groceries at the end of March, nearly 40% of those who tried to order online ultimately were unable to place an order at all, and a slightly larger percentage were able to place the order, but it was delayed by days.⁶⁴ In normal circumstances, such poor experiences for people trying out a new service likely would discourage future use. And indeed there is evidence of customer dissatisfaction—in the Brick Meets Click June survey, only 57% of people who used an online service said they'd be likely to use that specific service again, down from 74% in August 2019 (pre-COVID).⁶⁵ By their August 2020 survey, total sales in the previous 30 days had fallen to \$5.7 billion from \$7.2 in June, and the number of active customers in the previous 30 days dropped to 37.5 million from June's figure of 45.6 million. But these are obviously far from normal circumstances, and analysts suggest that customers may have more patience for inconveniences as grocery stores work out the kinks in their online grocery channels.

What do these patterns suggest for longer-term trends, especially as they relate to jobs in the industry? The longer that shelter-in-place recommendations are in effect, the more likely that online grocery ordering will become a regular part of consumers' shopping patterns, rather than simply an emergency response. There remain substantial barriers to customer acceptance of online ordering. As several consultants and food retailers we interviewed noted, consumers are slow to change their preference for selecting their own fresh produce.⁶⁶ This indicates that online ordering may be more concentrated on consumer-packaged goods (CPGs), while consumers will continue to shop for their produce and meats in store for some time. Very few consumers are likely to do all their grocery shopping online. Furthermore, most of these orders will be fulfilled from existing stores, meaning that brick-and-mortar infrastructure will remain a central component of grocery's e-commerce strategy.

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Of course, the growth of e-commerce will vary by market segment as well. Surveys of people who have shopped for groceries online suggest it is more common among parents and upper-income adults.⁶⁷ Age also is a factor, with millennials more likely to have shopped online than older generations.⁶⁸ Density is another element shaping the economics of online ordering technology. Areas with highly concentrated populations are likely to see expanded online ordering and delivery options, while rural areas might see more click-and-collect options. As stated above, larger companies will continue to develop their own online ordering systems and reduce their reliance on third-party services like Instacart. However, we expect that smaller and regional chains that lack the capital to invest in their own technology will continue to rely on these intermediaries.

Overall, then, it is clear that there is a tremendous short-term acceleration in online ordering that has pushed the industry a couple of years ahead of where it was predicted to be at this point, in terms of percentage of total sales. Once the pandemic subsides, health concerns about being physically in a store will be much less of a motivator for increased online ordering. With fewer people working at home, the challenges of coordinating delivery timing will once again increase, further limiting growth. But the changes to the industry are not likely to be reversed. While remaining a minority of total grocery sales, online ordering conceivably could rise to close to 10% of total industry sales in three to five years, and be somewhat higher for the largest companies in the industry, like Walmart, Kroger, and Albertsons. The most significant implications for the future of work from this development, however, are not in the online ordering segment of the process, but rather in fulfillment and delivery. This is not to ignore the important increase in demand for the skilled technical positions that the surge in digital ordering has stimulated—these are important, and we will return to a more detailed discussion of these positions in Section Four. But the number of people employed in this kind of work is small, compared with those employed in fulfillment and delivery. We now turn to examining each of these in turn.

Fulfillment

Key trend: Technologically sophisticated, semi-automated grocery fulfillment centers are increasing in number, both micro-fulfillment centers and larger centralized facilities, but they remain a small part of overall fulfillment channels. The vast majority of grocery fulfillment continues to be done from existing brick-and-mortar stores. This will continue to be the dominant model for some time.

Technologies and New Processes

There are currently three methods by which online grocery orders are fulfilled. The first and most prominent method is with people picking and packing orders from existing grocery store shelves. But as the recent surge in online ordering is making abundantly clear, picking groceries efficiently in a retail space is a challenging endeavor.

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The cost, of course, is one factor. Paying someone to fulfill an order is obviously more expensive than the traditional self-service method, and many analysts think grocery stores currently actually are losing money on their online orders, which obviously is not a viable long-term strategy.

A second, related factor, is that existing grocery aisles and shelves are not optimized for rapid order fulfilling. Unlike a dedicated warehouse, which is designed to optimize the rapid picking of products, the layout of a grocery store is merchandise-driven, meaning it is designed to visually entice customers, encourage “impulse purchases,” and maximize the consumer experience. Aisles have to be wide enough for multiple consumers, and shelving space for products expansive enough to allow for appropriate displays, making for inefficient use of space and inevitable conflicts between paid order fulfillers who are trying to optimize for speed, and self-service customers who also care about the shopping experience.

A third challenge with existing models of in-store fulfillment occurs when the work is done by third-party fulfillment services, like Instacart. With higher levels of turnover, and people often fulfilling orders from multiple different stores, it is inevitable that these people are less familiar with a store’s layout than full-time store employees. Not only are they less efficient in their own order fulfillment, but they can take time away from store employees when they have to ask for guidance on where certain items are located.

A fourth challenge of the in-store fulfillment process has to do with the space and temperature requirements for storing picked orders until the customer can pick them up or they are sent out for delivery. Grocery orders can require three different temperature regimes—room temperature, refrigerated and frozen. Items have to be stored in these temperatures after the orders are fulfilled, requiring dedicating new space. Existing store footprints are not designed for storing substantial volumes of online orders, which becomes even more challenging as the volume of e-commerce increases.⁶⁹

As a result of these challenges, one strategy companies are pursuing is to develop technology-based solutions to improve the efficiency of in-store order fulfillment. For example, fulfillment software continually is being developed and refined that can better integrate store planograms and real-time, in-store inventory with mobile device-based picking guidance systems. These systems provide direction to order pickers, allowing them to fulfill multiple orders at once, and increasing the efficiency of these in-store picking and packing processes.

Companies also are seeking to develop dedicated “rapid-pick” stores, like the model pioneered by Peapod. Peapod’s model relies on dedicated, densely packed and highly organized warerooms, most connected to existing grocery stores. This model is the easiest for stores to adopt, as there are low barriers to entry and no additional real estate is required. A closely related option is simply converting existing grocery stores to “dark stores,” solely dedicated to online fulfillment, which can make sense in a small number of cases where companies

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have excess store capacity and substantial online customers. This allows grocery staff to stock shelves in a more efficient manner for fulfilling orders, and avoids all of the conflicts between self-service consumers and paid order fulfillers.⁷⁰ As online ordering expands, the trend toward dedicated rapid-pick stores might grow, but this is still a highly labor-intensive process. Thus, we also are seeing growth in other semi-automated fulfillment options.

The second option for fulfillment is the **micro-fulfillment center (MFC)**. Micro-fulfillment centers are semi-automated systems that use existing store real estate to pick orders. These systems rely on a combination of robot technology and artificial intelligence to bring items to pickers, who then receive and pack orders for delivery. MFCs can be used for the most commonly ordered online goods and can contain both room temperature or dual-temperature products. Frozen foods still must be fulfilled by worker-based pick-and-pack processes, using the regular store's cold space.

The third option for fulfillment is large-scale dedicated warehouses, or **centralized fulfillment centers (CFC)** typified by the UK food retailer Ocado. These facilities are equipped with sophisticated robot and AI-driven technology and contain semi-automated systems that bring items to a small team of pickers working in the three different temperature regimes. Unlike MFCs, CFCs are designed to handle *all* inventory items, rather than just the most popular items. Importantly, CFCs are more expensive than MFCs, with an investment of approximately \$55 million per facility.⁷¹ This model, while more automated than the others, needs to handle significantly more volume in order to be profitable.

Adoption of Technology and Roll-out of New Business Practices

As mentioned above, the most dominant model pursued in the industry for fulfillment now is when workers fulfill orders from existing stores. But within this, there are several variations that are being pursued. One prominent option is for fulfillment to be done by a third-party firm, such as Instacart or Shipt. Estimates of the number of people doing this third-party fulfillment work are at best estimates. Before the pandemic, Instacart directly employed approximately 12,000 in-store shoppers, who worked mostly part time fulfilling online orders for pickup or delivery, but they didn't do the actual delivery. They also had an additional 130,000 "full-service" shoppers working through their platform whom they classify as independent contractors; these people both fulfill an order from the store and deliver it to the customer's door. Shipt, another prominent online grocery fulfillment and delivery service, doesn't have a separate shopper-only category, but had 50,000 to 100,000 shoppers in their system before the pandemic.

The other model for in-store fulfillment is for grocery companies to have their own direct employees do online order fulfillment. It is difficult to estimate how many direct employees actually are involved in doing this work, since it isn't identified as a separate occupation in official government statistics, many companies don't report specifically on this, and many

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employees may fulfill online orders as only part of their responsibilities, along with stocking, for instance. Prior to the pandemic, though, one source reported that Walmart had 45,000 people doing online order fulfillment in their stores.⁷²

The primary alternative to the labor-intensive process of people picking and packing are micro-fulfillment centers (MFCs), the relatively small, semi-automated systems that use existing store real estate to pick orders of the most popular items. Currently, Takeoff Technologies is the leading manufacturer of MFCs, touting partnerships with Albertsons, Ahold Delhaize (Stop & Shop), Florida-based Sedano's, and Wakefern (ShopRite). In April 2019, Takeoff Technologies announced it would be opening 50 micro-fulfillment centers across North America by the end of 2020.⁷³ Takeoff's MFCs, which cost approximately \$3 million to \$5 million to install, have a footprint ranging from 4,000 to 10,000 square feet, and can easily house 40,000 to 50,000 items. Unlike dedicated warehouses, which take years to construct, some MFCs are able to be installed and made operational within just three months.⁷⁴

Grocery giant Walmart has partnered with Alert Innovation to develop its own MFC robotic system called Alphabot. Like Takeoff Technologies, the Alphabot system relies on automated mobile carts to retrieve ordered items from a dense, vertical system where items are stored. Then, these items are delivered to a Walmart employee by mobile carts for sorting and packing.⁷⁵ According to a Walmart press release, the first Alphabot system was installed in early 2020 at a supercenter in Salem, New Hampshire, where, "a 20,000-square-foot extension connected to the store houses the new system and will serve as a dedicated grocery pickup point with drive-thru lanes for customers."⁷⁶

Another up-and-coming company developing MFCs is Fabric, formerly known as Commonsense Robotics, an Israeli company that moved its headquarters from Tel Aviv to New York City in 2019. It raised \$110 million in Series B funding in late 2019 and claimed to have 14 sites under contract in several U.S. cities, though a partnership with FreshDirect is the only one that was publicly announced.⁷⁷ In Israel, the company signed a deal with discount grocer Rami Levy to build 12 fulfillment sites. It also reportedly broke ground on what it called the world's first underground MFC, converting an underground parking structure to do fulfillment.⁷⁸

Importantly, for all MFC models currently available, humans still are needed to load items into the system, and to pack the robotically pulled items into totes. In addition, MFCs typically only handle the most commonly ordered items, and most have only a single temperature regime. This means that in-store pickers still are required to select refrigerated and frozen items, as well as more perishable produce.

