



Global Thematic Research

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Retail Automation: Stranded Workers?

Opportunities and risks for labor and automation



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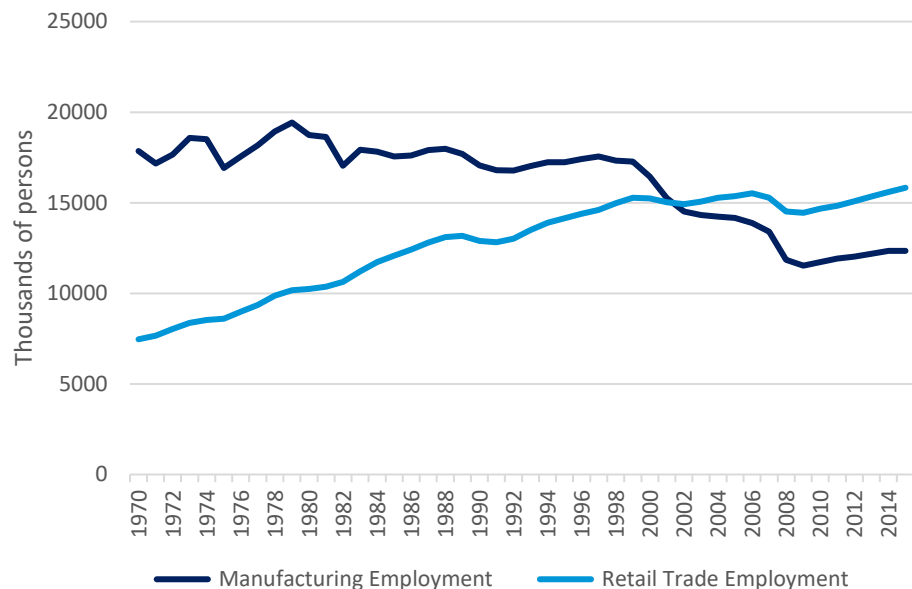
Executive summary

A reduction in the number of retail workers by 30% would result in the loss of almost 6 million retail jobs

The retail landscape is experiencing unprecedented change in the face of disruptive forces, one of the most recent and powerful being the rapid rise of automation in the sector. The World Economic Forum predicts that 30-50% of retail jobs are at risk once known automation technologies are fully incorporated. This would result in the loss of about 6 million retail jobs and represents a greater percentage reduction than the manufacturing industry experienced. Using Osborne and Frey study¹ with the Bureau of Labor Statistics, the analysis suggests that more than 7.5 million jobs are at high risk of computerization. A large proportion of the human capital represented by the retail workforce is therefore at risk of becoming “stranded workers.”

As of 2002, retail employment exceeded total manufacturing employment, and now sits at about 16 million workers (Figure 1). Total manufacturing employment, which peaked in 1979 at approximately 19 million workers, has fallen to 12 million workers. The repercussions of manufacturing’s decline, which was driven by automation and globalization, have been felt at the local and national levels. For example, certain areas of the US that were once manufacturing hubs have experienced rising poverty, declining populations, and erosion of political trust.

Figure 1: Employment in manufacturing and retail trade



Source: US FRED, Cornerstone Capital Group

¹ Frey and Osborne, “The Future of Employment: How Susceptible Are Jobs to Computerisation?” Oxford University, September 2013

Technology has the potential to automate part of the sales process and render a range of jobs redundant

The impact of significant reductions in retail workers may mirror the impact of manufacturing job losses. Retail sales at brick-and-mortar stores, as well as margins on those sales, are increasingly constrained as consumers shift to online shopping. At the same time, many parts of the country are experiencing upward structural wage pressure as concerns about income inequality are gaining political traction. Major retailers, including Macy's, J.C. Penney, Kohl's and Wal-Mart, have collectively closed hundreds of stores over the last few years in attempts to stem losses from unprofitable stores. These headwinds are pushing retailers to rethink the traditional retail business model.

Retailers are investing in technology to build out their omnichannel platforms. In some cases, technology is complementing labor by providing a better customer experience. Indeed, this report argues that companies which use technology to support their workers are likely to benefit from long-term productivity gains. However, technology also has the potential to automate part of the sales process and render a range of jobs redundant. Taken together, store closures and automation technology have the potential to accelerate job losses in retail, an industry that employs approximately 10% of the total US labor force¹.

An in-depth examination of retail automation was undertaken to enable investors to consider investment risks and opportunities by exploring how retail is addressing profit pressure and how employees are considered in the context of a broader shift in strategy. This report:

- Identifies the structural factors catalyzing change in the retail industry;
- Examines the current and potential automation initiatives across 30 retail companies, chosen based on market capitalization and comparability;
- Provides analysis on the characteristics of current retail workers, including gender and location, and assesses stakeholder groups that may be impacted by changes to retail labor;
- Leverages these insights, using Cornerstone's BRAVE² Matrix™ as well as novel metrics (given the retail sector's limited disclosure) to analyze how these companies are positioned to manage automation and labor through the industry's transition; and
- Provides a set of questions for investors to include in their engagement with retailers.

¹ Calculated from retail trade employment, given by the Bureau of Labor Statistics Current Employment Statistics Survey

² Business Relationship Analytics for Value Enhancement.

Key questions

Which factors are driving automation in retail?

Given that automation has been a central driving force for economic development for decades, it is important to understand why its application in the retail sector threatens to radically and rapidly reshape the retail labor force. The research identifies two key factors driving the automation conversation.

First, e-commerce has grown significantly over the last five years and now accounts for more than 8% of total US retail sales. Amazon has been a dominant force in e-commerce for years, and the company accounted for 43% of all online sales in 2016. While the consumer benefits from lower prices and greater price transparency, Amazon's success is pressuring retailer profit margins as they fight to maintain market share and keep prices low to remain competitive.

Second, a growing focus on income inequality and regulatory-driven minimum wage changes are a source of increasing wage pressure. Retail employs about 10% of the US labor force, and research finds that retail workers are disproportionately represented among recipients of public assistance.¹ Retailers have been increasing wages recently due to a tighter labor market, but retail faces a structural issue of increasing pressure for minimum wage hikes at the local and state level.

Taken together, retailers are facing structural price and cost issues that impact profitability and create meaningful long-term uncertainty. These headwinds will likely increase the industry's propensity to automate, which would have significant impacts on existing labor. Companies are likely to respond through two consumer strategies:

- Convenience – focus on removing the 'friction' of the purchase process within the retail store to increase sales volume and decrease labor costs through technology.
- Experience – focus on enhancing consumers' interaction with the store and its employees to increase pricing power.

While companies may pursue a mix of these two strategies, understanding which is the primary strategy will enable investors to understand how technology and labor are likely to be used, and how the overall labor profile of the company might change.

Retail workers are disproportionately represented among recipients of public assistance

¹ EPI analysis of Current Population Survey Annual Social and Economic Supplement microdata, pooled years 2012-2014

Research indicates companies are adopting mobile devices, self-checkout, digital kiosks, proximity beacons, and workforce and task management solutions

No companies provide key labor data such as employee turnover, labor costs as a percentage of SG&A, or employee satisfaction

How is automation being adopted in retail?

The technology initiatives of 30 retail companies were assessed, and ten in-store technologies that will impact the retail industry were identified. The assessment provides an indication of the extent to which each technology is being deployed. These initiatives are focused on improving customer satisfaction, operational efficiency, or a combination thereof.

The review of company reports indicates that retail companies are implementing technologies such as mobile devices, self-checkout, digital kiosks, proximity beacons, and workforce and task management solutions.

What are the broader stakeholder implications?

An assessment of the gender composition of retail workers shows that the largest group, retail salespeople, has equal numbers of men and women. However, cashiers, the next largest group of retail workers, are predominantly women (73%). Cashiers are considered one of the most easily automatable jobs in the economy. Based on this analysis, large-scale automation of retail labor could disproportionately affect women, as noted previously in Cornerstone Capital Group's September 2016 report, [Women in an Automated World](#).

From a geographical standpoint, it appears that several major retail companies have store footprints that are concentrated in less densely populated metropolitan areas. For example, a UCLA study shows that Wal-Mart possesses an average market share of 25% in metropolitan areas with populations of fewer than 500,000 residents. This market share, if indicative of employment share (even if not directly proportionate), suggests significant potential impacts for local communities should Wal-Mart pursue an aggressive labor automation strategy.

How are companies managing labor issues associated with automation?

The retail sector provides little disclosure on labor issues. None of the 30 companies reviewed in this report provides key labor data such as employee turnover, labor costs as a percentage of SG&A, or employee satisfaction. Therefore, a series of proxy metrics were developed to evaluate the universe of companies:

- Public disclosure of automation initiatives;
- Changing labor profile associated with an experience or convenience strategy;
- Minimum wage and poverty level exposure;
- Labor investment; and
- Public perception of employee practices, social policies, and prior reputation.

Based on the assessment, key takeaways include:

- No retailers appear to be pursuing a clear convenience strategy. Approximately 35% of the assessed retailers are positioning towards an experience strategy. The remaining 65% do not appear to have a clear strategy, at least as determinable by public disclosures.
- On average, retail companies are moderately exposed to state minimum wage increases, although Sprouts is significantly more exposed than others. Only Costco, Nordstrom, Whole Foods, and Tiffany & Co. pay their cashiers and associates a wage at or above the poverty level for a family of four as calculated by the US Department of Health and Human Services.
- Amazon, Best Buy, Lowe's, Staples, Target, and Wal-Mart stand out as investing in their labor through programs such as tuition reimbursement and technical and programming training, which is consistent with their strong employee ratings.
- Dollar General and Wal-Mart receive the most negative scores on social policies and public reputation from the data sources utilized, while Costco scores most favorably. Data sources include Mission Measurement and Sustainalytics.

The analysis indicates that automation is set to alter the retail industry's labor profile. If companies migrate towards a high-touch, experience-based strategy, then it is possible workers will receive improved training and higher wages, and there will be fewer layoffs. If companies adopt a heavily convenience-oriented strategy, more tasks will be automated and less labor required. To date, companies' discussions around implementing technology suggest that technology is aimed at complementing labor. However, should structural price and cost issues persist, technology may be viewed as a potential substitute for labor.

The most likely outcome is a mix of experience and convenience strategies, though this could still result in material layoffs in the retail sector. Because retail represents approximately 10% of the total US labor force, any systematic deployment of automation is likely to reduce the number of retail jobs by a figure in the millions.

Note: Investor engagement questions are provided in Appendix A, and tables for the company assessment are in Appendix B.

A mix of experience and convenience strategies, could still result in material lay-offs in the retail sector

Introduction

There has been much public discussion recently about the potential for technological advancements that would render a range of jobs redundant. The retail industry has been cited as being particularly susceptible to automation.¹ While traditional financial analysis focuses primarily on the economics of the labor versus capital decision, this analysis is too narrow to fully assess the impact of automation on investment decisions. A range of stakeholders—from employees and local communities to policy makers and consumers—will be impacted by increased automation. If these stakeholders are negatively impacted, there may be repercussions for companies and for the investors in these companies.

The retail sector accounts for about 6% of US GDP and employs approximately 10% of US workers

The retail sector is diverse and represents a substantial portion of the US economy and employment. As described by the Global Industry Classification Standards, subsectors in retail range from department to grocery to auto part stores. The sector also includes the rapidly emerging internet retail companies that are directly challenging the traditional retail model. In its entirety, the retail sector accounts for about 6% of US GDP² and employs approximately 10% of US workers³. At approximately 16 million workers, retail employment ranks third behind education and health services (22.7 million) and professional and business services (20.3 million).

The World Economic Forum's 2017 report "Shaping the Future of Retail for Consumer Industries" depicts a rapidly changing retail sector driven by technology and changing consumer preferences and notes that technology is likely to have a significant impact on existing labor⁴. The report states that 30-50% of positions related to day-to-day operations of retail stores are at risk and that 15% of US retail stores are anticipated to close over the next decade. A report on jobs susceptible to automation by Osborne and Frey of Oxford University⁵ asserts that workers in transportation, logistics, and service occupations are at risk of losing their jobs due to automation. Using Osborne and Frey's data with the Bureau of Labor Statistics, the analysis suggests that more than 7.5 million jobs are at high risk of computerization.

That said, automation could enable location-based existing retailers to compete more effectively with internet retailers. Therefore, the question for investors is how to consider the scope of automation in the retail industry and assess the

¹ Retail sector is understood to be the point in the value chain where the buyer buys the product for use/consumption and not for re-sale.

² Bureau of Economic Analysis, Gross Domestic Product by Industry.

³ Bureau of Labor Statistics, Employment Data.

⁴ http://www3.weforum.org/docs/IP/2016/CO/WEF_AM17_FutureofRetailInsightReport.pdf

⁵ Carl Benedikt Frey and Michael A. Osborne, The Future Of Employment: How Susceptible Are Jobs To Computerisation?, http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

implications of a company's approach to automation. This report supports investors by addressing the following questions:

- What are the factors driving the automation conversation in the retail industry?
- How is automation being adopted in retail?
- What are the investment implications?
- How are the companies in this report positioned to manage labor issues associated with automation?
- What are the broader implications of an automation-driven shift in retail labor?
- What questions can investors ask to understand how companies are considering retail automation and labor?

The 30 companies listed in Figure 2 are those with largest market capitalization within their respective subsectors, modified to account for available information and to ensure consistency across the analysis.

Figure 2: Companies included in this report

| Name | Sub-Sector | Name | Sub-Sector |
|--------------------|---|-----------------------|---|
| TJX Companies | <i>Apparel Retailers</i> | Whole Foods | <i>Food Retail</i> |
| Ross Stores | <i>Apparel Retailers</i> | Sprouts | <i>Food Retail</i> |
| L Brands | <i>Apparel Retailers</i> | Target | <i>General Merchandise Store</i> |
| Gap | <i>Apparel Retailers</i> | Dollar General | <i>General Merchandise Store</i> |
| Foot Locker | <i>Apparel Retailers</i> | Home Depot | <i>Home Improvement Retail</i> |
| O'Reilly Auto | <i>Automotive Retailers</i> | Lowe's | <i>Home Improvement Retail</i> |
| Advance Auto Parts | <i>Automotive Retailers</i> | Bed Bath & Beyond | <i>Home Furnishing Retail</i> |
| Best Buy | <i>Computer & Electronics Retailers</i> | Williams-Sonoma | <i>Home Furnishing Retail</i> |
| Macy's | <i>Department Stores</i> | Wal-Mart | <i>Hypermarkets & Super Centers</i> |
| Nordstrom | <i>Department Stores</i> | Costco | <i>Hypermarkets & Super Centers</i> |
| Kohl's | <i>Department Stores</i> | Amazon | <i>Internet & Direct Marketing Retail</i> |
| J.C. Penney | <i>Department Stores</i> | Ulta Salon | <i>Specialty Stores</i> |
| Walgreens Boots | <i>Drug Retail</i> | Tiffany & Co | <i>Specialty Stores</i> |
| CVS Health | <i>Drug Retail</i> | Dick's Sporting Goods | <i>Specialty Stores</i> |
| Kroger | <i>Food Retail</i> | Staples | <i>Specialty Stores</i> |

Source: Cornerstone Capital Group

Note: Sorted by market cap within each sub-sector

Why is automation important to retail now?

Given that automation has been a central driving force for economic development for decades, it is important to understand why its application in the retail sector threatens to radically and rapidly reshape the retail labor force. The research identifies two key factors driving the automation conversation:

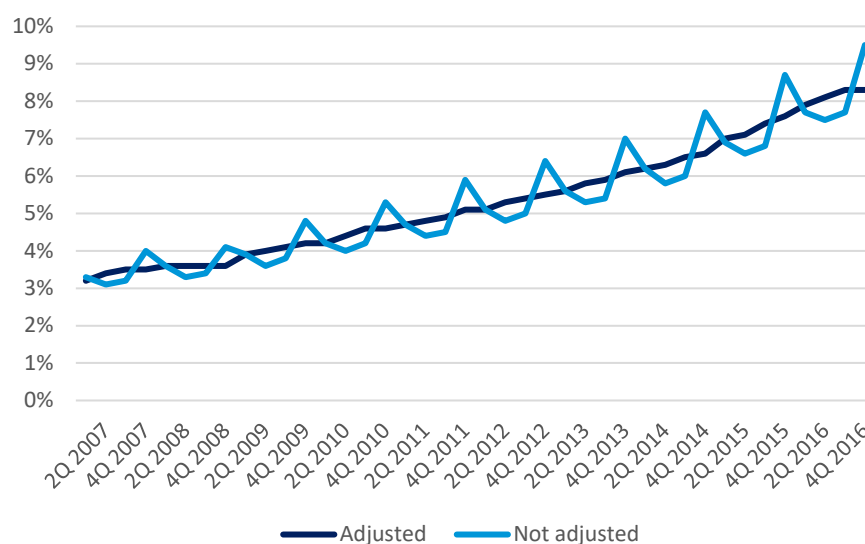
- The Amazon effect
- Increasing wage pressure

The Amazon effect

E-commerce sales grew 14.3% year over year in Q4 2016, while total retail sales (including Amazon) grew by 4.1%

E-commerce has grown significantly over the last five years and now accounts for more than 8% of total US retail sales¹ (Figure 3). Data from the US Department of Commerce shows that online sales topped \$102 billion in the fourth quarter of 2016, an increase of 14.3% percent over the same period a year earlier, while total retail sales grew by 4.1%.

Figure 3: E-commerce as percent of total US retail sales



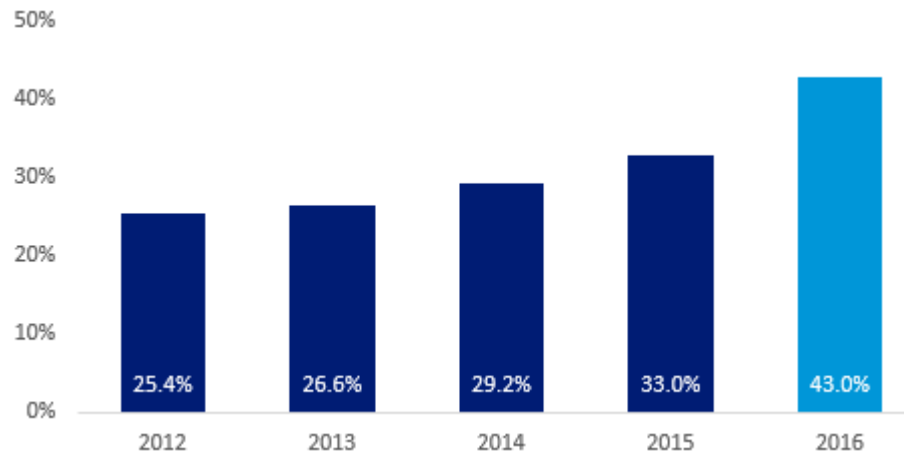
Source: US Census Bureau, Cornerstone Capital Group

Amazon has been a dominant force in e-commerce for years. A Slice Intelligence report shows that Amazon accounted for 43% of all online sales in 2016 (Figure 4). More impressively, Amazon accounted for 53% of the growth in online US retail sales in 2016. Slice Intelligence notes that one company having market

¹ US Census, Quarterly E-Commerce Report, 4th Quarter 2016

share of 40% or more is nearly unheard of in any segment of retailing. In comparison, Wal-Mart, the largest brick-and-mortar retailer by market share, has slightly more than 9% share of total US retail sales.¹

Figure 4: Percentage of total US e-commerce sales transacted on Amazon-owned sites



Source: Internet Retailer, ChannelAdvisor, Slice Intelligence, US Commerce Department, Cornerstone Capital Group

Note: Market share figures include Amazon's sales of its own products, as well as sales generated by other merchants on its marketplace

E-commerce is impacting retailers' ability to pass through increases in costs, including labor costs. The proliferation of e-commerce and smartphones has provided consumers with greater price transparency. Some consumers, dubbed showroomers, check the price of an item on Amazon while shopping in a physical store. A survey of 1,043 smartphone owners in 2013 found that 63% would buy from Amazon if a \$50 item in-store was \$45 on Amazon, while 76% would buy from Amazon if a \$100 item in-store was \$90 on Amazon².

Because Amazon avoids the occupancy costs of owning or leasing physical retail locations and the labor costs of staffing stores, Amazon can pass on its cost savings to consumers.

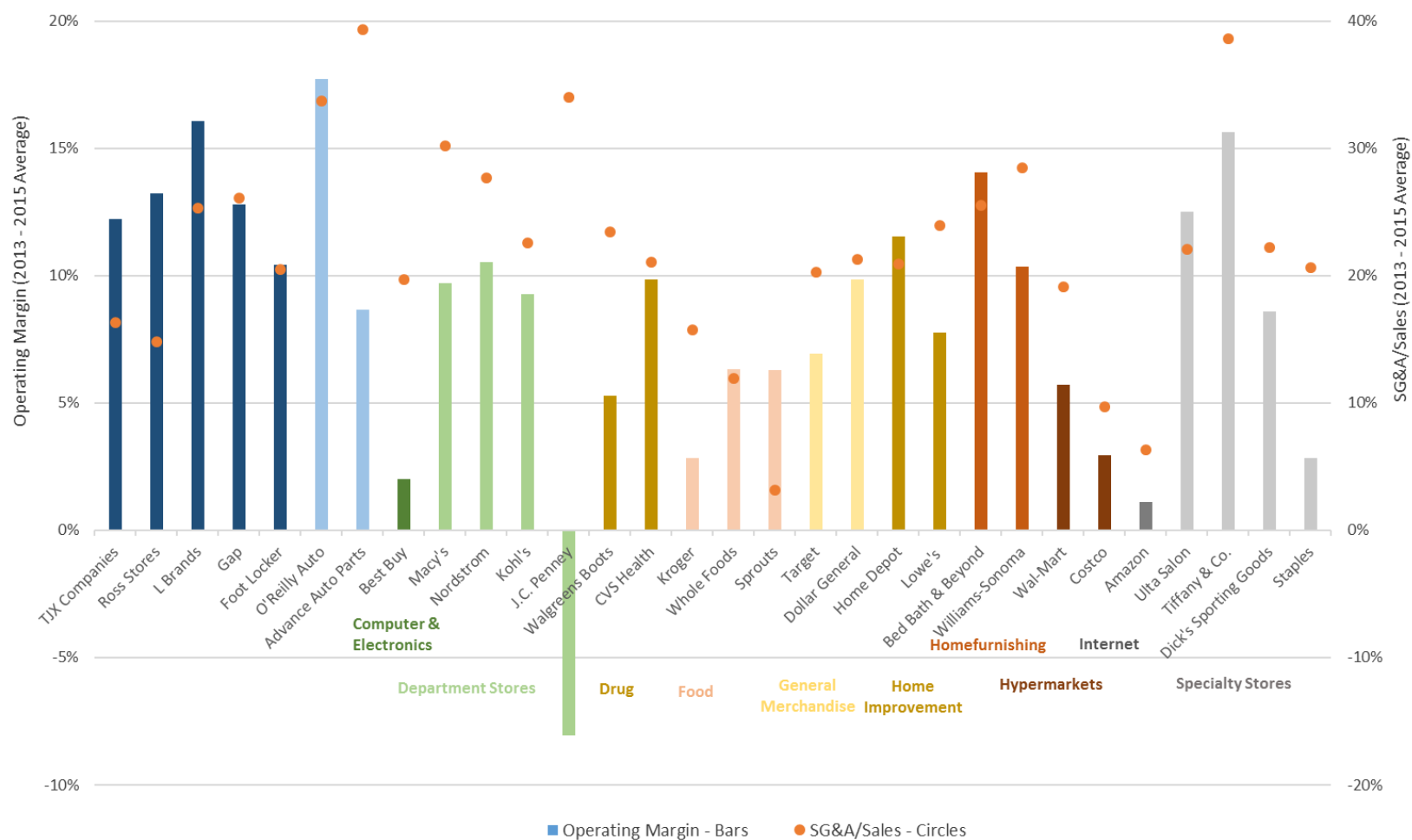
Because Amazon avoids the occupancy costs of owning or leasing physical retail locations and the labor costs of staffing stores, Amazon can pass on its cost savings to consumers.³ Lower prices and wider product selection enhance the customer experience, which drives traffic and attracts more sellers. This, in turns, fuels growth and allows Amazon to further drive down both costs and prices.

¹ <https://www.internetretailer.com/2017/02/01/earnings-preview-amazon-accounts-43-all-us-online-sales>

² <http://www.marketingcharts.com/online/showroomers-and-price-elasticity-intriguing-results-suggest-impact-of-free-shipping-35311/>

³ While Amazon has announced initiatives relating to brick and mortar stores, they remain minor in scope compared to its online business.

Figure 5: Operating margins and SG&A as a percentage of sales



Source: Bloomberg, Company reports, Cornerstone Capital Group

Amazon's success is pressuring retailer profit margins as they fight to maintain market share and keep prices low to remain competitive

This business model also allows Amazon to operate on slim margins. It's estimated that Amazon's core retail margins were less than 0.5% of its global gross merchandise value in 2015.¹ While the consumer benefits from lower prices and greater price transparency, Amazon's success is pressuring retailer profit margins as they fight to maintain market share and keep prices low to remain competitive.

Figure 5 shows operating margin and SG&A as a percentage of sales across the list of retail companies. The data illustrates the difficulty other retailers face in trying to compete with Amazon.

Increasing wage pressure

Retailers are expected to experience increasing wage pressure due to:

- A growing focus on income inequality; and
- Regulatory-driven minimum wage increases.

The World Economic Forum highlights deepening income inequality as the most significant negative trend facing the global economy

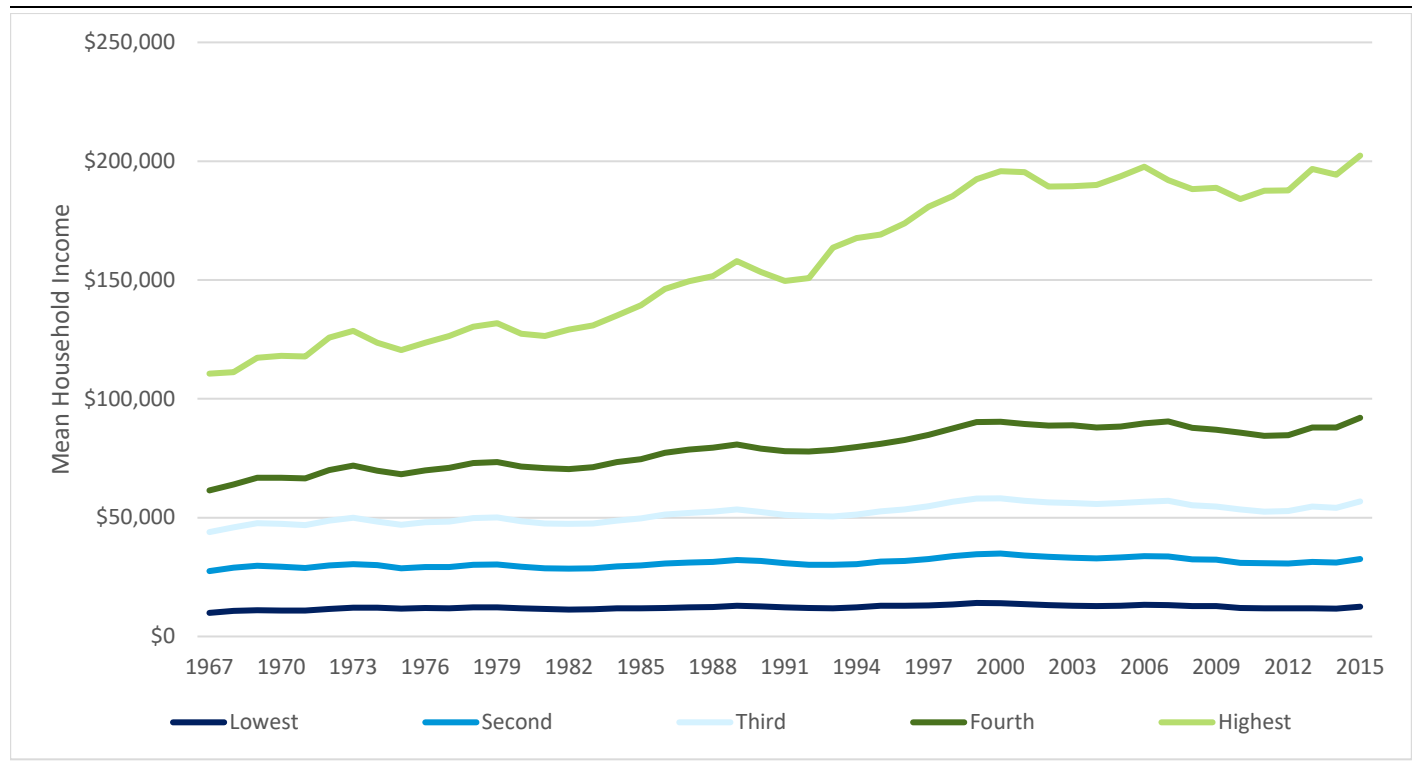
Income inequality has increasingly been discussed since the Great Recession of 2008-09. The World Economic Forum highlights deepening income inequality as the most significant negative trend facing the global economy. The International Monetary Fund (IMF), Standard & Poors, and the Organization for Economic Cooperation and Development (OECD) have also issued warnings about increasing income disparities.² Figure 6 shows the growth in mean household income across quintiles in the US since 1967.

Per Bureau of Labor Statistics (BLS) data, nearly 15.8 million people were employed in retail trade in 2015—about 10% of the US labor force. Retail salespeople and cashiers are the most common occupations in retail trade, employing 4.2 million and 2.8 million people respectively.³ Retail salespeople earned a median wage of \$10.47/hour, which translates into a full-time annual compensation of \$21,780. Cashiers earned a median wage of \$9.28/hour, or \$19,310 on an annual full-time basis.

¹ Gross merchandise value indicates a total sales dollar value for merchandise sold prior to the deduction of any fees or expenses.

² This issue is addressed in Cornerstone Capital Group's November 2014 report [Income Inequality: Market Mechanism or Market Failure?](#), and again in Cornerstone Capital Group's February 2017 report [The Art of the Possible: Investing to Address Inequality](#).