The third fulfillment option for the grocery industry is the highly automated centralized fulfillment center (CFC). Ocado is the leader in developing and implementing this model and its corresponding technologies. Based in the UK, Ocado refers to itself as "the world's largest dedicated online grocery retailer."⁷⁹ It has no brick-and-mortar presence and conducts all of its

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deliveries through its CFCs. Its highly automated fulfillment centers, along with algorithmically driven delivery guidance systems, makes its process highly efficient, allowing it reportedly to be able to deliver food in the UK to customers' doors for a lower price than to a grocery store shelf. Whether it will be able to replicate this performance in the United States remains to be seen.

In the United States, Ocado's current only partnership is with Kroger, a deal that was signed in 2018 to build 20 robotic warehouses across the United States over the following three years—a massive investment of hundreds of millions of dollars. The first site, a 335,000-square-foot center under construction in Monroe, Ohio, near Kroger's Cincinnati headquarters, is set to open in early 2021.⁸⁰ As of July 2020, it had announced the launching of another eight sites.⁸¹ Ocado has two generations of CFCs and it is the more advanced, second-generation model that it will be constructing for Kroger.⁸² Kroger seems to be pursuing a range of strategies in its location decisions. In some cases (e.g., Cincinnati, Wisconsin), the company is locating CFCs in markets where it already has retail stores, and thus name recognition. In other places, such as Florida and the Mid-Atlantic, the Ocado fulfillment centers seem to be an attempt at garnering market share in places where it does not already have a substantial presence.

The Pandemic and Beyond

With the rapid surge in e-commerce, grocery stores primarily have depended on in-store fulfillment. Much of this fulfillment has happened through Instacart, as the total number of people working on the platform reportedly has surged past 500,000. Grocery retailers themselves also are hiring people directly to do order fulfillment, though it is difficult to get specific figures on the number of people now doing fulfillment in house. Grocery stores overall have been one of the few retail subsectors that have done well during the pandemic. According to official BLS employment statistics, while total retail employment fell 15% between February and April, employment in food and beverage stores only fell 1%. By preliminary October figures, while total retail employment still was down 3%, employment in grocery stores actually was up 3% from the pre-COVID figure in February.⁸³ Clearly, much of this work is in traditional grocery store jobs, but there are signs that in-house fulfillment employment is growing as well. For example, in July, Instacart announced that ALDI and Sprouts had decided to have their own employees fill digital orders, forcing Instacart to wind down their in-store operations with those retailers.⁸⁴

Successfully handling the surge in online orders has been a challenge, especially early on in the pandemic. Disruptions in supply chains led to an increase in a need for substitutions, and delays in order fulfillment were common. Conflicts for aisle space between self-service consumers and paid fulfillment workers became more common, and the labor-intensive nature of in-store fulfillment meant that companies likely were losing money on each order.

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As a result, a range of companies began converting a few existing stores to online fulfillment only. As early as April 2020, Whole Foods, Kroger, Stop & Shop, Giant Eagle and others had announced that some stores were temporarily or permanently being converted to “dark” stores, solely dedicated to fulfilling online orders.⁸⁵ This seemed to make sense in dense urban areas where there is some overlap in multiple existing stores—rarely would this make sense if a retailer had only one store in an area.⁸⁶

There appears to be an acceleration in the deployment of micro-fulfillment centers as well. As of January 2020, Takeoff Technologies had five MFCs operating (with Ahold Delhaize, Albertsons, Wakefern and Sedano’s), Alert Innovation had two installations operating with Walmart, and Dematic had one in operation with Meijer.⁸⁷ By mid-year, Takeoff Technologies was opening a new MFC “practically every other week,” according to CEO José Vicente Aguerrevere, though this included customers in Europe and Australia, not just its main market in the United States.⁸⁸ Other MFC models also seem to be moving ahead. Fabric announced its first public partnership in the United States, with FreshDirect in the Washington, D.C., metropolitan area.⁸⁹ Amazon launched a new partnership with Dematic for a micro-fulfillment installation in its Los Angeles-area Amazon Fresh operations.⁹⁰

Meanwhile, in the other competing model to MFCs, the Ocado/Kroger partnership to develop 20 CFCs also is moving forward, with the first center outside Cincinnati expected to begin operations in early 2021. Investors are bullish on the company—its stock price more than doubled between February and early August.

Thus, we do expect automated fulfillment options to continue to expand in the coming years, though it is important to stress that this remains a very small part of the overall e-commerce fulfillment market, and is likely to remain so for some time. This is both because of the time it takes to build out the facilities, but also because of the operational challenges involved in getting new and complex inventory systems in place in the new facilities.

One key question is the extent to which either the MFC or CFC model is likely to be more prevalent. Both MFCs and CFCs claim their model to be superior. Takeoff argues that MFCs are the most economical option because they cost less to install, can use portions of existing store footprints, can become economical with a lower total volume of online ordering, and are more flexible, to integrate into both store pickup and more localized (and thus lower costs) home delivery options, and are thus more profitable for grocers. In contrast, Ocado argues that its more comprehensive approach (i.e., multiple temperature regimes and larger assortment of items) and efficient operations pays off in the ability to offer lower prices to customers.

Given the diversity of retail grocery markets in the country, we expect that both MFCs and CFCs will have success, though perhaps in different markets. CFCs will require a higher total volume of orders to be profitable, given the higher capital costs, but the recent surge in online ordering suggests this is possible to achieve. Meanwhile, MFCs clearly are operating already in a number

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of different settings, and while it is too early to fully assess the economics of these operations, the expansion in orders suggests they are having some success. But even at the scale that Takeoff Technologies is moving at the moment, of a new MFC opening every other week, it will be many years before either model becomes a large part of the e-commerce fulfillment market in the United States.

With roughly 40,000 grocery stores across the country, even expanding to 100 new MFCs a year, and assuming that each new MFC might have a delivery area of six to eight existing stores, in four years this still would represent less than 10% of the market even accessible by MFCs, much less using them. Thus, we anticipate that labor-intensive fulfillment from existing store shelves will remain the dominant form of online order fulfillment, at least for the next five years. Given the extra costs involved, however, grocery stores will have to either increase prices for online orders, or find greater efficiencies in fulfillment, such as devoting more dedicated space for “rapid-pick” models in dark stores or portions of existing stores for high-volume items. And these additional costs will continue to provide economic pressure on developing more automated processes.

In the near-term future, human labor also will continue to play a necessary role in both CFCs and MFCs. In both models, packing of orders still is performed by humans. Some technologists predict that automated, robot-arm based systems could be commercially viable in the mid-term future.⁹¹ Indeed, in November 2020, Ocado acquired two robotic arm designers and manufacturers, for a total of \$291 million, in what appeared to be an effort to accelerate automation in this component of their operations.⁹² We do think that such systems are likely to be phased in, but they most easily will be utilized for packaged goods, with more sensitive items still picked by human hand.

Food to Customers

Key trend: Home-based delivery options are expanding, including autonomous vehicles and even drone delivery along with the still-universal use of human drivers for delivery, but curbside pickup remains an important mechanism to get food to customers. It is likely to remain important, given the extra costs and logistical challenges of home-based delivery.

Technologies and New Processes

Once an order has been fulfilled, there are a number of different options for getting it to the customer. One option, of course, is for customers to pick it up themselves at existing grocery stores. This requires few changes in existing grocery store practices, other than reallocating parking lot space for grocery pickup and creating systems for workers to bring customers’ orders to their cars.

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To help coordinate the retrieval of orders, some grocery stores are adopting app-based systems to track customer arrival. This information allows employees to ready orders for curbside pickup as soon as a customer enters the parking lot. For example, Albertsons has a partnership with location-sharing service Glympse, which gives shoppers real-time status updates on their delivery or at-store pickup orders.⁹³

In addition to “drive-up-and-go” pickup, food retailers are offering new locker-based delivery sites. These pickup locations may be located in a store, like Walmart’s 11-foot-by-127-foot grocery kiosk, or at various neighborhood drugstores or coffee shops.⁹⁴ Locker-based pickups require employees to load picked orders into the temperature-controlled units. Then customers can “unlock” the unit to retrieve their order using a password or QR code. Analysts see pickup lockers as potentially expanding in areas that are dense enough to see a high volume of traffic, and close enough to fulfillment centers to be able to efficiently load orders, though this is likely to remain a secondary strategy to store-based pickup.⁹⁵

Third-party platforms, like Instacart, Shipt and ShopHero, provide delivery services specifically for grocery stores. Other platforms that have developed initially for prepared food delivery, like DoorDash and GrubHub, now also have expanded into grocery delivery. These delivery services allow customers to visually track their delivery using an in-app map that provides real-time updates. This may help customers better plan for the receipt of their delivery.