³ BLS Industry-occupation matrix data, by occupation

Figure 6: Mean US household income by quintile

Source: US Census Bureau, Cornerstone Capital Group

Retail workers are disproportionately represented among recipients of public assistance

While these wage rates are modestly higher than the federal minimum wage of \$7.25 per hour, research from the Economic Policy Institute—a nonpartisan think tank—indicates that retail workers in general are disproportionately represented among recipients of public assistance, with about 36% of workers in the retail sector using public assistance of some form (Figures 7 and 8).

Some suggest the low wages paid in retail reflect the young, part-time workforce employed. However, while the retail industry’s demographic makeup is slightly younger and slightly more part-time, the differences with the population of workers overall would not seem material enough to account for the higher percentage of public assistance recipients. Retail workers’ median age was 38 in 2015, compared with a median age of 42 for all workers. Furthermore, BLS data shows that 29% of retail workers are part-time versus 24% for all workers in nonagricultural industries.

Figure 7: Share of workers within each industry receiving public assistance directly or through a family member

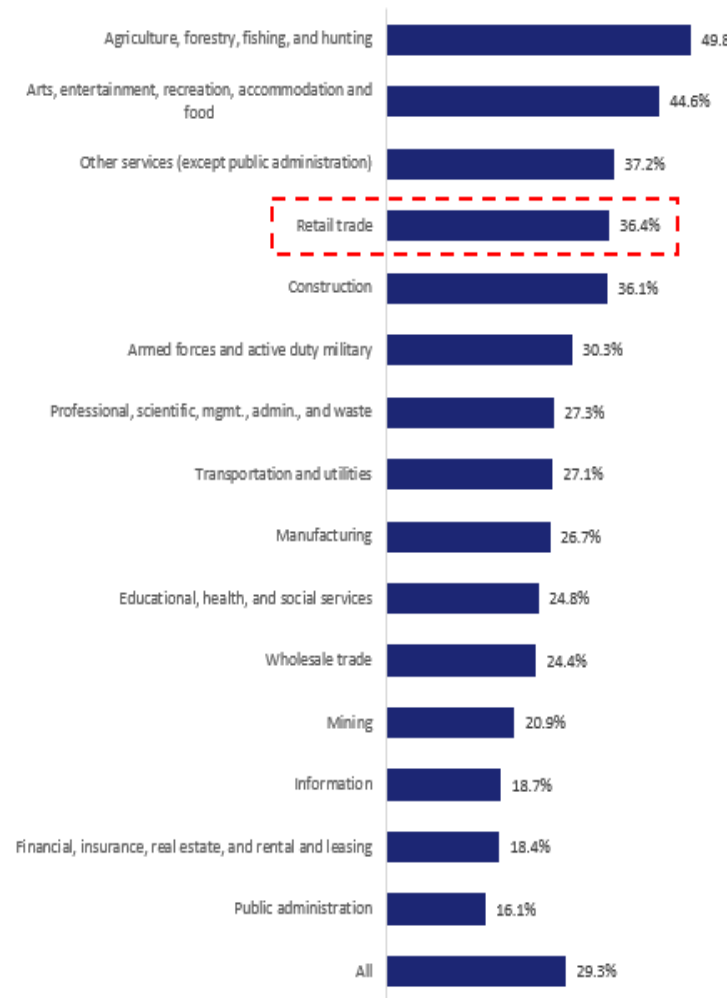
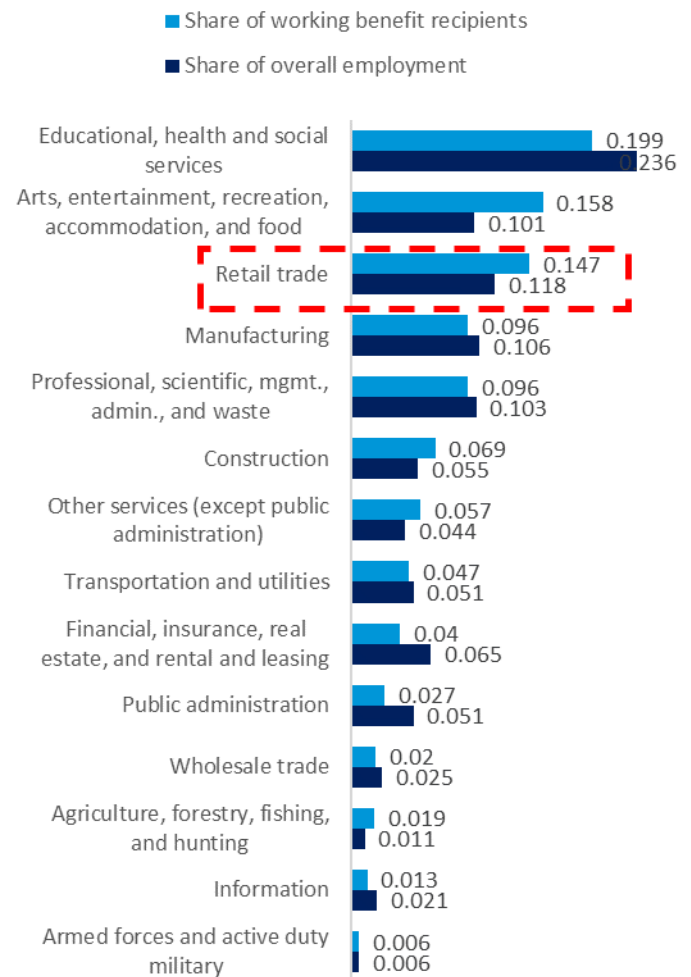


Figure 8: Distribution of workers receiving public assistance directly or through a family member, by major industry



Source: EPI analysis of Current Population Survey Annual Social and Economic Supplement microdata, pooled years 2012-2014

Retailers have been increasing wages in recent years as the labor market has tightened. For instance, Wal-Mart announced in February 2015 that it was investing \$1 billion in its US labor force for pay and training initiatives. Wal-Mart's action triggered a series of wage hikes across the retail sector, with other retailers such as Target and TJ Maxx following suit shortly thereafter. While tighter labor markets are cyclical in nature, retail faces a structural issue of increasing pressure for minimum wage hikes at the local and state levels. This

pressure comes amidst longer-term labor trends including an aging workforce and potential changes in immigration (which are beyond the focus of this report).

Given the increasing awareness around income inequality and minimum wage hikes at the local and state levels, wage pressure is a structural issue the industry must address. Indeed, the recent presidential election cycle brought the “Fight for \$15” discussion to the fore. The likelihood of a federal minimum wage increase has seemingly declined with a Republican administration, but states and municipalities continue to move forward with minimum wage hikes.

Profitability under pressure: implications for retailer strategies

Analysis indicates that companies seem to be taking a ‘consumer-centric’ approach towards automation in their stores. Yet the term can have a variety of meanings, and understanding what a company considers ‘consumer-centric’ can provide an indication of its future labor force.

McKinsey’s retail store transformation framework captures the elements of the retail store experience and enables a retailer to consider how their stores might evolve (Figure 9).

Figure 9: McKinsey – Retail store transformation framework

| Element | Description | Consumer effects |
|---|---|------------------------|
| <i>Convenience and proximity</i> | Do they value the ease and speed of being able to visit a store and get what they need? | Convenience |
| <i>Efficiency</i> | Do they see the store as a place that helps them make better use of their time—for example, by enabling them to make faster decisions or by serving as a pickup location for something they ordered online? | Convenience |
| <i>Inspiration</i> | Are they looking to discover—and be surprised by—new ideas and products? | Experience |
| <i>Instant gratification</i> | Do they look forward to store visits as a chance to make impulse purchases and get things they want immediately? | Experience/Convenience |
| <i>Discovery of a solution, information, or service</i> | Are they seeking knowledge and expertise above and beyond what they can find via an Internet search? | Experience/Convenience |
| <i>Entertainment and social interaction</i> | Do they see stores as places where they can be entertained and have fun with family and friends? | Experience |
| <i>Experiencing brands and products</i> | Do they visit stores for a chance to touch, feel, and be won over by products and brands? | Experience |

Source: McKinsey, ‘Making stores matter in a multichannel world’, Cornerstone Capital Group

Based on their analysis, McKinsey elements are categorized into one of two broad consumer strategies:

- **Convenience** – focus on removing the ‘friction’ of the purchase process within the retail store to increase sales volume and decrease labor costs through technology.

Elements such as proximity and efficiency improve the convenience effects for consumers, while inspiration, entertainment and brands are categorized as experience effects

- **Experience** – focus on increasing the consumer interaction with the store and its employees to increase pricing power.

Elements such as proximity and efficiency improve the convenience effects for consumers, while inspiration, entertainment and brands are categorized as experience effects. Instant gratification and discovery are a combination of the two. Prototypical examples of these strategies would be an Amazon Go store for convenience and a Tiffany & Co store for experience.

The type of strategy chosen by a company will impact how a company manages its labor, including potential layoffs enabled by automation and wage decreases or, conversely, wage increases and provision of complementary technology.

How is automation being adopted?

In considering whether retailers can automate labor to offset the structural headwinds previously identified, four areas were examined:

- The history of automation;
- Retail labor productivity;
- Academic perspectives on labor automation; and
- Automation applications in the retail industry.

History of automation

Automation of labor has been both integral to industry and controversial to society since the introduction of the steam engine in the 1800s. For example, the Luddites in England destroyed machinery in wool and cotton factories in the early 19th century, believing that the machines were costing them their jobs.

Analysis suggests that automation has had differing impacts on the labor force at various points in time. For instance, the automation that occurred during the mid-1800s due to the introduction of the steam engine impacted labor differently than electrification in the early 20th century.

During the 1850s to 1880s, automation resulted in a 'hollowing out' of the industrial labor force

During the 1850s to 1880s, automation resulted in a 'hollowing out' of the industrial labor force as the number of 'middle-skill' jobs declined while 'high-skill' and 'low-skill' jobs increased. Automation reduced the skill required for production, allowing trained artisans to be replaced by less-skilled operatives. Artisans typically fashioned a product from start to finish while operatives

The industrial automation from the 1900s to 1980s did not result in a significant 'hollowing out' as the skills of workers evolved with automation, aided, in part, by appropriate and widely available education

performed a smaller set of tasks with the help of machinery. At the same time, engineers and other highly skilled workers were needed to install and maintain the machinery. The impact was a reduction in middle-skilled jobs and pay but an increase in high- and low-skilled jobs.

However, the industrial automation from the 1900s to 1980s did not result in a significant 'hollowing out' as the skills of workers evolved with automation, aided, in part, by appropriate and widely available education. The only segment of workers impacted were low-skilled workers in the beginning of the 1900s, as electrification of the existing manufacturing plants eliminated the category of unskilled jobs that involved moving bulky raw material from one place to another in the plant.

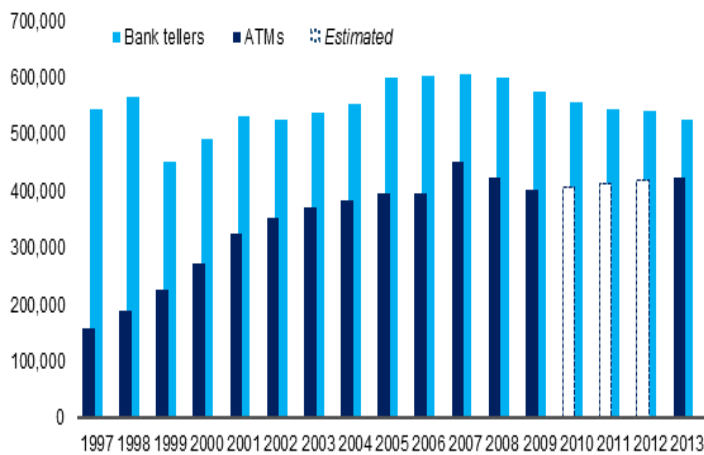
A paper by Katz and Margo¹ posits that the automation seen from 1980s onwards, principally driven by improvements in information technology and software, more closely resembles mid-1800s 'hollowing out' than the early 20th century wave. Industries that are experiencing significant amounts of automation in this era face a similar 'hollowing out' of the workforce.

Cornerstone Capital Group's 2015 report on automation in the quick serve restaurant industry, [The Economics of Automation: Quick Serve Restaurant Industry](#), examined two historical case studies—the introduction of automated teller machines (ATMs) and the introduction of self-service kiosks for airline check-in. These case studies appear to support the evidence of a hollowing-out effect from automation.

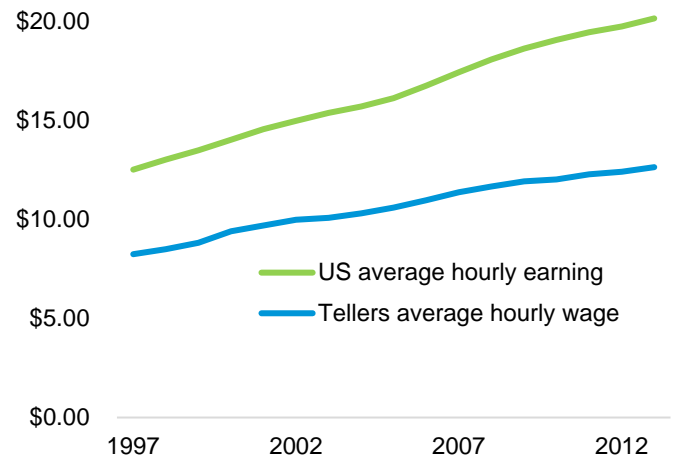
ATMs were first introduced in the 1960s and became widely available in the 1980s; however, the lifting of fees in 1996 drove exponential deployment. At the time, banks claimed that ATMs weren't a threat to bank tellers' jobs as they would relieve tellers from menial tasks and drive worker productivity. However, during a period of ATM deployment growth, data reveals declining bank teller jobs and lackluster wage growth (Figures 10 and 11).

While the absolute number of bank tellers increased during the roll-out of ATMs, bank teller jobs started to decline once ATMs reached a critical mass. While this drop is the result of several factors, it does coincide with the peak of ATMs. The wage data provides pushback against the bank industry's claims of increased productivity of bank tellers. The wages of bank tellers diverged from the wider economy in the late 1990s. All else being equal, increased productivity should have pushed a sector's wages upwards relative to the rest of the economy.

¹ Katz and Margo, 2013, Technical Change and the Relative Demand for Skilled Labor: The United States in Historical Perspective, NBER Working Paper 18752

Figure 10: Bank teller employment and ATM deployment

Source: Bureau of Labor Statistics, National ATM Council, Creditcards.com, *Wired* Magazine, Cornerstone Capital Group

Figure 11: Wages – US and bank tellers

Source: Federal Reserve Bank of St. Louis, Bureau of Labor Statistics, Cornerstone Capital Group

In airlines, the industry began installing airport self-service kiosks in the mid-1990s, and this trend accelerated when tighter security regulations (post the September 11th attacks) began impacting passenger check-in times. Airlines said that ticket agent jobs wouldn't be eliminated because of kiosk deployment because agents would instead be afforded the ability to focus on customer service. Per Forrester Research, airlines previously spent approximately \$3 per passenger for conventional check-in services but reduced this cost to \$0.14-0.32 after deploying kiosks (and online check-in).¹

As with ATMs, check-in technology was promoted as complementing reservation and transportation ticket agents, but the change in workers and wages suggests that the technology acted as a labor substitute (Figure 12). UC Berkeley Labor Center notes "these [reservation and ticketing agent jobs] faced downward wage pressure from automation as kiosks and Internet reservations became even more common¹."

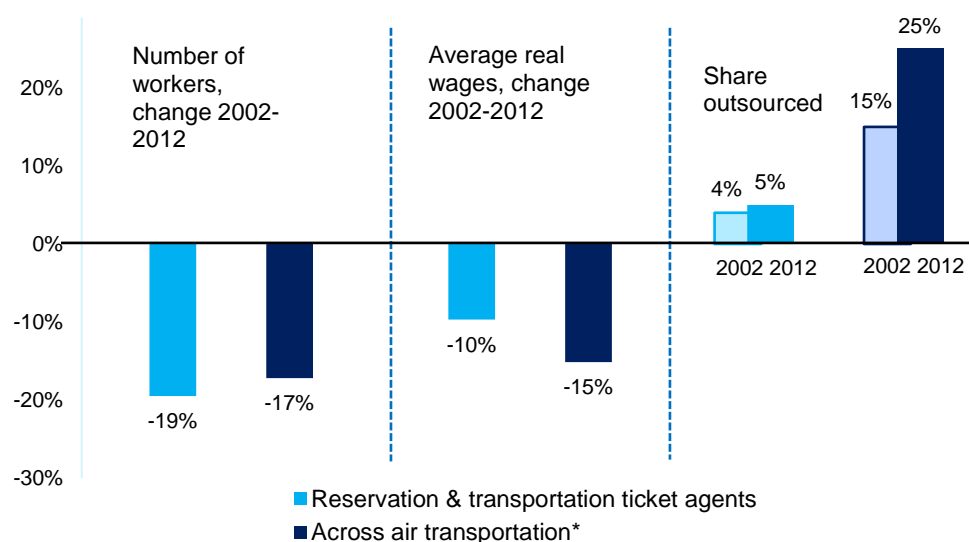
It's true that many airline and airport occupations are experiencing similar challenges related to job and wage growth, but this is partly due to outsourcing. In contrast, the share of reservation and ticket agent jobs outsourced is small and only increased slightly (from 4% to 5%) from 2002 to 2012. This supports the notion that check-in technology is pressuring employment and wage growth for reservation and ticketing agents.

These two historical examples suggest that while companies may intend for technology to act as a productivity enhancer and complement existing labor, the

¹ UC Berkeley Labor Center

results have often been a hollowing out of middle-skilled workers with negative impacts on employment and wage growth.

Figure 12: Airline workers, wages and outsourcing – 2002 to 2012



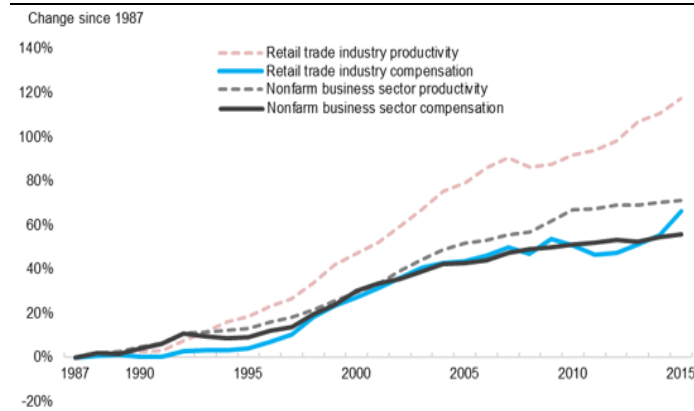
Source: UC Berkeley Labor Center, Cornerstone Capital Group

* Across air transportation represents selected common low-wage, non-maintenance and outsourced occupations that the original report studied, excluding 'Transportation Workers, All Other' (which is unavailable in 2002), 'Office Clerks, General' (which is unlikely to include many on-site airport workers), and 'Janitors and Cleaners' (which includes only about 2,500 air transport-related workers; most airport janitors are instead captured in the 'Janitorial Services' industry).

Retail labor productivity

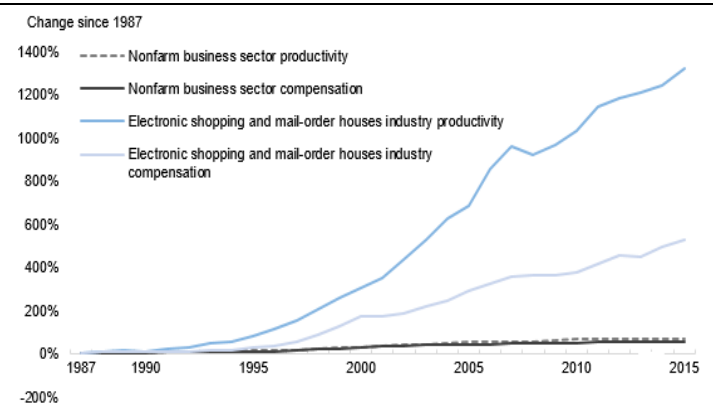
As noted previously, companies often cite automation as a key driver of labor productivity, enabling workers to focus on higher-value tasks. Figure 13 shows that retail labor productivity has grown faster than the broader economy, growing 120% while non-farm productivity grew 60%. However, certain sub-sectors of retail trade such as electronic shopping and mail-order houses (which includes online retailers such as Amazon) have had an outsized impact on that growth, with productivity soaring 1,200% (Figure 14). A deeper examination of labor productivity in other retail sub-sectors (Figure 15) shows diverging labor productivity compared to the broader economy.

Figure 13: Labor productivity – nonfarm business and retail trade sector



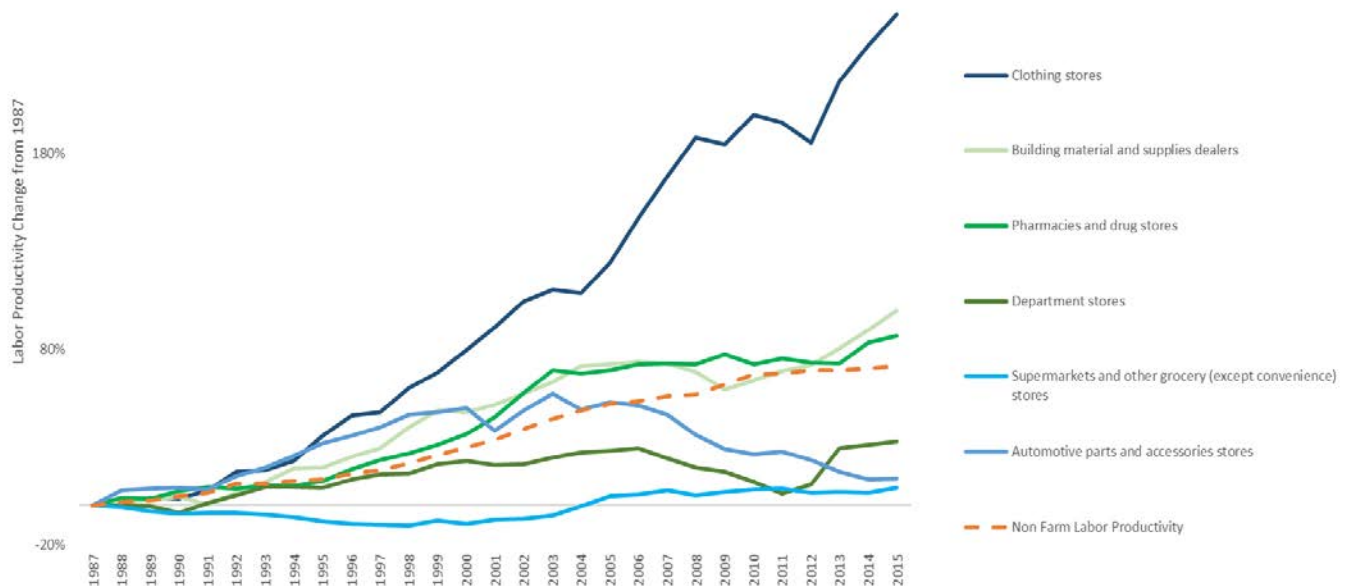
Source: Bureau of Labor Statistics, Cornerstone Capital Group

Figure 14: Labor productivity - electronic shopping and mail-order houses



Source: Bureau of Labor Statistics, Cornerstone Capital Group

Figure 15: Change in labor productivity since 1987 – retail sub-sectors and non-farm labor



Source: Bureau of Labor Statistics, Cornerstone Capital Group

Supermarkets, department stores, and automotive parts have experienced relatively stagnant labor productivity over the last several decades. Stalled productivity growth can be partially attributed to the lack of productivity-enabling technology. In contrast, clothing store labor productivity has experienced a significant and sustained increase since 1987.

Analysis of clothing store productivity suggests that clothing stores introduced a series of new technologies including UPC codes (barcodes) and internet-based inventory management. In addition to applying technology, the clothing store

subsector has seen higher levels of consolidation over the past decades than most other retail subsectors. This suggests that the stark increase in productivity of clothing stores is attributable to a combination of technology increases and structural consolidation.

Labor productivity in most of the retail sub-sectors has lagged the broader economy. Many companies are building out their online businesses, which could drive some improvement. However, sub-sectors such as department stores and grocery stores are likely to see opportunities to drive labor productivity growth for in-store workers through initiatives such as automation. History suggests that this may be at the expense of wages and total employment.

Academic perspectives on automation

A review of the academic literature identified two relevant views on the impact of automation on labor:

- Computerization of tasks; and
- Marginal cost.

Computerization of Tasks View

Oxford University's Michael A. Osborne and Carl Benedikt Frey published a study in 2013 that assigned 702 US occupations a probability, or risk, of computerization (stated as between 0 and 1), with computerization defined as job automation by computer-controlled equipment. Their analysis builds on prior work that distinguishes between workplace tasks using a two-by-two matrix, with routine versus non-routine tasks on one axis, and manual versus cognitive tasks on the other. Osborne and Frey proceed to examine the susceptibility of jobs to computerization considering "bottleneck variables" including perception and manipulation, creative intelligence, and social intelligence. Thresholds of 0.3 and 0.7 were used to differentiate occupations by low, medium and high risk of automation.

The study, and the resulting analysis, enables identification of jobs by job title, and through the Bureau of Labor Statistics, calculation of the number of retail jobs in the high-risk category (greater than 70% probability). The analysis in Figure 16 shows the number of high-risk retail jobs ranked by probability.

Figure 16: Oxford study – Number of retail workers at high risk (>.70) of computerization

| Jobs | Probability of computerization (0-1) | Number of workers in retail trade sector 2014 |
|--|---|--|
| Order Clerks | 0.99 | 52,600 |
| Parts Salesperson | 0.98 | 167,300 |
| Counter and Rental Clerks | 0.97 | 87,900 |
| Cashier | 0.97 | 2,778,500 |
| Retail Salesperson | 0.92 | 4,189,800 |
| Laborers and freight, stock, and material movers, hand | 0.85 | 312,700 |
| Total number of workers | | 7,588,800 |

Source: Frey and Osborne, "The Future of Employment: How Susceptible Are Jobs to Computerisation?" Oxford University, September 2013., BLS, 2014

The analysis suggests that approximately 7.5 million retail jobs are at high risk of computerization. There is potential for significant automation of labor, leading to changes in employment for millions of US workers. However, the ability to computerize a set of tasks is only one component of the decision to automate. Another important component is the marginal cost of automation relative to the current labor cost.

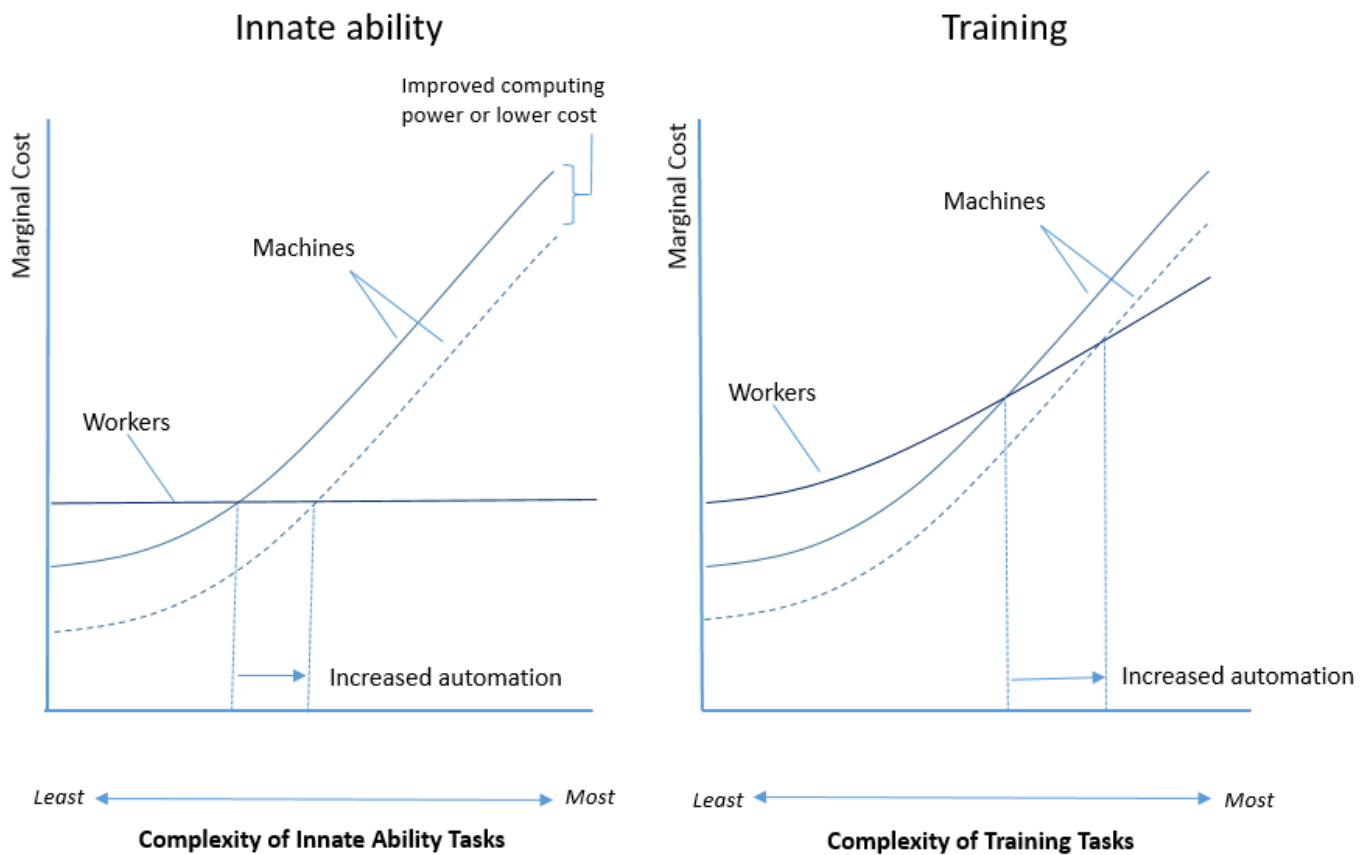
Marginal cost view

A report published by the Institute for the Study of Labor¹ examines the impact of labor-saving innovations on jobs and wages. This study separates labor tasks into two categories: innate ability and training. Innate ability tasks include empathizing with other people, recognizing facial patterns, or engaging in conversation. These tasks do not require training but nevertheless are quite complex to automate. Training-intensive tasks fall into two categories. The first includes less complex tasks such as calculating, assembling, and packing, which are easier to automate. Highly complex tasks such as diagnostics and process re-design are more difficult to automate.