Companies also are developing various types of automated delivery vehicles. Some, such as Udelv and Nuro, are custom-designed autonomous vehicles designed to operate on existing roadways, with multiple temperature-controlled separate compartments that allow for multiple deliveries within a single neighborhood before having to return to the fulfillment center for refilling. Other models are smaller, and designed for single-order delivery and more convenience shopping. This includes models such as Refraction AI, which can operate in bicycle lanes, and other models, like Starship Technologies and Kiwibot, that are designed to operate on sidewalks and crosswalks. In all cases, customers must be present to receive the order, verifying their identity through a passcode or biometric authentication.⁹⁶

There is also the prospect of drone-based delivery. Amazon has been seen as the industry leader here, with the 2016 high-publicity roll-out of its Prime Air delivery service for packages. It has developed a number of related patents, including an aerial “beehive” fulfillment center and blimp-based aerial fulfillment center. But Amazon is not the only company pursuing this option, and 7-Eleven, in fact, claims to have beaten Amazon to the first FAA-approved drone delivery, to a Reno family in July 2020.⁹⁷ Walmart has launched a pilot in Fayetteville, NC, to deliver grocery and household items by drone as well.⁹⁸

Whether done autonomously or by human hand, the home delivery of perishable groceries often is constrained by customers needing to be home to receive their orders. In an attempt to address this barrier, a number of companies are exploring smart-lock systems, allowing

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pre-approved delivery drivers to enter a locked premises with an access code, enabling them to put perishable items in the refrigerator. Walmart launched its own “smart lock” system in 2019, initially in New Jersey⁹⁹ and expanding to other markets.¹⁰⁰ In an attempt to ease customer fears about strangers entering their home, Walmart specified they must have been employed by the company for at least one year prior to making home deliveries. Upon entering the home, they wear a camera that allows customers to watch the delivery live, from their phones.¹⁰¹ Amazon is rolling out similar technology.¹⁰²

Adoption of Technology and Roll-out of New Business Practices

Traditional curbside pickup and traditional driver delivery will remain the dominant e-commerce delivery mechanisms for now. Customers picking up their orders themselves now makes up a significant portion of e-commerce grocery sales. For Walmart, for example, in 2018 “click and carry” accounted for more than 50% of all online sales and more than 60% of grocery sales.¹⁰³ Walmart now offers grocery pickup in more than 2,000 of its U.S. stores.¹⁰⁴ In 2019, the number of stores offering grocery pickup almost doubled among leading U.S. grocery retailers.¹⁰⁵

In terms of third-party driver delivery, Instacart remains the industry leader. But its leadership in delivery is built primarily on its integration of ordering, fulfillment and delivery. Grocery retailers that have their own online ordering platforms have more options in contracting for delivery, which also is facilitated by the lowering of barriers to online ordering systems. Walmart, for example, has signed grocery delivery partnerships with a wide range of companies, including Point Pickup, Skipcart, AxleHire, Postmates, DoorDash, Roadie and others.¹⁰⁶ DoorDash claims that more than 2,000 grocery stores across the country use its service, including Hy-Vee, Woodman’s Markets, Kowalski’s Markets and hundreds of independent grocers, working in tandem with a range of less well-known e-grocery platform companies, including Freshop, GrocerKey, Mercato and Rosie.¹⁰⁷

While new automatic delivery systems eventually may become more widespread, for the moment they remain very much in the small-scale trial stage. Nuro, for example, has had some success with a pilot operation in Houston in 2018 in a partnership with Kroger, with human drivers in the car monitoring performance.¹⁰⁸ Refraction AI has a partnership with the Produce Station, a small independent grocer in Ann Arbor, Michigan, to offer autonomous robot grocery delivery within three miles of the store.¹⁰⁹ Rouse Markets will be piloting a grocery delivery drone program in Mobile, Alabama, starting in the fall of 2020.¹¹⁰ But, however intriguing the option of automated grocery delivery might be, industry analysts suggest the “delivery robot revolution is not quite ready for primetime.”¹¹¹

The Pandemic and Beyond

The pandemic obviously has resulted in a huge boost to e-commerce in the grocery industry. This has included a dramatic increase in the number of delivery drivers, particularly through Instacart, and to a lesser extent other third-party delivery platforms. As mentioned above, Instacart says it has added at least 300,000 full-service shoppers (including delivery) to its platform since the pandemic began, with more than a half-million people now registered on the platform. Direct competitor Shipt reportedly doubled the number of shopper/delivery workers.

DoorDash also has announced new partnerships with grocery stores, but also seems to be trying to expand particularly in delivery for convenience stores. DoorDash is at a disadvantage compared with Instacart and Shipt because it doesn't have an integrated online ordering platform or fulfillment system. But in an effort to compete more in the grocery industry, in early August 2020 it launched DashMart, an online convenience store format that includes many basic grocery items as well. Being piloted in eight cities, this involves DoorDash-owned fulfillment centers for a range of convenience-store items, bypassing retail stores entirely. Presumably the company thinks that being able to provide fulfillment and online ordering, as well as delivery services, is a growth opportunity for them.

Given the substantial costs and challenges of operating home-based delivery systems, we think curbside pickup will remain a very substantial portion of the grocery last mile for the near-term future. Autonomous vehicles seem unlikely to take off anytime soon, in part because of the challenges that occur in dense urban environments, with high levels of traffic and unpredictable behavior.¹¹² Long before full automation of last-mile delivery, we are likely to see new analytics-driven systems to try to optimize delivery patterns of grocery drivers. Last-mile delivery companies FedEx and UPS have been improving such systems for a couple of decades. Grocery delivery provides many more challenges for implementing such systems, due to lower overall volumes (making it harder to geographically cluster deliveries), and the perishability of goods (requiring greater coordination with customers' schedules). Ocado already has been able to develop highly sophisticated delivery algorithms in their dense UK markets, and are well-positioned in their partnership with Kroger to implement such systems in the United States if they are able to generate sufficient volume in their centralized fulfillment centers. This would reduce the last-mile delivery costs, which could contribute to the growth in online grocery ordering, fulfillment, and delivery.

New Prepared and Semi-Prepared Food Delivery Options

Key trend: Online ordering is facilitating the growth in different ways that customers get food consumed at home, which is pushing grocery stores to expand their prepared food offerings, and contributing to the growth in home-delivery jobs.

Technologies and New Processes

The growth of meal kits and online platforms for prepared food delivery is affecting how people get food to be consumed at home. A relatively new business model, meal kits are a food service wherein a company sends customers pre-portioned food ingredients and recipes to prepare meals to be cooked and consumed in the home. Meal kit companies generally rely on a weekly or monthly subscription model to retain customers. However, some grocery stores have started selling meal kits individually on store shelves. Some large chains even have gone so far as to acquire meal kit companies outright, beginning with Plated's sale to Albertsons in 2017.¹¹³ Outside of the grocery store environment, however, the meal kit model relies exclusively on online ordering technology.

Another recent trend is the explosion of new platforms for ordering prepared foods to be delivered to the home. These new platforms began with simple online aggregators that bring together various restaurants that already offered delivery services themselves into a single online ordering portal where customers can compare menus, search by food item or delivery time, and read customer reviews. While restaurants are not responsible for building out and maintaining this online ordering infrastructure, they must retain their own drivers and fulfillment protocols.¹¹⁴ This low-cost and low-barriers-to-entry arrangement makes online aggregators an appealing choice for restaurants with previously existing delivery services. Importantly, online aggregators take a percentage of each order completed using the platform, which is paid by the restaurant and thus cuts into their own profit margins. Examples of prominent companies that began as online aggregators include GrubHub and Just Eat.

While companies limited to online ordering aggregators remain in some local markets, the larger firms all have expanded into providing platform-based delivery services along with food ordering. The most prominent players in this market are DoorDash, Uber Eats, Postmates, and Caviar. The technology involved in these prepared food delivery models is very similar to the third-party grocery platforms described above, with an increasing blurring of boundaries between grocery and restaurant food. These companies also are exploring autonomous vehicle delivery options as well, though focused primarily on smaller, sidewalk-based models, rather than the larger road-based models that are more relevant for groceries.

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Alongside new models for ordering and delivery of prepared food, we also are seeing the development of “ghost kitchens” or “dark kitchens.” These dedicated kitchens are being constructed for the sole purpose of assembling and cooking foods for online delivery orders. They have significant cost advantages over traditional restaurants, including not needing the physical space for in-restaurant dining or customer-facing employees.

Adoption of Technology and Roll-out of New Business Practices

When the meal kit industry emerged, it was predicted to grow dramatically. Industry pioneer HelloFresh started selling meal kits in Europe in 2011, following by Blue Apron in the United States in 2012. Other names including Plated, Sun Basket, and Home Chef began to attract attention, and some investors predicted meal kits would be the “next big thing.” According to PitchBook data, in 2011 just one meal kit company raised venture capital funding anywhere in the world, but by 2015, venture firms made a total of 16 investments worth more than \$440 million. That year Blue Apron alone pulled in \$135 million in venture funding, with a peak valuation of \$2 billion.¹¹⁵

By fall 2017, however, the limits of the meal kit industry were becoming clear. There are a number of reasons that meal kits hit a roadblock to further growth. First, as a survey of ex-customers suggests, they are more expensive than traditional meal preparation.¹¹⁶ Second, many customers report using the kits as a short-term way to learn how to cook various recipes, saving favorite recipe cards provided by the meal kit company, then ultimately shopping for their own ingredients further down the line.¹¹⁷ Excessive packaging, inconveniences of delivery, and other concerns meant that customer retention has been difficult. For example, in 2017, Emory University business school professor Dan McCarthy estimated that 60% of Blue Apron’s customers stopped using the service within six months.¹¹⁸

In the face of these challenges to growth, meal kit companies began looking for different exits besides going public, and found them in partnership with grocery stores. Albertsons acquired Plated in 2017 for \$200 million, while Kroger acquired Home Chef in 2018, also for \$200 million. Selling meal kits in existing stores avoids the extra labor and packaging costs of home delivery, and is indicative of a longer-term trend of grocery stores offering a greater variety of semi-prepared and prepared foods in store. According to research from IRI, nearly 80% of U.S. consumers made a purchase from the deli-prepared foods department in grocery stores in 2018, generating more than \$12.5 billion in sales.¹¹⁹ This is an increase from purchases five years prior, which hovered around \$10 billion.¹²⁰ A 2019 Nielsen study similarly points to deli-prepared foods as a growing source of revenue for grocery stores.¹²¹ And meal kit businesses continue to grow as well, just not as rapidly as originally predicted. Overall industry revenue grew 36% in 2018, with 14.3 million households purchasing some form of a meal kit in the last six months of 2018.