Figure 17 plots the marginal cost of employing machines and the marginal cost of labor. Growing computer power and decreasing costs of technology increase the amount of automation. As machines become cheaper, their marginal cost (MC) curve shifts to the right and becomes relatively lower than the workers' MC curve.

¹ Feng, Andy and Graetz, Georg, 2015, "Rise of the Machines: The Effect of Labor-Saving Innovations on Jobs and Wages," Institute for the Study of Labor

Figure 17: Innate ability and training task automation



Source: Adapted from Feng et al, 2015, Cornerstone Capital Group

Note: For simplicity, the chart assumes that the marginal cost of innate ability worker is the same as the least-trained worker.

Minimum wage increases, all else being equal, will likely make more automation cost effective

For innate ability tasks, workers have a set of skills that are difficult to materially change or recreate with technology (the job of a store greeter, for instance, is to make customers feel welcome, a task that requires empathy and a physical presence that technology cannot yet replicate). Thus, the decision between workers and automation for innate ability tasks is based on wages and the speed of machine improvement. All else equal, a mandated wage increase would accelerate the automation process. It is noted that higher wages may also reduce turnover and increase motivation, but there is a lack of academic literature to robustly support this connection.

Due to the increasing slope of workers' MC for training tasks, automation increases as the complexity of tasks increases to certain point. After that point, it is cheaper to train a worker to complete the task. This impacts middle-skilled workers the most, as they are positioned to be most impacted by a shifting

machine MC curve. These middle-skilled jobs, therefore, represent the ‘edge’ of the automation process.

Overall, the chart and study suggest that automation creates a ‘hollowing out’ of middle-skilled ‘training’ workers. These previously middle-skilled ‘training’ workers will either be retrained to undertake higher-skilled jobs or, without training, to innate ability jobs. Minimum wage increases, all else being equal, will likely make more automation cost effective. The question for the retail industry is whether employment opportunities exist for workers to move up the training curve. Otherwise, their only option is to move to existing innate ability tasks—which in turn are likely to experience continued downward wage pressure from automation.

Automation applications in retail

The general composition of a retail store—typically a show room or retail floor, checkout, and backroom for inventory storage and store management—provides numerous opportunities for automation. Retailers are discussing or implementing a variety of automation initiatives,¹ focused on improving customer satisfaction, operational efficiency, or a combination thereof. Figure 18 summarizes in-store technologies and provides an indication of the extent to which each is being deployed. This is not an exhaustive list, but instead captures the technologies that are most relevant to the topic of this report.

Mobile devices and proximity beacons

The increasingly ubiquitous use of mobile devices has been a key driver in the transformation of the retail marketplace. Mobile capabilities allow a retailer to break down the barrier between the online digital environment and the physical store.

Consumers now use mobile devices to research product features, read customer reviews, compare prices, and increasingly to pay for in-store purchases. Several retailers have designed mobile apps that allow customers to scan barcodes or upload pictures of products which are used to access product information or find other colors and sizes on the retailer’s website.

¹ The scope of automation is extensive, but simply stated, *automation refers to the use of machines and technologies to optimize productivity in the production of goods and delivery of services.*

Figure 18: Retail In-Store Technology

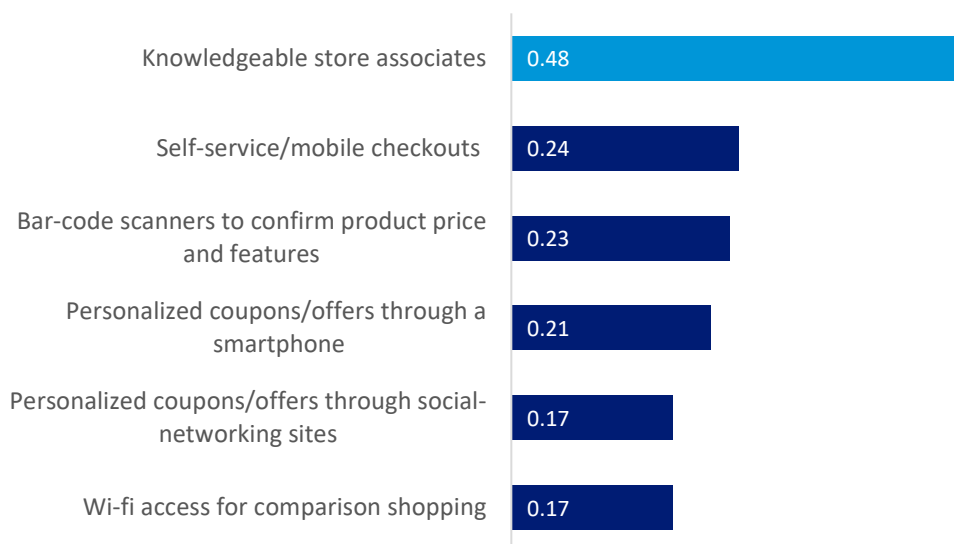
| Technology | Description | Focus | Frequency of Use |
|---|---|----------------------|------------------|
| Mobile devices | Mobile apps enable consumers to scan a barcode or take a picture of a product to access product info or find other colors and sizes on the retailer's e-commerce site | Consumer | High |
| Self-checkout | Customers scan and finalize purchase at terminal | Consumer/Operational | High |
| Digital kiosks | Touch screens that enable consumers to view product info, access customer reviews, and place orders for delivery | Consumer | High |
| Proximity beacons | Devices that alert shoppers to promotions or provide sales associates with information on frequent store visitors to deliver high-touch service | Consumer | High |
| Workforce and task management solutions | Software that analyzes, forecasts, and manages labor scheduling and task management | Operational | High |
| RFID technology | Radio Frequency Identification (RFID) tags enable enhanced inventory tracking throughout the supply chain | Operational | Medium |
| Autonomous robots | Smart robots that aid in areas ranging from leading customers to desired products to inventory replenishment | Consumer/Operational | Medium/Low |
| Smart price tags | Smart price tags can be changed in real time based on demand or other trends | Consumer | Medium/Low |
| Sensor-based checkout | Contactless checkout by automatic scanning of product as customer walks out of store | Consumer/Operational | Low |
| Smart shelves | Sensor-based shelves that detect when inventory is low | Operational | Low |

Source: Cornerstone Capital Group, Accenture, Company filings

Access to knowledgeable store associates is the number one in-store feature that may increase the likelihood of making a purchase

While mobile technology is empowering consumers in their purchasing decisions, in-store consumers are likely to require sales associate interaction. Deloitte's survey reveals that access to knowledgeable store associates is the number one in-store feature that may increase the likelihood of making a purchase (Figure 19). To this end, retail associates are being equipped with handheld mobile devices to enable inventory look-up for products at the store and even for items not immediately available, access product information, and to support transaction processing anywhere in the store.

Figure 19: In-store features that increase likelihood of purchase



Source: Deloitte Annual Holiday Survey, 2014 (Question not asked in 2015 and 2016 surveys)

Location-based technology, such as proximity beacons, increasingly is being used to target shoppers in or near stores. Beacons utilize a mobile device's location technology to alert shoppers to personalized promotions or provide sales associates with information on frequent store visitors to deliver high-touch service.

Notable mobile device and beacon initiatives include:

- *Macy's* mobile app includes "Image Search" functionality which allows customers to search merchandise on macys.com by taking a picture of any outfit, accessory, or merchandise item they see in daily life.
- *Wal-Mart* launched an iBeacon (Apple's beacon technology) trial partnership with GE using GE lightbulbs to house beacons which send push notifications of specials and discount coupons to in-store customers.
- *Nordstrom's* beacon-enabled mobile app has an image search function and notifies a consumer if any item in his/her online shopping cart is in stock as they pass by a store.

Self-checkout and digital kiosks

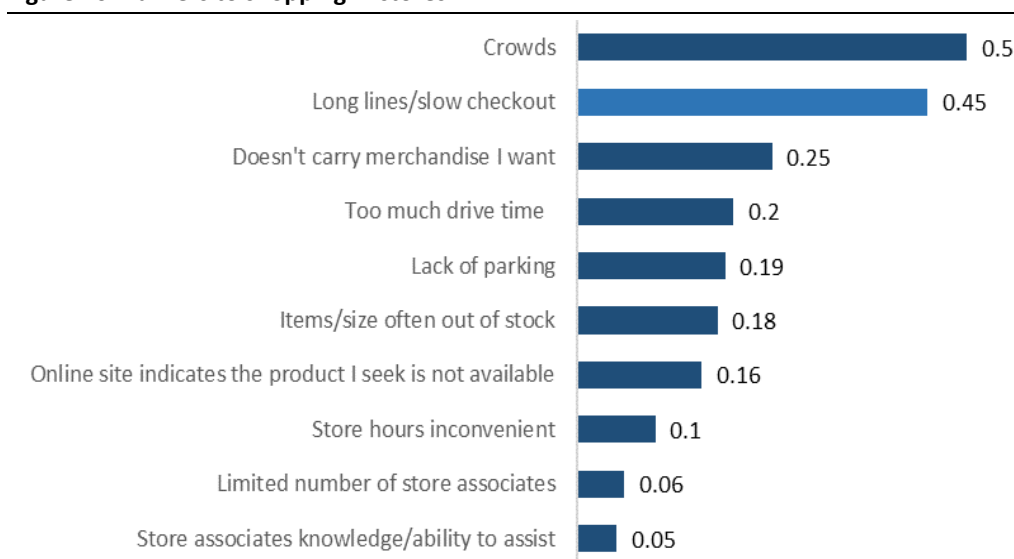
Self-checkout terminals allow customers to process their own purchases from a retailer and are an alternative to the traditional cashier checkout. The concept is growing in popularity due to high consumer acceptance and the benefits it offers

Nearly three out of four consumers who used self-checkout said it saved time

retailers in improving the customer experience. A recent Consumer Reports grocery-store survey showed that nearly three out of four consumers who used self-checkout said it saved time.¹ Furthermore, the top complaint among those surveyed is too few open checkout lanes, highlighting the potential of self-checkout. This is particularly important given data from Deloitte's Annual Holiday Survey which shows that long lines and slow checkout is the second most important barrier to shopping in physical retail stores (Figure 20).

While self-checkout is a mature technology, new concepts are emerging to accommodate smaller store formats, offer convertible options to switch from customer-facing self-checkout to an assisted checkout during peak periods, and enable placement throughout various points in the store instead of being restricted to the front end.²

Figure 20: Barriers to shopping in stores



Source: Deloitte Annual Holiday Survey, 2016, Cornerstone Capital Group

Retail associates can leverage digital kiosks to improve customer service and drive the sales process

Digital kiosks are part of a broader omnichannel platform and can bridge a consumer's experience on a mobile device to the physical store. Kiosks enable shoppers to find product information, view products that may not be available in the store, access customer reviews, and place orders for delivery or in-store pickup. Retail associates can also leverage digital kiosks to improve customer service and drive the sales process.

¹ <http://www.consumerreports.org/cro/news/2015/04/the-pros-and-cons-of-supermarket-self-checkout/index.htm>

² https://www.ncr.com/sites/default/files/white_papers/RET_SCO_wp.pdf

Notable self-checkout digital kiosk initiatives include:

- *Macy's*-owned luxury department store Bloomingdale's is testing smart fitting rooms equipped with wall-mounted tablets that allow customers to scan items to view other colors and sizes, product reviews, and recommendations to "complete the look." Customers are also able to tap a button to call for assistance from a sales associate without leaving the room.
- *Walgreens Boots* invested in MedAvail and is piloting the company's automated pharmacy kiosks. The kiosks allow customers to fill prescriptions easily from any location at any time. MedAvail says the technology reduces labor costs of filling each order by focusing the work of pharmacists on the tasks of counseling, drug selection and confirmation, rather than fulfilling all the tasks of end-to-end dispensing.
- *Whole Foods'* self-serve kiosks allow customers to order an array of prepared food from the grab-and-go section.

Wal-Mart is testing "scan and go" capabilities whereby a customer could ring up his/her own purchases with a smartphone and skip the checkout line.

Workforce and task management solutions

As customer demands evolve with the rollout of omnichannel platforms, retailers are tasked with finding labor to perform new tasks while keeping labor costs in check

As customer demands evolve with the rollout of omnichannel platforms, retailers are tasked with finding labor to perform new tasks while keeping labor costs in check. RSR Research, a retail-focused research firm, identifies "click and collect" order fulfillment as an issue. Where store customers used to collect their own purchase choices and take them to the checkout counter, at some types of stores they now expect a retail employee to do this for them. To allocate labor to customer-service tasks, retailers have to more efficiently utilize labor, which can include ratcheting down labor spend in other areas.¹

One way retailers are tackling this challenge is by implementing just-in-time staffing based on real-time monitoring of sales and traffic in stores. In this system, employees check in before their scheduled shift and only report to work if the store is expected to be busy. However, retailers have received pushback from opponents of the practice who note that the erratic and unpredictable work hours negatively impact employees and their families.

Companies are also turning to workforce and task management solutions, such as automated labor scheduling software, that enable better alignment of labor with customer demand while ensuring compliance with labor laws. These tools generate optimized schedules factoring in a variety of variables including

¹ <http://www.rsresearch.com/research/store-labor-vs-customer-service-collision-course>

forecasted customer demand, employee preferences, business goals, and labor laws.

Notable workforce and task management solutions include:

Kroger implemented Quevision, a predictive software program cost \$85m in capital with \$1m in ongoing costs resulting in a 3.5-minute reduction in checkout wait time and avoiding \$250m in labor costs

- *Kroger* implemented Quevision, a predictive software program that estimates the number of cashiers that will be needed based on customer arrivals. The program cost \$85 million in capital with \$1 million in ongoing costs, resulting in a 3.5-minute reduction in wait time and \$250 million in labor cost savings.
- *Lowe's* cameras capture customer traffic in stores and transmit data which is analyzed to drive payroll efficiency and align staffing to customer traffic. Lowe's is also moving installation services scheduling from the store-level to centralized contact centers to drive efficiency improvements.
- *Home Depot* implemented a centralized labor management system which has improved store manager forecast accuracy rate from a 10% variance to less than 2%. The company has also rolled out freight handling software designed to drive employee productivity by providing visibility and instructions for the freight unloading and stocking process.
- *Wal-Mart* is automating and centralizing accounting and invoicing jobs that were previously completed in stores.
- *Foot Locker* installed a new labor scheduling tool and expanded traffic counting capability to enhance scheduling efficiency.

RFID technology is helping retailers compete with online sellers because it enables frequent inventory counting, which, in turn, drives inventory accuracy

Radio Frequency Identification (RFID)

RFID tags typically consist of a microchip attached to an antenna and use radio waves for identification and tracking purposes. This provides an advantage over barcodes, which require an unobstructed line-of-sight between the barcode and reader. RFIDs are more expensive than barcodes, but decreasing costs, improving performance and reliability, and increasing standardization are driving RFID usage not only in retail, but in supply-chain management broadly.