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On the restaurant side, delivery sales faced fewer obstacles and, as a result, bookings have continued to grow rapidly, with third-party platforms such as GrubHub, Uber Eats, DoorDash, Caviar, and Postmates playing an important role in expansion. Even before the pandemic, delivery sales were projected to grow at 11% annual growth rates.¹²² Industry leader DoorDash received a new round of funding in May 2019 with a \$12.6 billion valuation, while reporting a 280% year-over-year increase in gross orders on the platform.¹²³

The Pandemic and Beyond

Just as the pandemic contributed to a surge in grocery delivery, it also has contributed to a surge in meal kits and prepared food delivery. The turnaround in the meal kit industry has been particularly remarkable. Pre-COVID in February 2020, industry analysts were asking whether meal kits were on their deathbed, DOA (dead on arrival), or doomed.¹²⁴ Six months later, fortunes for many companies had turned around.

In February 2020, industry icon Blue Apron announced a net revenue decrease of 33% in the fourth quarter from the previous year, and there was strong talk of it being acquired by another company.¹²⁵ By the second quarter 2020, it was reporting a 10% increase in revenue and 20,000 new customers, as well as a 25% jump in average revenue per customer, the highest levels reported since 2015. It reported a surprise \$1.1 million in profit, the first profitable quarter since going public in 2017.¹²⁶ Other companies have had similar experiences. HelloFresh nearly doubled its U.S. customers to 2.6 million in the first quarter of 2020, compared with the previous year, and made a profit of \$70 million, compared with a loss the previous year.¹²⁷ U.S.-based revenues were up 124.7% in Q3 2020 from the previous year.¹²⁸

Overall, a June 2020 industry report estimated that the entire meal kit delivery industry would expand at a 13% annual rate from 2020 to 2027, growing to reach \$20 billion by 2027, up from \$9 billion in 2020. This growth is in part stimulated by the spread of COVID-19, but also by their evaluation of millennials' consumption and purchasing patterns, a significant part of the meal kit market.¹²⁹ In-store sales of meal kits were also up 23% in May compared with the same period a year ago, according to Nielsen data.¹³⁰

At the same time that meal kit sales have grown, so have sales for prepared food delivery. Total sales for DoorDash and Uber Eats more than doubled between February and April. DoorDash remained the market leader, with an estimated 49% of the total market in September 2020, but with Uber's July 2020 acquisition of Postmates, Uber Eats, and Postmates now combine for 30% of the market.¹³¹ Uber reported that gross bookings through its Uber Eats platforms were up 106% in the second quarter from the previous year, though these were global figures.¹³²

Currently, online food delivery is a \$26 billion market, projected to grow to \$32 billion by 2024, according to Statista Market Forecast.¹³³ Only 42% of this is platform-to-consumer delivery,

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however, with the rest being direct restaurant-to-consumer delivery, with both projected in the long term to grow modestly, in the range of 4% to 6% per year.

The pandemic also has given a boost to “ghost kitchens.” The closure of indoor dining due to the novel coronavirus pandemic is expanding customers’ experience with delivery-only restaurants, while the cost advantages (e.g., no need for customer dining space, ability to take advantage of lower-cost property in warehouse districts) of a delivery-only restaurant are becoming clearer to a broader segment of the restaurant industry. Some analysts are predicting that ghost kitchens will become a \$1 trillion global industry by 2030.¹³⁴ Existing restaurant chains, including Wingstop,¹³⁵ McDonald’s, Inspire (the parent of Arby’s, Sonic and Jimmy Johns), and others have announced new online delivery-only kitchens in the past year. Dedicated ghost kitchen company Kitopi announced a \$60 million Series B funding round in February, and expects to open 50 new delivery-focused kitchens in the United States by the end of 2020.¹³⁶ Kitopi partners with existing restaurant brands, providing services like aggregating orders, preparing food according to partner specification, and working with the delivery platforms.

Another leader in the industry is CloudKitchens, majority owned by former Uber CEO Travis Kalanick, which received venture capital funding in 2019 valuing the company at \$5 billion.¹³⁷ As of fall 2019 it had operations in at least eight U.S. cities, and six other countries, and was developing modular kitchens to go with its rapid expansion of warehouse space for kitchens. Kalanick reportedly thinks the market opportunity is larger than Uber, though of course there is substantial marketing in that claim. His hope is that its facilities can produce food for delivery so cheaply that people will stop visiting traditional restaurants, and even skip grocery stores.¹³⁸

While the growth of new delivery options for meal kits and prepared foods certainly provides a challenge to existing grocery stores, potentially threatening jobs in the industry, it is important to recognize there also are potential synergies. If the meal kit industry continues to grow, for instance, it is likely to contribute to growth in stores via subscription delivery services. A 2019 Nielsen survey, for example, discovered that in-store meal kit users accounted for 60% of the growth in meal kits between 2018 and 2019.¹³⁹ Similarly, the growth in home delivery of prepared foods may cut into grocery sales, but it is just as likely to cut into dine-in restaurant sales. Meanwhile, grocery stores have continued to expand their offerings of prepared meals in store. This of course requires more people in the store doing food preparation—another one of the labor changes associated with the growth of online food ordering.

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Overall Implications for Work and Employment

Until now we have focused on trying to understand technological changes in the food retail industry, how this is linked to new ways that customers are ordering food online, how those orders are getting filled, and how those fulfilled orders are getting into customers' hands. In this section, we want to go more into depth regarding what the implications of these new food delivery channels are for workers. This includes trying to understand both the changes in the number of jobs of different types of work, and examining what the implications are for the quality of work in those jobs, including wages and benefits, hours, and working conditions.

One point that should be clear from the previous sections is that, in contrast to many of the predictions that technological change, including the growth in e-commerce, would lead to large-scale job loss, in fact there are many *new* jobs being created in food retail. Tasks involved in creating platforms for ordering food online, for fulfilling those orders, and for delivering those orders to customers (either at in-store pickups or delivered to their homes) are all new jobs—work that customers used to do themselves, but that workers now are paid to do.

In what follows, we review both the wages and working conditions in these new jobs, as well as the implications for current jobs in the grocery industry.

New Jobs

There are three categories of new jobs being created with the new food delivery channels, each with a distinct set of challenges:

1. *Technical positions involved in creating online ordering platforms.* These positions can be both in house or in contract firms. Because of the technical skill involved in these positions, they pay above average for the grocery industry, but compared with pay for people with technical skills in other industries, the pay in these occupations in grocery is low.

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FIGURE 4.1:
Current and Projected Employment (2019-2029) and Wages in Grocery and Specialty Food Stores in Occupations Directly Impacted by E-commerce

	2019		2029		Employment Change	Employment Percent Change	May 2019 Median Hourly Wage	
	Employment	Percent of Industry	Projected Employment	Projected Percent of Industry			Food and Beverage Stores	All Private Industries
All Occupations	2,915,000	100.0%	2,843,900	100.0%	(71,100)	-2.4%	\$12.36	\$18.25
Occupational Category								
Computer and mathematical occupations	1,900	0.1%	1,900	0.1%	1,917	0.9%	\$20.01	\$43.33
Stockers and order fillers	544,500	18.7%	553,700	19.5%	9,200	1.7%	\$12.38	\$13.10
Cashiers	866,300	29.7%	792,800	27.9%	(73,400)	-8.5%	\$11.54	\$11.36
Food preparation and serving-related occupations	393,700	13.5%	412,500	14.5%	18,800	4.8%	\$12.29	\$11.61
Motor vehicle operators	13,500	0.5%	13,800	0.5%	300	1.7%	\$15.07	\$18.60

Sources: Wages are from BLS May 2019 Occupational Employment Statistics, available here: <https://data.bls.gov/oes/#/home>; Employment and projections are from BLS Employment Projections National Employment Matrix available here: <https://data.bls.gov/projections/nationalMatrix?queryParams=4450A1&ioType=i>

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2. *Order fulfillment positions.* These positions also can be in-house or contracted out. In-house jobs are similar to existing stocking positions, but most people doing this work in contracted positions are classified as independent contractors by third-party platforms—a denial of basic employment protections and benefits. These workers face significant problems with low and unpredictable wages, and lack of employment protections and access to benefits.
3. *Delivery jobs.* The vast majority of these jobs at the moment are classified by third-party platforms as independent contractors—again, a denial of basic employment protections and benefits. Some combine delivery with fulfillment, while others are providing just delivery services, but either way, they face significant problems with low and unpredictable wages, and lack of employment protections and access to benefits.

We'll examine each in turn in more detail.

Ordering Groceries and Food Online

The work involved in developing online ordering platforms is quite complicated and technical. It is not just about developing a website or a discreet piece of software. Online ordering systems require a sophisticated user interface, and a complicated back-end data system that links ordering and inventory systems. These systems have to enable multiple functions effectively and efficiently, including search, recommendations, promotions, cart and checkout functions, real-time inventory tracking and restocking, dynamic pricing, order management systems (how orders get translated to fulfillment), and integration of potentially a range of other microservice providers. User-centered design also is critically important for effective customer adoption of online ordering.