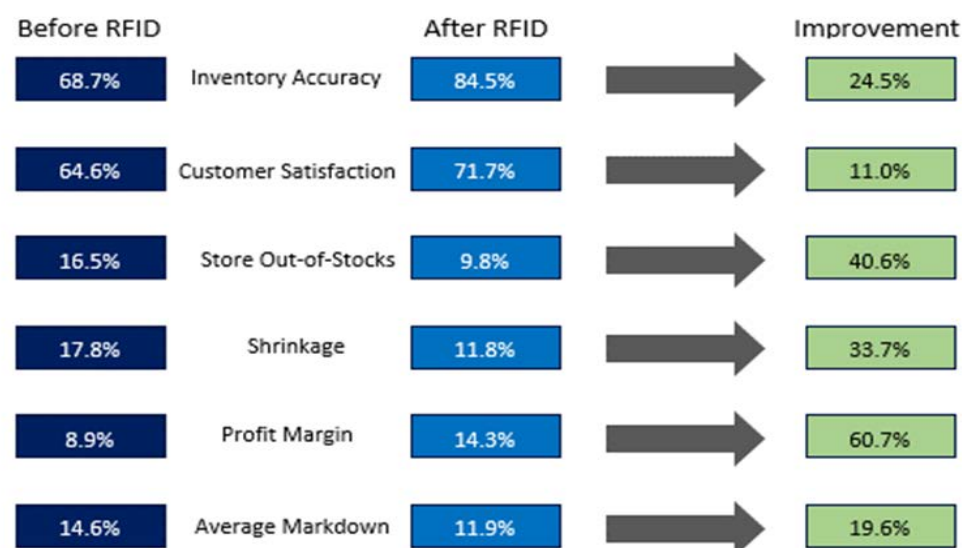
RFID technology is helping retailers compete with online sellers (e.g., Amazon) because it enables frequent inventory counting which, in turn, drives inventory accuracy. To run a successful omnichannel platform, retailers must have high confidence in their inventory all the way down to the size and color level.

A 2016 study on RFID use in retail and the results indicate that inventory accuracy improved by 25% following RFID adoption.

Consulting firm Kurt Salmon conducted a study in 2016 on RFID use in retail and the results indicate that inventory accuracy improved by 25% following RFID

adoption.¹ Other key metrics such as customer satisfaction and profit margin showed significant improvement as well (Figure 21).

Figure 21: Retailers are seeing significant benefits from RFID



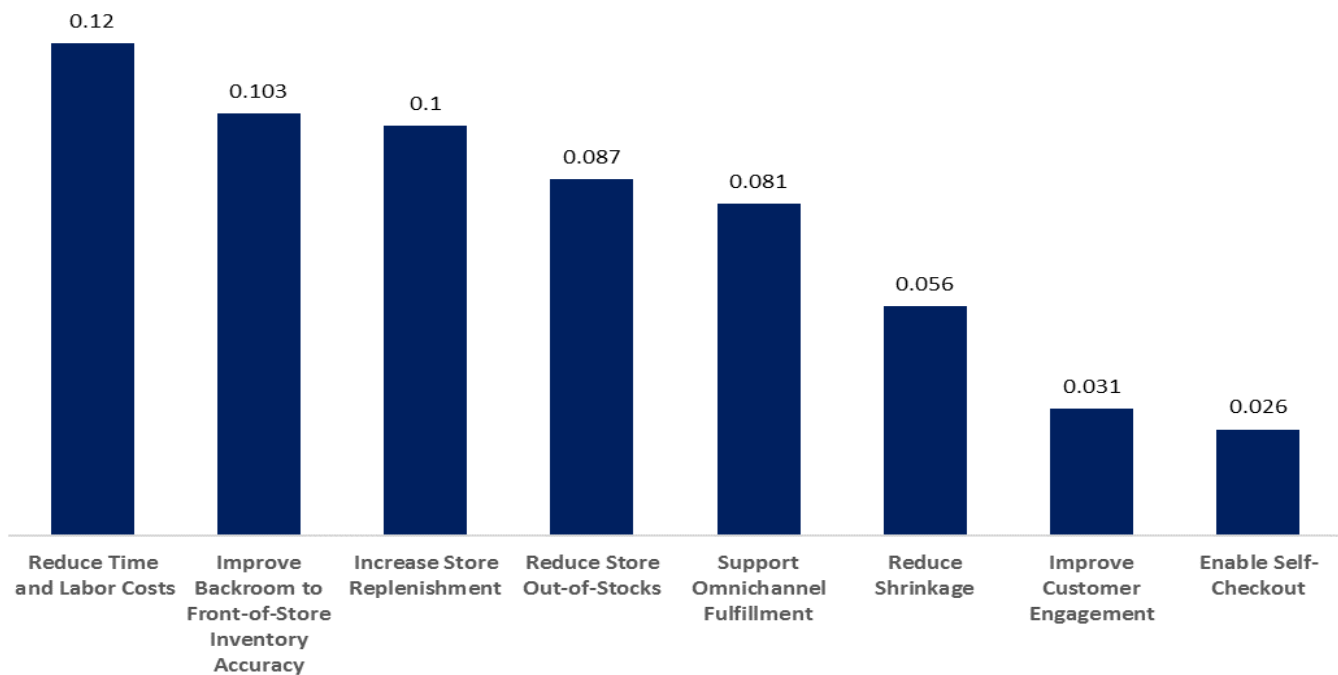
Source: Kurt Salmon, Cornerstone Capital Group

From a return on investment (ROI) perspective, retailers reported multiple use cases with significant ROI including a 12% ROI from labor cost savings due in part to employees conducting cycle counts (an inventory auditing procedure) more efficiently or not at all (Figure 22).

Notable RFID initiatives include:

- *Macy's* is expanding use of RFIDs to track every item in its stores and fulfillment centers by the end of 2017.
- *Kohl's* and *Target* are deploying RFIDs across select departments and key merchandise categories.

¹ <http://www.kurtsalmon.com/en-us/Retail/vertical-insight/1628/Kurt-Salmon-RFID-in-Retail-Study-2016>

Figure 22: RFID – Reported ROI by Use Case

Source: EKN – Kurt Salmon RFID in Retail Survey, 2016, Cornerstone Capital Group

Wal-Mart was an early adopter of RFID technology in 2003 when it issued a mandate to its top 100 suppliers requiring all cases and pallets be RFID-tagged within 18 months (other suppliers had to comply by the end of 2006). However, the company pulled back the project significantly, describing that it was a “solution looking for a problem,” and said that barcodes served the same purpose. However, retailers like Macy’s, Kohl’s and Target are now rolling out initiatives at the item level in an effort to address inventory accuracy in the store itself.

Robots, smart tags, and automated checkout

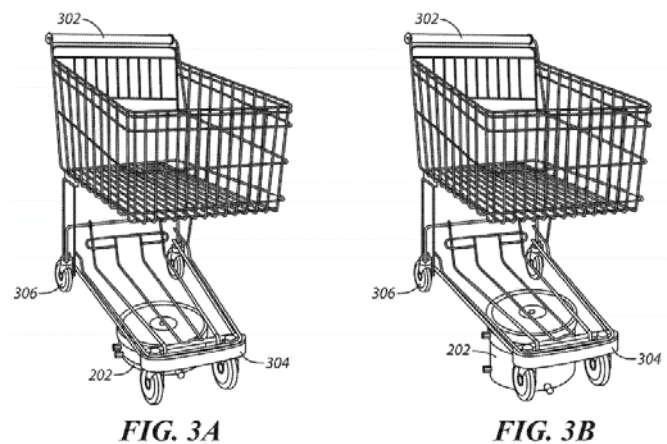
Other emerging automation initiatives are being tested in the lab or piloted in select stores. Because these technologies are still nascent, it is unclear if or how widely they will be implemented. Based on available information, however, there are interesting use cases that could drive customer satisfaction and operational efficiency.

Figure 23: Lowe's LoweBot



Source: Lowe's Innovation Labs

Figure 24: Wal-Mart's Motorized Transportation Units



Source: US Patent and Trademark Office

Notable initiatives include:

Digital tags light up as shoppers approach crowded racks and can highlight items that meet specific dietary needs

Wal-Mart patented a "motorized transport unit" system that can enable shopping carts to drive and dock themselves

- *Lowe's* introduced LoweBot, an autonomous retail service robot developed by NAVii in 11 stores in the San Francisco Bay area. LoweBot can find products in multiple languages and effectively navigate the store. Furthermore, LoweBot can assist with inventory monitoring in real-time, which helps detect patterns that might guide future business decisions.
- *Kroger* is testing Digital Shelf EDGE, which is "smart shelf" technology that can detect individual shoppers through their mobile devices. Shoppers can be directed to items on their digital grocery list and alerted if they accidentally pass an item on a shelf. Digital tags light up as shoppers approach crowded racks and can highlight items that meet specific dietary needs (i.e. gluten-free, organic, and allergens). Kroger says the digital tags are freeing up time for store clerks to pay more attention to customers by eliminating the need to change price tags manually. As a point of reference, a typical Kroger store takes more than two weeks to completely re-price by hand with new tags.
- *Wal-Mart* patented a "motorized transport unit" system that can attach to shopping carts, enabling them to drive and dock themselves. The systems use a combination of sensors, video cameras, a wireless network and a central computer. Business Insider says the motorized units may potentially be used to "move containers; scan, retrieve, and deliver products; check inventory; retrieve trash; and even connect with customers."¹
- *Amazon* recently introduced its Amazon Go store, a checkout-free shopping experience enabled by computer vision, sensor fusion, and deep learning. The

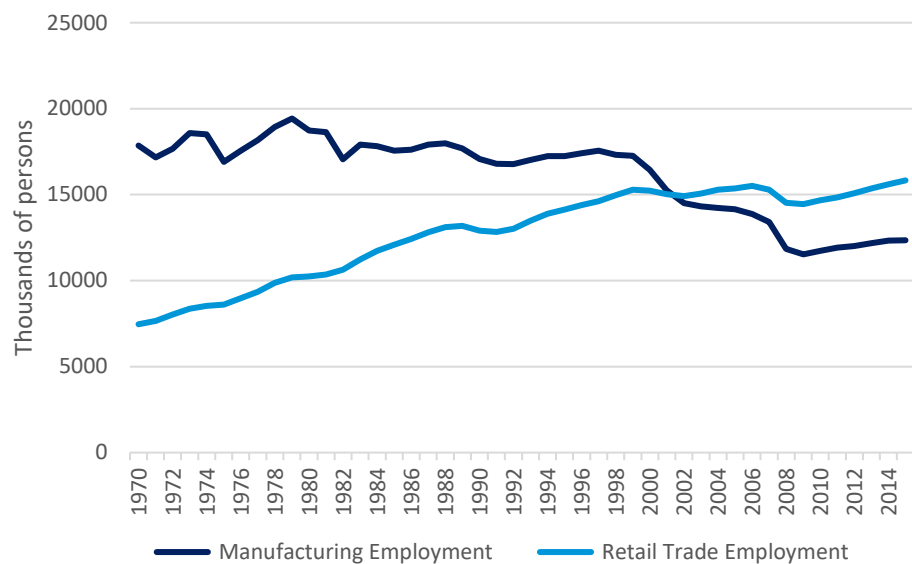
¹ <http://www.businessinsider.com/walmartWal-Mart-could-ditch-workers-for-patented-tech-2016-9>

“Just Walk Out” technology automatically detects when products are taken from or returned to shelves and keeps track of them in a virtual cart. When a customer is done shopping, he simply leaves the store, and his Amazon account is charged. A beta test store is currently open to Amazon employees in Seattle, though it is unclear when the store will open to the public.

Broader stakeholder implications

Figure 25 shows the employment in manufacturing and retail trade (a subsector of retail). Total manufacturing employment, which peaked in 1979 at approximately 19 million workers, has fallen to 12 million workers. The repercussions of manufacturing’s decline have been felt at the local and national levels. For example, certain areas that had been economically based on manufacturing have experienced rising poverty, declining populations, and erosion of political trust.

Figure 25: Employment in manufacturing and retail trade



Source: US FRED, Cornerstone Capital Group

As predicted by the World Economic Forum, a reduction in retail workers of 30-50% would result in the loss of about 6 million retail jobs

Retail trade overtook manufacturing in total employment in 2000 but growth has slowed since then. As predicted by the World Economic Forum, a reduction of retail workers by 30-50%, would result in the loss of about 6 million retail jobs. In percentage terms, this would be roughly equivalent to the reduction seen in the manufacturing industry. Using Osborne and Frey’s data along with the Bureau of Labor Statistics data, more than 7.5 million retail jobs appear to be at

high risk of computerization. While estimates vary based on methodology, both approaches suggest a significant number of jobs at risk.

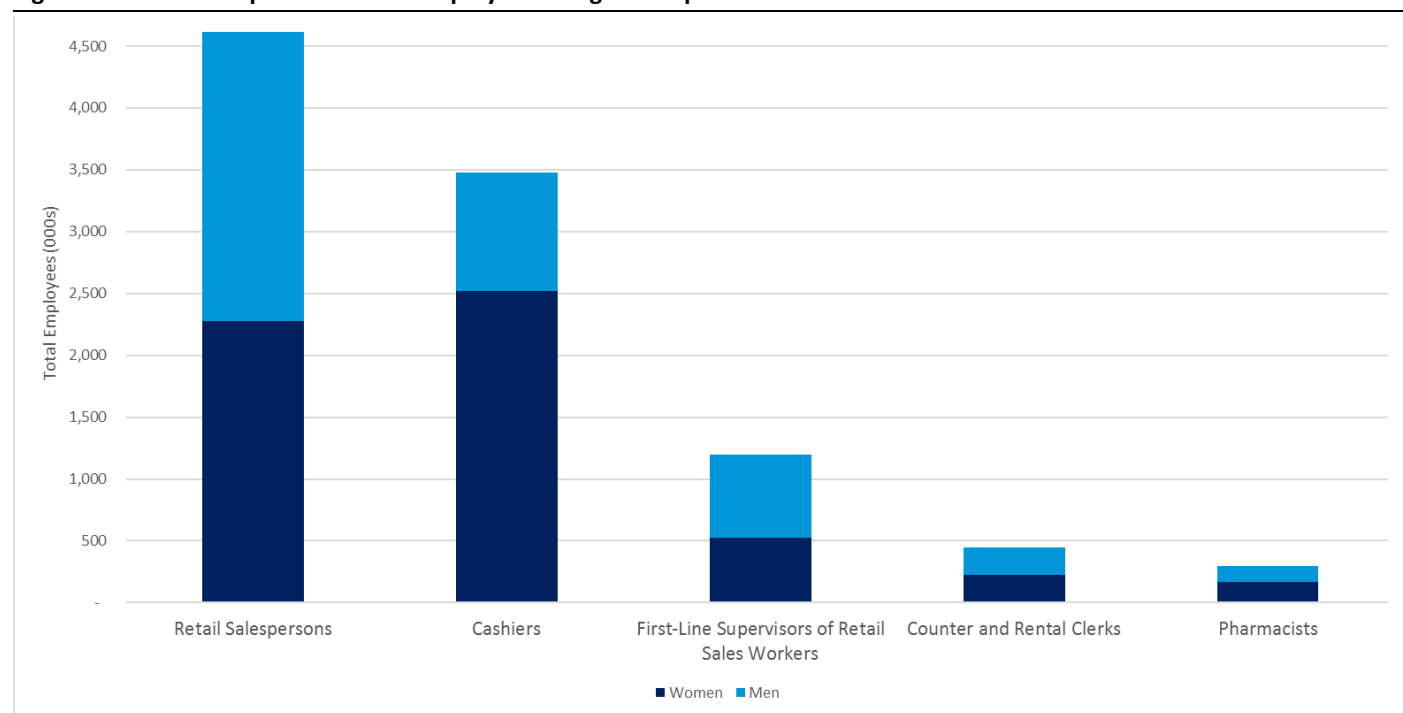
Retail worker demographics provide an indication of which groups might be most affected by large scale automation.

Gender inequality

Large-scale automation of retail labor could disproportionately affect women

An assessment of the gender composition of retail workers (Figure 26) shows that the largest group, retail salespeople, has equal numbers of men and women. However, cashiers, the next largest group of retail workers, are predominantly women (73%). The job of cashier is considered one of the most automatable jobs in the economy. Osborne and Frey indicate a 97% probability of cashiers being automated, which is slightly greater than retail salespeople. Based on this analysis, large-scale automation of retail labor could disproportionately affect women.

Figure 26: Retail occupations – total employees and gender split



Source: Osborne and Frey, US Bureau of Labor Statistics, Cornerstone Capital Group

Note: Gender breakdown is provided at the higher Retail level (not Retail Trade) which means total employment is approximately 10% higher than Retail Trade employment. It is not anticipated that the split would deviate significantly for Retail Trade employment.

Geographical inequality

There does not appear to be a subset of states that will be disproportionately affected by labor automation

The analysis of employment in retail by state shows fairly consistent levels of employment. The states with the highest proportions—Florida, New Hampshire, Alabama and Montana—have 12-13% of state employment in retail. North Dakota, Wyoming and Alaska have the lowest percentage of their workforce in retail at 8-10%. Therefore, at a state level, there does not appear to be a subset of states that will be disproportionately affected by labor automation.

Wal-Mart possesses an average market share of 25% in metropolitan areas with populations of fewer than 500,000 residents

However, while detailed local data could not be found, it appears that several major companies in this study are particularly concentrated in less densely populated metropolitan areas, and that major retailers hold significantly less of the market in major metropolitan areas. A UCLA study on Wal-Mart¹ shows that since 2006, its average grocery market share in the 25 most populated metropolitan areas grew from 5.5% to almost 12%. However, Wal-Mart possesses an average market share of 25% in metropolitan areas with populations fewer than 500,000 residents. If market share is considered a proxy for employment share (albeit not directly proportionate), large-scale automation could have significant impacts on a number of specific local communities.

What are the investor implications?

The analysis suggests there is significant pressure for retailers to automate and the technology is available to do so. Given this thesis, the implications for retail industry investors was examined. The assessment utilizes Cornerstone Capital's BRAVE Matrix™ to identify and assess investor implications.²

The key areas identified in this report using this framework are:

- Future store strategy;
- Employee wage increases;
- Recruitment, retention and training; and
- Public perception of job losses.

¹ http://www.irle.ucla.edu/publications/documents/AnthonyRobert_Wal-MartReport_July2015.pdf

² The BRAVE Matrix provides a generalized business case for addressing social and environmental issues. The BRAVE Matrix is used to consider how a company's relationships with supply, demand and contextual stakeholders individually may affect each of the six business drivers, positively or negatively.

Future store strategy

As noted in the prior section, identifying the primary customer strategy (experience or convenience) of a company enables investors to understand the use of technology, labor profile changes and implications for their investments.

Announced technology initiatives provide insight into how a retailer is positioning itself. A retailer may not disclose all initiatives for competitive reasons, and publicly disclosed information may lack specificity. Despite these challenges, announced initiatives indicate how a company is thinking about its future customer strategy.

To this end, proxy metrics enable investors to interpret the overarching strategy for retailers and facilitate engagement regarding the potential impacts on labor. Analysis suggests that a key factor in differentiating between convenience and experience strategies is the decision regarding the quantity and wage level of the labor force. The assertion is that stores with more, well-paid workers signal an experience strategy, while stores with fewer, low-paid employees may be pursuing a convenience strategy.

Currently, no retailer provides detailed information on labor costs but research indicates that labor constitutes two-thirds of SG&A for retail companies on average

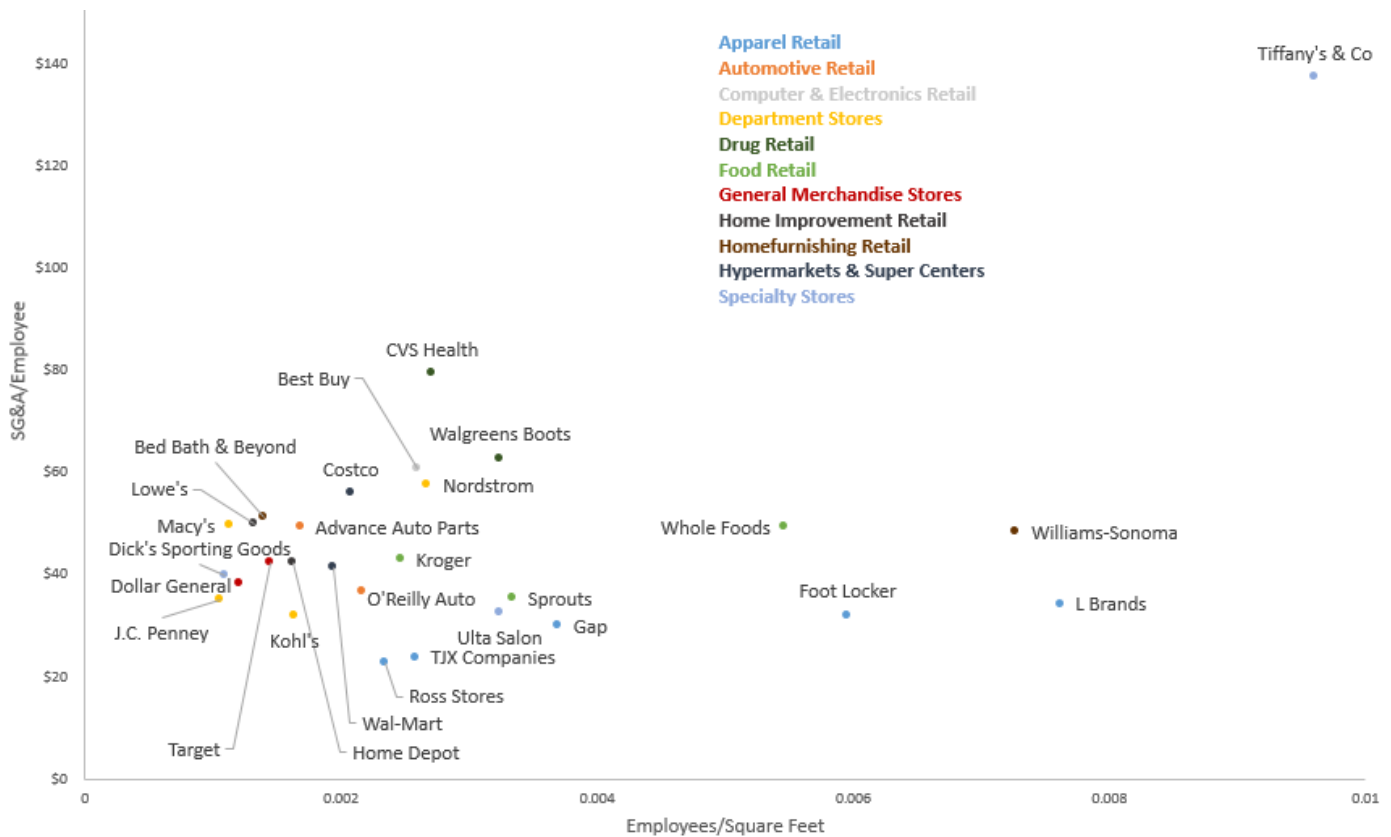
Currently, no retailer provides detailed labor cost information, so SG&A is used as a proxy for labor. Research indicates that labor constitutes approximately two-thirds of SG&A for retail companies on average. Other costs included in SG&A range from occupancy costs to maintenance spending on technology, but given the absence of other, more specific information, SG&A per employee is a reasonable and available wage proxy.

The number of employees and square footage are used to examine the number of employees required to operate a store. Most companies do not delineate between part-time and full-time, so total employees is utilized. SG&A per employee and employees per square foot are shown in Figure 27.

Forward-looking analysis requires an understanding of how these metrics are changing over time, and the change in each metric from 2010 to 2015 can be calculated. The change in SG&A per employee over time indicates directional changes in wages, while change in employee per square foot signals directional changes in the quantity of labor. Based on this analysis, four quadrants are identified that may provide an indication of a company's strategy and its impact on labor (Figure 28).

Figure 29 shows the companies on the two axes - change in SG&A per employee and change in employees per square foot from 2010 to 2015.

Figure 27: Current SG&A per employee versus Employees per Square Foot ('000s)



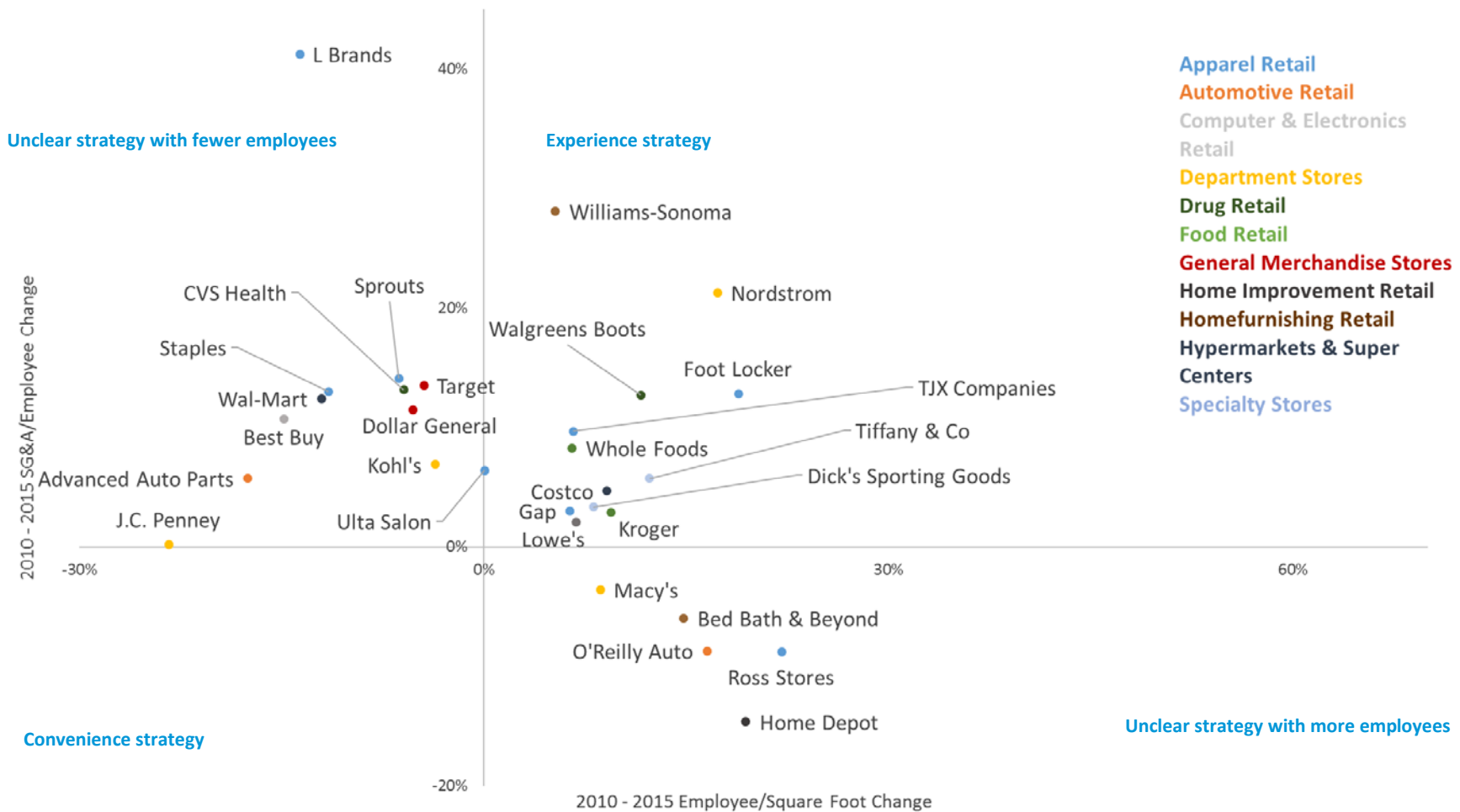
Source: Bloomberg, Company reports, Cornerstone Capital Group

Figure 28: Retail store strategy quadrants

| | |
|--|--|
| <p>Unclear strategy with fewer employees</p> <ul style="list-style-type: none"> Increasing SG&A per employee but decreasing employees per square foot. Companies are possibly increasing wages to improve the quality of the workforce but reducing employees per store to offset costs. Companies are also possibly reducing employees a result of automation substituting for labor and spending more on technology maintenance. | <p>Experience strategy</p> <ul style="list-style-type: none"> Increasing SG&A per employee and increasing employees per square foot. Companies could be seeking to drive sales through an increased number of well-compensated employees. Possible increase in tech investment may complement an increased workforce. |
| <p>Convenience strategy</p> <ul style="list-style-type: none"> Decreasing SG&A per employee and decreasing employees per square foot. Companies are likely to be deploying labor-substituting automation resulting in lower wages and lower employment. This quadrant could be associated with a focus on convenience and low touch. | <p>Unclear strategy with more employees</p> <ul style="list-style-type: none"> Decreasing SG&A per employee and increasing employees per square foot. A consistent strategy was not identified in this quadrant. It is possible that a 'hollowing out' is occurring with higher paid employees being replaced by more, lower paid employees who are aided by technology. |

Source: Cornerstone Capital Group

Figure 29: Retail strategy quadrant chart



Source: Bloomberg, Company reports, Cornerstone Capital Group

Excludes Amazon (business does not depend on physical stores) and Staples (does not release square footage information)

Companies in the “unclear strategy” quadrants deserve attention as they may be employing contradictory strategies

Companies in the “unclear strategy” quadrants deserve attention as they may be employing contradictory strategies. For example, if companies in the “unclear strategy with more employees” quadrant are looking to make their stores more high-touch and experience-based, but are not compensating their employees adequately, they could face high turnover and an unsatisfied labor force. Among the companies in this quadrant are Ross Stores, Macy’s and Bed Bath & Beyond.

The “convenience strategy” quadrant is currently empty as no company is decreasing both SG&A per employee and employees per square foot. While this category in theory would suggest that a company is focusing on convenience and low touch through labor-substituting automation, it remains to be seen whether this is occurring. Companies that move into the “convenience strategy” quadrant may undertake significant labor force reductions in the long run.