For all but the largest grocery retailers, developing these systems entails externally sourcing the technological systems themselves, and to a large extent outsourcing the process of technological development. Historically, most retailers purchased or rented hardware (computers, cash registers) and software, and used in-house information technology (IT) departments to run systems tracking and regulating inventory, labor scheduling, payroll, payments for purchases, customer loyalty programs, and so on. IT staff managed these systems and adapted them to the needs of the business.¹⁴⁰

The current burst of technological change has disrupted this stable world in two ways:

- First, there are new applications for technology: fulfilling online orders, contacting customers through a variety of communication channels, monitoring customer behavior and, above all, analysis of data collected from these processes and others.
- Second, the speed of change, including changes in the mix, content, and functions of interlocking software and hardware (e.g., mobile, cloud, computers), has become far more rapid.

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Managing this expanded, constantly evolving set of systems calls for a much broader and stronger set of technical capacities than those found in traditional grocery store IT departments. In addition, grocery retailers face the need for a new kind of role, that of *dynamically translating* the ever-changing mix of digital technologies on offer (which have migrated from other sectors) to grocery retail environments, designing implementation plans, monitoring rollout, and analyzing data collected to address retailer organizational priorities.

Retailers seem to be adopting essentially three different options for reaching people with these new skills. At one extreme, retailers may aim to keep these roles in house. However, given the new demands associated with today's technologies, only the largest retailers, such as Walmart and Kroger, can adopt this solution. This is particularly true when it comes to cutting-edge data analysis, which involves machine learning and artificial intelligence applications. To hire the data scientists fluent in these techniques, retailers must compete in recruitment with such higher-paying industries as financial services, biotechnology, and digital media.

At the other extreme and currently most common, retailers essentially can contract out all of the functions related to technology translation, adoption, implementation, monitoring, data analysis, and updating to (external) technology providers and their workforce. Organizational consultants, engineers, coders, and data analysts—jobs that could have been developed in house—are outsourced.

Third, a middle-ground pattern also may be possible, though it would take more research to assess how widespread this option is. It would involve outsourcing some portion of the technological development needed to organizational consultants to the grocery industry. Such consultants exist in other retail sectors. They can play an important role of translating innovations of all kinds for retailers, including providing ongoing, onsite consulting on implementation, monitoring and, to a degree, data analysis. Here the crucial role involves “translation” and implementation functions of technologies new to the grocery store, which could be solved through a combination of in-house talent and external tech vendors and consultants.

How many people are employed in each of these different options? We only have direct evidence on the number of computer occupations employed directly in the grocery industry. According to the most recent data from the Bureau of Labor Statistics (BLS) national employment industry-occupation matrix, as of 2019, only a tiny percentage (0.1%) of direct employees in the grocery industry are in computer occupations, with only a 0.9% growth of these occupations within the grocery industry expected by 2029.¹⁴¹ This is significantly less than the 12.1% growth expected in computer occupations across the whole economy by 2029.¹⁴² Furthermore, 47% of the people employed in this category are classified as computer user support specialists—commonly understood as “tech support”—and another 10% are classified as network administrators, leaving only 43% of employment for other computer occupations, such as more advanced software developers or programmers. Thus, there is little evidence across the industry as a whole of substantial employment in technical occupations.

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On the other hand, we know from sales data that third-party platforms like Instacart handle a substantial portion of e-commerce traffic, while major software companies like Microsoft, Google, and IBM are offering significant retail-as-a-service options to the retail industry, further suggesting that most companies are accessing computer skills outside the grocery industry. There are obvious exceptions to this. Walmart has invested substantially in its e-commerce infrastructure, as it tries to compete head to head with Amazon. For example, Walmart bought e-commerce startup Jet.com for \$3.3 billion in 2016, folding all of Jet employees into its own e-commerce operations. In 2018, Walmart spent nearly \$12 billion on software, hardware, services, telecommunication equipment, and staffing, the third-largest information technology outlay of all corporations, only slightly behind Amazon and Google parent Alphabet.¹⁴³ Kroger has made similar investments, with its subsidiary data analytics company 84.51° (named after the longitude of its Cincinnati headquarters) and its partnership with Ocado.

In general, wages for computer occupations are above the average for all occupations, with a median annual wage of \$93,760 across all industries in 2019.¹⁴⁴ We heard from multiple people we interviewed that the grocery industry struggles to attract people with computer and data analytics skills, since the low margins in the industry make it hard to pay competitive wages. This is evident in BLS wage data, where the annual median wage of people employed in all computer occupations within the grocery industry is only \$41,630—less than half of the economywide median for the same set of occupations.

Fulfillment

With the new fulfillment jobs, the difference between being hired in house at a grocery store or outsourced to a third-party platform company—which either can hire workers as employees or as independent contractors—can make a huge difference in wages and working conditions.

While it is difficult to get specific estimates, we do know that grocery stores themselves directly employ a substantial number of people filling orders. Walmart, for example, claimed in April 2019 to have added more than 40,000 jobs as in-store pickers in the previous 18 months—jobs that didn't exist previously.¹⁴⁵ Another source put the number at 45,000 employees doing order fulfillment by September of that year.¹⁴⁶ As of April 2020, Kroger offered personalized order online and store pickup services at 1,989 out of its 2,757 stores, with presumably the majority of that fulfillment work done by existing Kroger employees.¹⁴⁷ It is difficult to get reliable data on wages specifically for in-house people fulfilling orders, but for the broader category of stocker and order fillers, the median wage in May 2019 in food and beverage stores was \$12.38, ranging from \$9.44 (10th percentile) to \$18.61 (90th percentile).¹⁴⁸ This occupation currently has approximately 545,000 people in the grocery industry, and is projected to grow 1.7% by 2029, while employment in grocery and specialty food stores overall is projected to decline by 2.4%. While only a small portion of people in this occupation currently are doing online order fulfillment, we expect this to increase.

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Grocery stores also can contract with other companies to fulfill online orders. As discussed above, Instacart is the largest contract company providing order fulfillment from within existing grocery stores. It has two categories of Instacart workers doing order fulfillment.¹⁴⁹ One category, known as in-store shopper, specializes in just fulfilling orders in the store without also doing delivery. In some cases, the order will be picked up by customers as part of a click-and-collect system, and in other cases delivery will be provided by another contract delivery driver. Instacart typically employs these in-store shoppers directly as W-2 employees. There is some conflicting information about how much of this work is part time versus full time. Listings for full-time in-store shopping existed on Instacart's website as of September 2019, but had disappeared by summer 2020.¹⁵⁰ Several sources suggest that in-store shoppers only can work up to a maximum of 29 hours a week, though they are not guaranteed those hours, with the actual availability of hours depending on weekly demand.¹⁵¹ Onboarding of new employees is conducted in person, and shoppers are assigned a specific grocery store for each shift they work. The hourly pay varies by location, but seems to range from \$10 to \$17 an hour, with an average base pay of \$13 in 2020, which was lower than the listed average pay of \$14 in 2019.¹⁵²

There are some indications that Instacart may be reducing the number of people it hires directly as in-store shoppers. In some cases, this is because their grocery store clients have decided to do the in-store fulfillment themselves, and Instacart has announced associated layoffs.¹⁵³ Another factor may be the company's desire to avoid union organizing efforts of regular employees—Instacart in-store shoppers in Skokie, Illinois, became the first Instacart workers to win a certified union election in the United States in February 2020,¹⁵⁴ and there have been efforts of Instacart workers to form unions elsewhere across the country, from California to Illinois to Texas,¹⁵⁵ including winning enough support for a union vote in Chicago.¹⁵⁶

The other category of workers for Instacart is what is termed a full-service shopper. These people both fulfill and deliver online orders. These positions are classified by Instacart as independent contractors, rather than direct employees; problems associated with this misclassification will be discussed in more detail later. To be a full-service shopper, people are required to have access to a personal vehicle. People can work as much as they want, and Instacart gives early access sign-up to particular shifts for shoppers who work more hours—at least 90 hours over the prior three weeks or 25 hours over the prior three weekends.¹⁵⁷ Other companies that have fulfillment workers they also classify as independent contractors include Shipt (bought by Target in December 2017), and Postmates (which also does prepared foods).

In addition to fulfilling orders from existing grocery stores, the other way that fulfillment increasingly is happening is through dedicated fulfillment centers. Other than Peapod, these types of dedicated fulfillment centers are just being developed, so there is little data on employment in these centers. Peapod has a longstanding model of warehouse-based order fulfillment, and many of the people in these positions across the country now are represented by the UFCW. Most of their warehouses have been “rapid pick” warehouses, in which grocery items remain stationary and warehouse workers move up and down aisles fulfilling orders, though

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Peapod also has some more highly automated warehouses. According to postings on Glassdoor and SimplyHired, these positions pay in the \$12 to \$15 per hour range.

Employment in the large-scale dedicated warehouses that Kroger is developing in partnership with Ocado involves three major types of jobs. When goods arrive, receiving workers need to unbundle pallets and large shipments into the smaller batches that can be handled by the automated routing systems. Another major task is picking and packing orders, which involves fulfilling individual orders, lifting items from bins and packing them into grocery bags and plastic totes. The final set of tasks involves loading completed orders into delivery vans, ready for dispatch. Since none of the Ocado/Kroger fulfillment centers is operational yet, we have no hard data on wages. Research on technological change and employment conditions in other e-commerce-based fulfillment centers suggest that the work likely is tightly controlled, with algorithms driving the pace of work, and high levels of technological monitoring that can make for stressful working conditions.¹⁵⁸ Employment in micro-fulfillment centers is likely to be quite similar, though their direct physical connection to grocery stores provides opportunities for integration with other store positions and thus greater variability in work tasks. The more limited selection of items to be handled automatically by these micro-fulfillment systems means many orders will require some items to be filled from store shelves.

Delivery

As described above, a large portion of customer online orders likely will remain “click and collect,” with customers picking up their orders at the store. But the other portion will require someone to deliver to customers’ homes. These job holders currently either are direct employees of grocery store companies, or classified as independent contractors by platform companies.

Larger companies like Albertsons and Kroger already employ grocery delivery drivers in their e-commerce units. These drivers are employees with W-2 direct employment status, with pay estimated at \$15 to \$17 per hour, depending on location.¹⁵⁹ Where workers are represented by unions, the conditions of pay, hours, and work requirements are governed by a union contract, which helps ensure better working conditions.

Most grocery stores offering delivery, however, currently use third-party delivery services, most prominently Instacart and Shipt. Other companies, including DoorDash, Uber Eats, GrubHub, and Postmates, which predominantly do meal delivery, also increasingly are delivering groceries as well. This workforce faces a range of problems:

- *Low pay.* It is difficult to get reliable estimates of earnings in this work because there are no government data specifically for grocery or food delivery workers; while surveys of workers can generate data on gross earnings, these workers are misclassified as independent

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contractors and thus responsible for their own expenses, and there is substantial difficulty in estimating real expenses to calculate real earnings. It also is difficult to estimate hourly pay because of the way jobs are structured. Instacart, for example, increasingly is bundling multiple grocery orders into “batch assignments,” with payment rates determined by algorithms that drivers claim do not adequately compensate for multiple deliveries or the complexity of fulfilling multiple orders.¹⁶⁰ Nonetheless, available evidence makes clear that actual pay for grocery delivery workers is low. One national survey of Instacart workers estimated median hourly gross earnings of \$9.50 before deducting expenses.¹⁶¹ A detailed study we conducted in San Francisco that was representative of the work being done across the city found a median weekly earnings for delivery workers of \$224 to \$320 per week (depending on different estimates for how to account for expenses), despite 42% of people working more than 30 hours a week, and 25% working more than 40 hours a week.¹⁶² An online calculator developed by the labor rights organization Working Washington showed there is a wide variation in pay across a range of different job offers—ranging from as low as \$2.74 per hour to as high as \$29.05 per hour, according to one analysis of their data.¹⁶³

- *Lack of access to employment protections and benefits.* Many of these estimates of pay rates suggest that many delivery workers are paid below legal minimum wage laws at least some, if not most, of the time. But because they are misclassified by the platforms as independent contractors (more on this below), they are not protected by wage and hour laws, have no access to overtime pay or sick leave, and typically are not able to access unemployment insurance. They also are responsible for paying their own expenses, as well as being responsible for their own health insurance—and many have no health insurance at all. Our San Francisco study, for example, found that 25% of delivery drivers had no health insurance, while another 26% depended on some form of public subsidy or public insurance program.¹⁶⁴
- *Insecure earnings and vulnerability to shifting algorithms.* The challenge of contract delivery jobs lies not just in the low wages, but insecurity of earnings and vulnerability to algorithms on these apps that can lead to seemingly arbitrary punishments and high stress. All food delivery platforms use algorithms to manage work—assigning jobs, evaluating performance, assigning payment, and structuring deliveries. One key concern here has been how apps treat tips provided by customers. DoorDash, Instacart, and Shipt all have received substantial negative publicity in the past year for deducting customer tips from the delivery payment to drivers, rather than adding it to the drivers’ pay. Customers think they are providing a tip to the driver, but in fact their tips provide nothing additional to the drivers and just subsidize the companies’ delivery costs. There also is some evidence that Instacart has a particularly troubling set of practices with their algorithms. Recent research by Griesbach et al. (2019) shows startling evidence of Instacart providing more stringent regulation of the time and activities of workers than other platform delivery companies, in what the authors call “algorithmic despotism.”¹⁶⁵

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In their research, respondents described how retaining Instacart’s “early access” status was important for retaining adequate earnings—even any work at all, according to some respondents. Maintaining “early access” requires working at least 75 weekend hours or 90 weekday hours over the previous three-week period, essentially forcing people to put in longer hours on more fixed schedules than other apps. Instacart also makes it more difficult to decline or reject orders than other apps. Many Instacart workers interviewed in this nationwide study think the algorithm “learns” the lowest rate it can successfully offer for an order within a particular region, time, and date of the week, and differentiates between different drivers, so that drivers that accept lower offers continually are offered lower offers, while others are not, facilitating individual-level pay discrimination. Compared with other food delivery platforms in the study, Instacart workers reported a higher percentage of their time on the app waiting for jobs (20% vs. 13%), and were less likely to think the platform is “fair” to them (3.37 on a 1- to 7-point scale, compared with 4.95 on all other apps). Instacart workers said they were pressured to work more hours (and in fact reported working an average of 32.16 hours a week, compared with 23.62 for all other apps), since a worker who loses the early access sign-up privileges ends up with few remaining hours.

- *Oversupply of drivers and insecurity.* One of the major sources of insecurity in earnings lies in the overall supply of drivers. Platform companies have an interest in having a higher number of drivers working at any point in time than the demand actually would warrant. Such oversupply results in higher levels of unpaid down time for each driver, but results in quicker response time for customers and higher levels of customer satisfaction. Drivers in multiple contexts have complained about declining earnings as platform companies have gone on aggressive recruiting campaigns to increase the supply of drivers. This dynamic is what underpinned New York City’s freeze on the number of for-hire vehicle registrations and recent policies designed to encourage ride-hailing companies to maintain high levels of driver utilization rates.¹⁶⁶ Even though New York City’s policies relate to ride-hailing companies, not food delivery, the dynamics are quite similar. Utilization rates, as well as the overall supply of drivers working at any point in time, is shaped by the algorithms the platforms use and how this shapes incentives for drivers. This also has become a particular problem during the pandemic, as many former ride-hailing drivers have switched to grocery and food delivery, leading to a flood of people competing for the limited number of available jobs.

A factor that relates to all of the work challenges identified above is that grocery and food delivery companies classify the people providing their delivery services as independent contractors, not employees. This classification results in the poor working conditions, low wages and insecure income that many of these workers face. If they were classified as employees, the platforms would be required to pay for work-related expenses, would be subject to ensuring

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they are abiding by all minimum wage laws, and would be responsible for contributing to unemployment insurance and workers' compensation funds, among other employer responsibilities. Appropriate classification of platform-based workers has become a highly politicized issue, and California has become a central battleground for this struggle across the country.

Until the passage of Proposition 22 in November, classifying grocery and food delivery workers as independent contractors was clearly illegal under California state law. The California Supreme Court issued a landmark decision in 2018 in the *Dynamex* case, finding that the same-day courier and delivery service company Dynamex had improperly reclassified its drivers as independent contractors, and firmly establishing a narrower "ABC test" that companies must pass before they can classify employees as independent contractors.¹⁶⁷ This ABC test later was codified into law with Assembly Bill 5 (D-Gonzalez, 2019) by the California state legislature, with the explicit goal of ensuring that major ride-hailing and delivery service companies classify workers on their platform as employees.¹⁶⁸

Uber, Lyft, DoorDash and other platform companies refused to follow the law, leading the California Attorney General and various city attorneys, to attempt to enforce the law through the courts. An initial ruling on Aug. 10, 2020, later confirmed by an appeals court in October, found in favor of the state and ordered Uber and Lyft to classify their drivers as employees.¹⁶⁹ Meanwhile, DoorDash, Instacart, and Postmates joined Uber and Lyft in sponsoring a high-profile proposition on the November 2020 ballot to exempt platform-based workers from the provisions of AB 5. They spent over \$200 million, outspending opponents by a 20 to 1 ratio in the most expensive proposition in California history, and the proposition passed with the support of 59% of voters.¹⁷⁰

If the proposition is allowed to go into effect (as of the time of writing, it is likely to face legal challenges), it would codify into law the substandard wages and working conditions that delivery and rideshare workers face.¹⁷¹ The proposition claims to require drivers receive a guaranteed pay equal to 120% of the minimum wage (\$15.60 in 2021), but accounting for all expenses, this could end up being as low as \$5.64 an hour.¹⁷² The 120% guaranteed minimum under Proposition 22 is about one half of the required pre-expenses minimum pay for drivers in New York, and the new minimum rate passed in September 2020 in Seattle—both are much more reasonable standards.¹⁷³ Plus, Proposition 22 continues to deny workers legal protections as employees, and allows the platform companies to avoid paying unemployment insurance taxes, costing the state hundreds of millions of dollars.¹⁷⁴

The platform companies like to stress that a majority of people who work on their platforms do so part time for supplemental income. However, all evidence shows that the ability of the platform companies to provide their services depends on a smaller number of people who work full time (or more!), and who depend on that work as their primary source of income. For example, in our study of delivery and ride-hailing work in San Francisco, which was specifically designed to get a representative sample of the *work* being done in the city, more than 50% of

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the delivery workers in our sample worked more than 40 hours a week, with 28% working more than 50 hours a week. Some 76% of respondents said that platform work accounted for more than half of their monthly income, with 50% saying it was their only source of income.¹⁷⁵ A study of Seattle ride-hailing drivers found that a third of drivers account for 55% of all trips, and nearly three-fourths rely on driving as their sole source of income.¹⁷⁶ The platform companies could not provide the services they provide without this core full-time workforce.

Furthermore, while the platform companies are trying to tweak their algorithms to try to attain legal definitions of independent contractors in all states, it is clear that people working on these platforms are strongly under the control and direction of the platforms and their algorithms. Bonuses, ratings systems, and various competitions on the apps are all designed to push people to work harder and maximize company income.¹⁷⁷ Delivery drivers have the nominal ability to accept or not accept individual job offers, but if they refuse offers, they often are subtly punished, either in the types and number of subsequent jobs they are offered, or limitations in access to bonus pay. Lack of complete transparency in grocery orders in particular—number of items, size and weight of items, and picking multiple orders—makes it particularly difficult for workers combining fulfillment and delivery services to assess the desirability of any job.¹⁷⁸

As the debate over ‘gig employment’ continues at a national level, it should be clear that suggesting that on-demand grocery and food delivery workers meet any commonsense definition of an independent contractor, free of the reasonable control and direction of the platforms, defies credibility. Continuing to allow platform companies to hire them as independent contractors, without regulations to ensure and enforce adequate minimum standards, will simply continue the substandard employment practices that characterizes this work at the moment.

Existing Grocery Store Jobs

While the greatest impact of the growth in e-commerce in grocery seems to be in the creation of new jobs, it also will have some impact on existing jobs in grocery stores. In the short- to medium-term perspective of this report, the impact on the number of jobs is likely to be quite modest, though there may be some shift in tasks and responsibilities. E-commerce is likely to become 5% to 10% of sales in the industry overall, with some chains reaching higher amounts. Even here, the vast majority of fulfillment continues to be done from stores, and at least half is likely to continue to be picked up by customers, rather than delivered. This means the vast majority of sales will continue in traditional brick-and-mortar stores with only modest modifications in staffing. But there could be concentrated effects in some occupations that are worth examining.

Currently, cashiers make up an estimated 30% of total employment in food and beverage stores.¹⁷⁹ The BLS estimates that the number of cashiers in food and beverage stores will decline

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by 8.5% between 2019 and 2029, significantly higher than the 2.4% decline being predicted across all occupations in the industry. Total employment of cashiers in food and beverage stores is predicted to decline from 866,300 to 792,800 during this time period. As discussed above, women make up a disproportionate number of cashiers, and thus will be disproportionately hurt by this decline. Nationally, the median hourly wage for cashiers was \$11.54 in May 2019, below the \$12.36 median wage across the entire industry.¹⁸⁰

Occupations likely to see a substantial increase in employment associated with the growth of e-commerce include order fulfillment occupations and food prep positions. Order fulfillment occupations in stores likely will increase due to increased online ordering being fulfilled from within the store. As grocery stores are seeing growing competition from Amazon and new forms of prepared food delivery, many are pursuing strategies to expand the diversity of prepared foods they offer to continue to attract customers to the store. This trend is not simply the result of growth in e-commerce, but is part of a broader trend.

The category of stock clerks and order filler occupations accounts for 18.7% of total employment in the industry, with a median wage of \$12.38 in 2019, nearly a dollar an hour higher than cashiers. This occupation is disproportionately filled by men. The BLS estimates that employment in these occupations will grow 1.7% between 2019 and 2029, despite a predicted decline of 2.4% in employment overall. Total employment in these occupations is estimated to grow from 544,500 to 553,700 during this time, an increase of 9,200 positions.

Food preparation occupations currently account for approximately 14% of positions in the industry, with an overall median wage of \$12.29 in 2019. The BLS estimates that employment in these occupations will grow by 4.8% from 2019 to 2029, rising from 393,700 positions to 412,500, a rise of 18,800. This is one of the largest categories of projected employment increase during this time.

There are two other occupations likely to see some substantial increase in employment in coming years, though total employment is quite small. Motor vehicle operators, including delivery services drivers and driver/sales workers, currently account for 0.5% of total employment in the industry, or roughly 13,500 people. Median wages in these occupations are somewhat higher than industry average—an estimated \$15.07 overall, but \$14.52 an hour for light truck/delivery services drivers, and \$19.42 for heavy and tractor-trailer truck drivers. The BLS estimates that employment will increase by 1.7% in these occupations between 2019 and 2029, but given the small number of people, this translates into only a few hundred jobs. Similarly, computer and mathematical occupations also are likely to see an increase with the growth in online ordering. According to BLS statistics, these occupations are likely to grow 0.9% in the next decade in the industry, but from a very small number of total positions.

For delivery drivers in the industry, one key question will be the extent to which they are employed in house by grocery companies themselves, versus hired as employees of a

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third-party company, or as independent contractors. Direct employment in grocery companies provides higher pay and security of earnings, as well as the benefits and protections of employment status. Motivations for grocery companies to use platform-based delivery services include cost and convenience, as well as the operational and logistical challenges of developing an efficient and cost-effective in-house home delivery system. On the other hand, as we discussed above, many of the larger companies seem to be increasingly wary of working with Instacart or Shipt because of the loss of the direct relationship with their customers in the online platform. They lose the value of their brand and potentially lose customer loyalty, since the dedicated companies deliver for multiple grocery stores. Furthermore, since delivery drivers are interacting directly with customers, grocery stores may be outsourcing their customer relations as well. To the extent customer relations is an important part of grocery store businesses, this creates another risk.

One other potential impact of the growth of e-commerce on existing grocery store jobs is the potential of an expansion of platform-based work making its way into other jobs in the store, with similar problems of low wages and insecure work associated with misclassification as independent contractors. For example, Jyve is a company that provides stocking, auditing, display building, and ordering services to the grocery industry through a platform-based “gig” work model.¹⁸¹ GoHyer is another task-based platform that provides some stocking and inventory services to the grocery industry.¹⁸² At the moment, these platform services are a very small part of the grocery industry, but potentially could expand if the issue of misclassification isn’t addressed effectively.

SECTION FIVE:

Conclusions: Future of New Food Delivery and Implications for Grocery Stores

There is widespread fear across the entire economy about the impacts of technology on jobs. Economic insecurity is a reality for a large portion of Americans, and technological change seems to be a primary cause. The fear of automation—the robots are coming!!—permeates much of the discussion around technological change.¹⁸³ The retail sector sometimes is seen as the epicenter of such changes. Amazon’s rapid growth, especially in recent years, and the overall acceleration in the growth of e-commerce has fueled a fear of widespread layoffs in the retail sector. Indeed, certain sectors of retail—sporting goods, toys, electronics, even clothing—have seen real declines in employment in recent years. The result is that many analysts talk about the changes in the industry as being apocalyptic, with stores shutting, companies going bankrupt, and mass unemployment the inevitable outcome.¹⁸⁴

This study of the growth of e-commerce in the grocery industry makes clear that the fear of technology-induced job loss is overblown. E-commerce growth in the industry has been moderate and manageable and, despite the surge caused by a historic pandemic, will remain a modest feature of the industry for the medium-term future. Rather than large-scale job loss, the growth of e-commerce is contributing to job gain, and there is significant potential for synergies between jobs related to e-commerce and jobs in existing brick-and-mortar stores.

Perhaps what is more important is that these patterns make clear the importance of paying attention to job quality and restructuring of existing jobs, rather than just total numbers of jobs. This study also makes clear there is significant variation in the ways that technology is linked with changing business practices in the industry, that there is nothing inevitable about

these changes, and that there is significant potential for different business strategies and public policies to shape the outcome of these changes for working conditions and workers' livelihoods.

Barriers to Technological Change

Our research showed there are substantial barriers to technological change slowing down the expansion of e-commerce in food retail, despite rapidly advancing technological capabilities. In this industry, the preferences of consumers drive a lot of the dynamics of change. Even though it has been possible technologically for more than two decades to order groceries online and have them delivered, many customers remained reluctant to do so in any significant numbers until a historic global pandemic. Even in the pandemic, there are many factors that limit overall growth, and will continue to shape the industry post-pandemic:

- E-commerce in groceries is more complex than any other sector of retail, given the number and diversity of items in each order, the multiple temperature regimes, the perishability of goods, and diverse and shifting consumer food preferences.
- Customers still seem to prefer choosing their own perishables—ensuring the quality of fruits and vegetables they want, paying attention to cuts of meat and “good until” dates on perishable products.
- Convenience is still a challenge with online ordering. The initial barriers to entry for the first order are substantial, including taking a long time finding the right selection. Delivery windows when customers are home still can be a challenge for many households during the pandemic, and when the pandemic subsides, this barrier will return for many, if not most, of the households with workers who now are able to work at home but will be returning to their more regular commute patterns.
- Costs still are higher for home delivery, and many cost-conscious customers simply are not willing to pay others to shop and deliver for them. These costs likely will come down in coming years, as more efficient hand-picking systems develop and automated fulfillment centers come online, but the pace of change will be modest.

This is why, given current trends, in the grocery industry overall we expect the rapid pace of growth we've seen in e-commerce during the pandemic will slow down dramatically when the pandemic subsides. More customers are willing to endure substantial inconveniences and additional costs during a pandemic than normal times. Once more workers return to their workplaces in person, the inconveniences of home delivery become more of a concern. We expect the proportion of total revenues coming from e-commerce to reach double digits for major companies in the industry, like Walmart, Kroger, and Albertsons, within a couple of years—but we expect it will be a number of years beyond that before the industry as a whole will reach that threshold.

Technological Change Leading to Job Growth and Linking with Existing Stores, Not Replacing Them

Perhaps what is most striking in our research is the finding that new technologies in e-commerce in the grocery sector are leading to a net *increase* in jobs, not a decline. Far from the “retail apocalypse” discussed in popular media, we’re actually seeing a substantial growth in order fulfillment and delivery jobs, as customers are paying for services they used to perform themselves. Some of these jobs are not in grocery stores, and don’t even show up in the grocery or food delivery industry statistics. This is particularly true of the home delivery positions that are filled by people misclassified as independent contractors or even contract delivery firms, rather than grocery companies themselves, but also is true of some of the picker/packer and e-commerce positions. Many of the new positions are growing in grocery stores as well, particularly in order filling.

There also are opportunities for grocery stores, as they start to devote some store footprints to fulfilling e-commerce orders, to change the utilization of their existing store floorspace to provide products and services that will bring people to the store. For example, we’re already seeing the growing trend within the grocery industry to increase the selection of prepared foods as a way of enticing customers to come to the store. Thus, a concern that technological change in the grocery industry is likely to contribute to rapid automation and overall job loss is misplaced and unsupported by the data.

Job Quality is a Major Concern

While automation and substantial job loss is not a major concern at the moment, low wages and poor quality of work in the new jobs being created is a very significant concern. As discussed in the previous section, new positions in filling orders and home delivery, as well as in warehouses providing meal kits and grocery items, are insecure, low-paid jobs, with many companies misclassifying their workers as independent contractors. While many people find the flexibility of these positions attractive, wages and working conditions are challenging and deserve significantly more attention.

Furthermore, there is nothing technologically inevitable about the low pay and poor working conditions in these jobs. In both order fulfillment and delivery positions, there are clear examples of how in-house employees, rather than externally sourced independent contractors, are doing the same work with greater job security and predictability of income, especially true for union members. While our study didn’t specifically try to get detailed data on comparable wages for in-house employees and outsourced independent contractors doing the same job, there is growing evidence of the low pay and vulnerable working conditions of independent contractors.¹⁸⁵

Business Strategies and Public Policies Can Make a Difference in Improving Job Quality

Just like the choice of hiring fulfillment workers and delivery drivers as employees in house, versus outsourcing them to other companies that frequently misclassify their workers as independent contractors, there are a range of decisions grocery stores can make that could help contribute to improved job quality in e-commerce-related jobs. This broadly involves using e-commerce channels strategically to improve the quality of their products and in-store experience. While e-commerce potentially can undermine grocery store sales, it also can contribute to grocery store growth in important ways. Online ordering is simply one way grocery stores now communicate with consumers in the growing “omnichannel” environment. In this context, traditional grocery stores have some significant strategic advantages over dedicated warehouse-based food delivery. Grocery stores already are located close to consumers, a very important locational advantage, with high levels of customer loyalty, even in the era of growing e-commerce.

As e-commerce expands, one clearly viable model for grocery stores going forward is to expand their “click-and-collect” services while restructuring their store footprint. We already are seeing this in many contexts, with stores shrinking the size of the center store and increasing the size of the store periphery—including expanding produce options, bakeries, delis, and cafes. The more standard packaged goods in the center store can be increasingly provided to customers via storerooms or micro-fulfillment centers, while the more complex products and services typically provided on the periphery of stores can contribute to more revenue and expanded employment opportunities for in-store workers. Developing more prepared food and semi-prepared food options provides channels that can keep customers coming to the store, and creates new opportunities for higher-profit, value-added products.

This strategy, while viable in much of the industry and many customer segments, also has its limits. Grocery stores will continue to face strong price pressures. Indeed, the low-cost, discount chain sector of the industry seems to be expanding rapidly, with one study finding that 65% of all new grocery stores opening in 2019 were discount dollar stores.¹⁸⁶ Indeed, there now are some 30,000 dollar stores in the United States, six times the number of Walmart stores, many of which are expanding their grocery offerings to include dairy and even produce, and thus more directly competing with a larger segment of the grocery industry.¹⁸⁷

Given the competitiveness of the industry and these price pressures, it is not enough to rely on high-road business strategies to improve working conditions. It will require improved public policies and systems of worker voice.

One obvious area that needs attention is to directly address the problems faced by people misclassified as independent contractors in platform-based fulfillment and delivery positions. As

SECTION FIVE: Conclusions: Future of New Food Delivery and Implications for Grocery Stores

discussed above, this is precisely what California's Assembly Bill 5 tried to do, by narrowing the criteria that allows someone to be classified as an independent contractor. Similar laws exist in Massachusetts. Setting clear national standards to protect the employment rights of gig workers would be the single most important strategy for protecting the job quality of fulfillment and delivery workers.

Where clear laws about misclassification do not (yet) exist, there are several interim or alternate strategies to improve working conditions in food fulfillment and delivery that are possible. In many states it is possible for local governments to pass regulations or labor standards that can improve conditions for food fulfillment and delivery services. San Francisco, for example, passed an emergency ordinance requiring grocery stores, drug stores, restaurants and on-demand delivery services to provide personal protective equipment to their workers during the pandemic "without regard to whether the Covered Employer classifies the person as an employee for any other purpose".¹⁸⁸

Another step could be to create a separate higher minimum wage for platform workers, set high enough to ensure workers are receiving a living wage after accounting for all related business expenses. In New York, for example, the Taxi and Limousine Commission set minimum standards for ride-share drivers that include both a per-mile and per-minute minimum and taking into account company specific driver utilization rates, designed to ensure that these drivers receive a minimum of \$17.22 an hour after all expenses (at least \$27.86 per hour before expenses) as of December 2018.¹⁸⁹ In September 2020, Seattle became the second U.S. city to institute a specific minimum wage for ride-hailing drivers, with mandated minimum per minute and per mile rates designed to reach a minimum of just under \$30 before expenses and \$16.39 per hour after all expenses.¹⁹⁰ In both New York and the Seattle, the ride-hailing standards do not address the issue of employment classification, so they do not in any way prevent future efforts to achieve full employment protections for ride-hailing workers currently classified as independent contractors. Similar laws could be passed specifically for grocery and food delivery workers.

Another option is to require licenses for meal and food delivery workers. This could be used to limit the number of workers who can access jobs at any moment in time, ensuring that those who are working can have sufficient earnings. This strategy already is used in the ride-hailing industry in New York, and could be implemented elsewhere.

Each of these strategies would require companies to regularly provide data to appropriate regulators on driver compensation and mileage, as well as driver utilization rates. This provision of data in itself would be a good thing, since it would allow public agencies to have the data needed to appropriately set and implement policy in this largely unregulated industry. New York already has such a system in place for its ride-hailing companies, and it could be expanded to grocery and meal delivery platforms as well.

In all these cases, it is important to consider workers' access to the benefits and rights associated with employment, such as unemployment insurance, workers' compensation, anti-discrimination

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and other types of protections, and also to ensure that any policies avoid enshrining a new substandard category of employment into law.

Ultimately, what is needed are more well-developed systems for workers in these new delivery channels to have a voice in company and industry business strategies. Unions have an important role to play in the grocery industry, seeking to ensure that the growth of e-commerce doesn't come at the expense of erosion of wages and working conditions. An estimated 15.1% of workers in the grocery industry were directly covered by a union contract as of 2019, and the number of workers indirectly benefiting from union protections is higher than that, due to some company efforts to more closely match union wages and working conditions to avoid union contracts.¹⁹¹ In addition, the United Food and Commercial Workers (UFCW) recently began organizing Instacart workers, but challenges for new union organizing efforts persist. Reforming national labor law to remove obstacles to workers forming unions and engaging in collective bargaining is the most important step to helping more workers gain a voice on the job. Where unions do not currently exist, other organizations representing grocery store workers, like United for Respect, also can play an important role in addressing concerns of in-store employees, while organizations representing so-called gig workers, and other labor rights and labor law advocates, also will be important for addressing misclassification, low wages, and working conditions for platform-based workers.

APPENDIX:

List of Interviews

Consultants

- Liz Bacelar, Together Group, and Scott Emmons, TheCurrent Global (now with Memomi Labs) (two interviews)
- Peter Burggraaff, Boston Consulting Group
- Ken Cassar, Rakuten Intelligence
- Scott Clarke, Cognizant Technology Solutions (now with Publicis Sapient)
- Jim Dion, Dionco
- Lisa Disselkamp, Deloitte Consulting LLP
- Ken Fenyo, McKinsey
- Tom Furphy, Consumer Equity Partners
- Sucharita Kodali, Forrester
- Brittain Ladd, Brittain Ladd Consulting
- Zoe Leavitt, CB Insights (now with ZX Ventures)
- Argentina Moise, Bleexy
- Thomas Moore, Zebra Technologies (now with Motorola Solutions)
- James Okamura, Okamura Consulting
- Steven Pinder, Kurt Salmon/Accenture Strategy
- Rick Stein, FMI – The Food Industry Association
- Elley Symmes, Kantar Consulting
- Zebra Technologies group interview: Bree Bergman, Scott Drobner, Kasia Fahmy, Daniella Gutierrez, Tim Kane, Thomas Moore
- One anonymous consultant

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Technologists

- Yegor Anchyshkin, Takeoff Technologies
- Alexei Agratchev, RetailNext
- Curt Avallone, Takeoff Technologies
- Megan Berry, by REVEAL
- Roger Davidson, iControl Data
- Stacey Ferreira, Workjam (formerly Forge)
- Adam Hatch, Workjam
- Kevin Howard and Kaitlyn Kempiaik, AWM Smart Shelf
- Charles Jackson, Pricer AB
- Steven Kramer, Workjam
- Eric Mahecha, Adyen
- Larry Negrich, Reflexis
- Grace Paglen, Jyve Corp.
- Sylvain Perrier, Mercatus Technologies
- Sam Purtill, Jyve Corp.
- ShiSh Shridhar, Microsoft
- Sarjoun Skaff, Bossa Nova Robotics
- Daniel Sokolovsky, AxleHire
- Greg Tanaka, Percolata
- Eric Martinez and Jen Thorson, Modjoul
- Simon Turner, Myagi
- Jaron Waldman, Curbside
- Michael Weksel, Same Day Delivery

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Retailers

- Curt Avallone, formerly of Ahold (now at Takeoff Technologies)
- Brett Bonner, Titus Jones, and Doug Meiser, Kroger Sunrise (Brett Bonner now with Arete South LLC)
- Casey Carl, formerly of Target
- Paul Clarke, Ocado
- Scott Emmons, formerly of Neiman Marcus
- Narayan Iyengar, Albertsons Companies
- Mary Jensen, Sur La Table
- Chris Kung, Macy's
- Mike Molitor, Raley's
- Vibhu Norby, b8ta
- Elpida Ormanidou, Chico's (now with Starbucks)
- Shari Rossow, Best Buy
- Three anonymous retail interviewees (one grocery, two apparel)

Other informants: Worker organizations, workers, and researchers

- James Araby, United Food and Commercial Workers
- Eddie Iny, Ryan Gerety, and Lily Wang, United for Respect
- Susan Lambert, University of Chicago
- John Marshall, United Food and Commercial Workers
- Anonymous worker member, United for Respect

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