The “experience strategy” quadrant includes companies whose SG&A per employee and employees per square foot are increasing. Companies in this quadrant may be using their labor force as a competitive differentiator. Technology is also likely being used to complement the labor force, thereby increasing customer satisfaction and employee productivity. Among the companies in this quadrant are Nordstrom, Williams-Sonoma, Tiffany and Whole Foods.

L Brands is positioning towards an experience strategy, with a labor force that is more motivated and knowledgeable and better able to create an inspired store experience

While the matrix framework approach is a reasonable starting point, a detailed company examination is needed to further distinguish between strategies. L Brands (owners of Victoria’s Secret, Bath and Body Works, and Pink), located in the “unclear strategy with fewer employees” quadrant, saw the total number of employees decrease 9% from 2010-2015, while SG&A per employee increased 29% and store count only increased 1%. This reflects L Brand’s strategy as described in its investor discussions to transition to more full time-workers versus part-time workers and to pay these workers more competitively. This points to L Brands positioning towards an experience strategy, with a labor force that is more motivated and knowledgeable and better able to create an inspired store experience.

In contrast, Home Depot, located in the “unclear strategy with more employees” quadrant, may be positioning the company towards a convenience strategy by streamlining the customer experience and keeping labor costs low. Home Depot has implemented self-checkout technologies and discussed initiatives around inventory management in store, all of which lead to a more efficient customer experience. Home Depot has also increased its labor force by 20% over this five-year period, but SG&A only rose 2%, indicating that labor force compensation has not kept up with the absolute increase in labor. The company has announced plans to reorient payroll hours towards more efficient jobs, policies that are in keeping with self-checkout technologies.

Employee wage increases

A consequence of an improving US economy and labor market is rising wages and higher labor costs. This dynamic is becoming increasingly evident in the retail industry along with other labor intensive industries such as food service. While tighter labor markets are cyclical in nature, retail also faces a structural issue of increasing pressure for minimum wage hikes at the local and state levels. This comes amidst longer-term labor trends including an aging workforce and potential changes in immigration (which are beyond the focus of this report).

Wal-Mart announced in February 2015 that it was investing \$1 billion in its U.S. labor force for pay and training initiatives

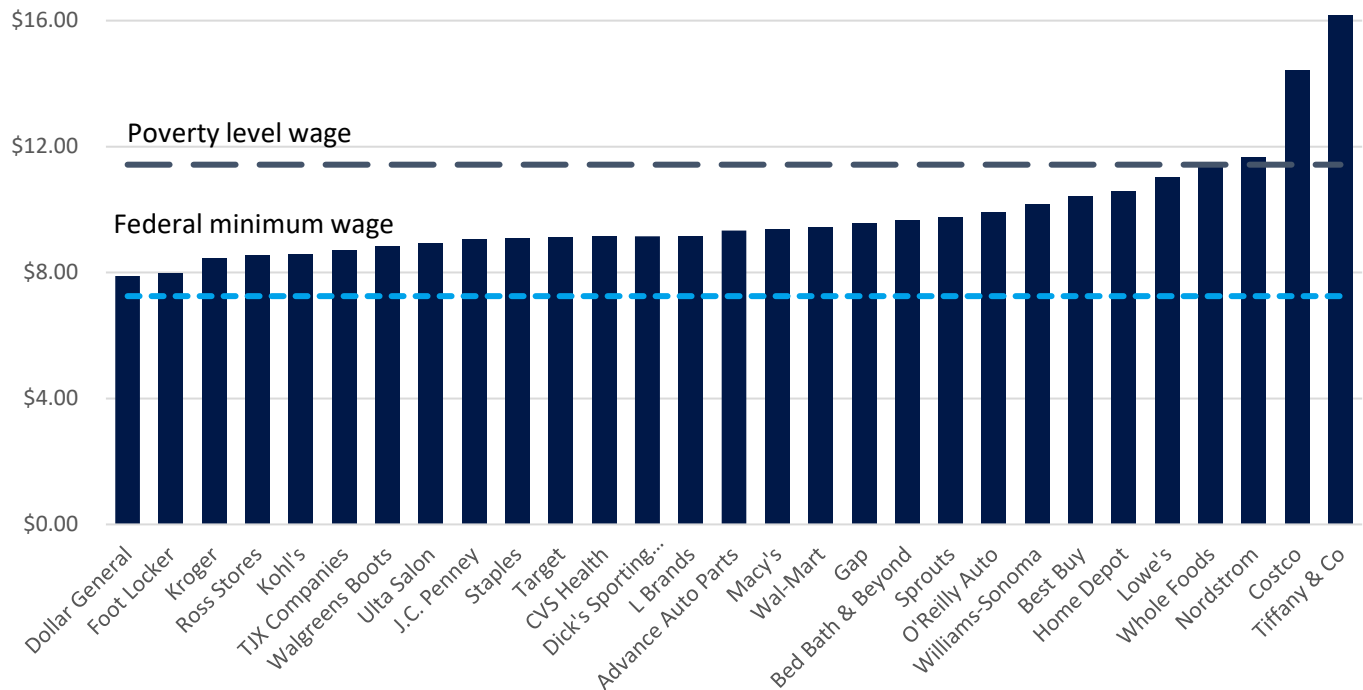
Wal-Mart announced in February 2015 that it was investing \$1 billion in its US labor force for pay and training initiatives. Wal-Mart's action triggered a series of wage hikes across the retail sector, with other retailers such as Target and TJ Maxx following suit shortly thereafter. Along with minimum wage hikes, retailers must also address the "ripple effect," which is the pressure to maintain a consistent wage gap between entry-level employees and more seasoned staff. As the base wage rises, this puts upward pressure across the entire store-level employee base.

To assess which retailers might experience the greatest burden from wage pressure, two factors were considered:

- Current compensation structure of each company; and
- Company store exposure to high wage pressure states.

First, Glassdoor data was used to compare hourly wage rates relative to peers. The methodology entailed identifying the two most common entry-level positions recorded on Glassdoor for each company and calculating weighted average hourly compensation for them. The results are shown in Figure 30, which also indicates the federal minimum wage and a poverty wage. The federal minimum wage is \$7.25 an hour, and the hourly poverty wage is calculated from the annual compensation for a family of four to be considered in poverty by the US Department of Health and Human Services.

Figure 30: Retail sales associate and cashier average hourly compensation



Source: Glassdoor, US Department of Health and Human Services, US Department of Labor, Cornerstone Capital Group

*Amazon is excluded because it does not employ sales associates and cashiers

Three key observations are drawn from the data.

- Only four companies, Costco, Tiffany, Nordstrom and Whole Foods, pay at or above the poverty level wage. The fact that so many companies do not pay above the poverty level aligns with the earlier observation that retail workers in general are disproportionately represented among recipients of public assistance.
- Retailers on the higher end of the wage scale require sales associates to have specialized skill or a greater level of training. For instance, the home improvement (Home Depot and Lowe's), auto parts (O'Reilly Auto Parts), and consumer electronics (Best Buy) retailers need employees with knowledge of their respective fields so they can provide a higher level of service to customers. On the other end of the spectrum are those retailers that require less skill and training, or simply an innate ability to perform simple tasks. To this end, apparel retailers and dollar stores pay some of the lowest wages on average.

Tiffany & Co, Nordstrom, Whole Foods, and Williams-Sonoma are focused on delivering high-touch service and a unique customer experience

- Retailers on the higher end of the wage scale are targeting an above-average income demographic and, in many instances, are seeking to create a shopping experience. Tiffany & Co, Nordstrom, Whole Foods, and Williams-Sonoma are focused on delivering high-touch service and a unique customer experience. On the other hand, the off-price retailers (TJX Companies, Ross Stores) primarily offer a self-service format. This isn't to say customer service isn't a part of the business, but these companies do not differentiate themselves from traditional retailers based on customer service. Instead they provide opportunistic buying of quality, brand-name merchandise.

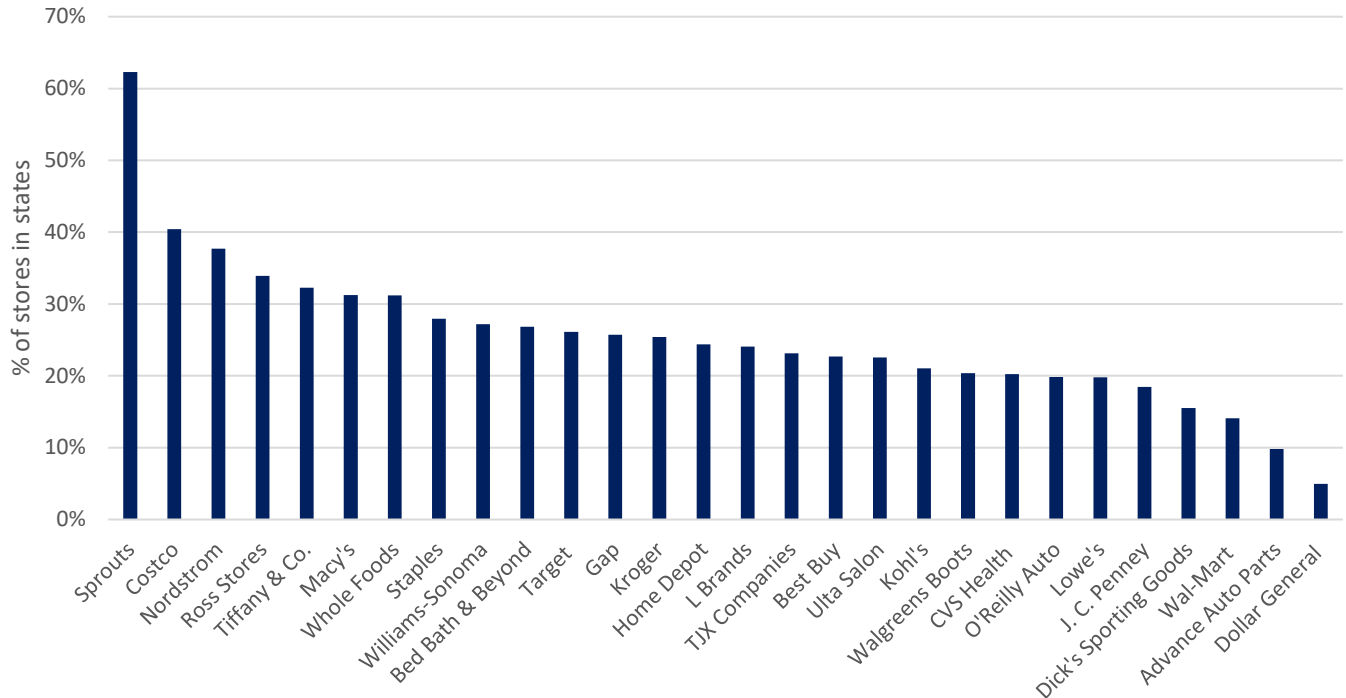
Next, the geographic exposure of each retailer to states experiencing high wage pressure was analyzed. The current and future minimum wages was determined for each state based on announced wage changes through 2020. Then, the store base mix by state for each retailer was analyzed. Finally, these two metrics were cross-referenced.

The analysis shows that five states—California, New York, Arizona, Washington and Colorado—account for 73% of the population-weighted minimum wage increase through 2020. For instance, California's minimum wage is set to grow at a 6.8% compounded annual growth rate from 2016-2020. With California's population representing ~12% of the total US population, the state accounts for ~0.8% of the national population-weighted minimum wage increase. The local and municipal minimum wage increases are not accounted for due to the complexity involved. This means the population-weighted wage increase is slightly underestimated because cities are not factored in, even if they have announced minimum wage increases that outpace their respective states (e.g., New York City).

The results of the analysis are shown in Figure 31.

Employee recruitment, retention and training

Most retail companies discuss how the future of retail entails highly motivated and engaged sales associates using technology to better serve customers. Ensuring that employees remain engaged and motivated is, therefore, a key measure of success. However, as automation changes the roles and responsibilities of workers within stores and hollows out in-store roles into low-paid innate ability and highly paid, highly trained workers, companies may find it more difficult to recruit and retain an appropriate workforce.

Figure 31: Retailers - Percentage of stores exposed to top 5 wage-increase states

Source: Company reports, Cornerstone Capital Group

*Amazon is excluded as it does not have retail stores and Footlocker does not disclose store location by state

Metrics such as employee satisfaction and turnover enable investors to understand how a company is managing its workforce—particularly as automation technologies are rolled out. Currently, none of the companies in the list report employee turnover or satisfaction metrics. Office supply retailer Staples reported turnover up until 2014 (Figure 32). Employee turnover increased from 36% to 46.4% from 2011 to 2014.

Figure 32: Staples employee turnover

| (%) | 2015 | 2014 | 2013 | 2012 | 2011 |
|---------------------------------------|------|------|------|------|------|
| Average annual employee turnover rate | | 46.4 | 43 | 40 | 36 |
| Salaried associate turnover rate | | | 13 | 13 | 14 |
| Hourly associate turnover rate | | | 49 | 46 | 42 |

Source: Company reports, Cornerstone Capital Group

Understanding how employee satisfaction or turnover is changing as automation technologies are implemented enables investors to consider the trade-offs. Effectively, automation that increases turnover and decreases satisfaction is

A proxy for considering recruitment and retention issues caused by automation is considering how a company is investing in employee training and career development

actively undermining the stated aim of brick-and-mortar retailers to improve the quality of in-store service. The fact that companies do not report turnover is a significant hindrance to investors seeking to understand how a company is managing its human capital.

A proxy for considering recruitment and retention issues caused by automation is considering how a company is investing in employee training and career development. Technologies present on the store floor will change significantly over the next decade and, therefore, the types of training and career development should enable workers to progress with this technology.

The impact of training goes beyond recruitment and retention to developing a workforce that can use the emerging technologies to better serve customers. In the absence of appropriate training, retailers will face a similar scenario to the high-tech manufacturing industry in the US. In 2015, Deloitte warned that the US faced a two million worker shortage for manufacturing jobs¹. These are jobs that require an advanced understanding of technology, which is better provided through tertiary education programs.

Therefore, the companies that provide most workers with the following programs were identified:

- Tuition reimbursement; and
- Technical and programming training.

A subset of the publicly announced training and career development initiatives is shown in Figure 33. Amazon, Lowe's, Gap and Wal-Mart provide tuition reimbursement programs while Best Buy has announced incentives for completing professional development programs. Automotive retailers Advanced Auto Parts and O'Reilly Automotive also provide technical programs that help employees achieve certification from the National Institute for Automotive Service Excellence.

If retailers truly intend to benefit from technologies, they will need to build their own workforces. Companies that do so are likely to be better positioned to reap the benefits of new technologies and to manage workforce recruitment and retention issues.

¹ <https://www2.deloitte.com/us/en/pages/about-deloitte/articles/press-releases/skills-gap-public-perceptions.html>

Figure 33: Publicly disclosed tuition reimbursement and incentivized training programs

| Company Name | Publicly Available Information on Career Development-related Training |
|----------------------------|---|
| Advance Auto Parts | Provides technical programs to help employees achieve certification by the National Institute for Automotive Service Excellence. |
| Amazon | 'Career Choice' – offers up to 95% of tuition reimbursement for either job-related training or professional courses not applicable in retail business line (such as mechanic or nursing jobs). Another example is the company's "Pay to Quit" program offering USD 2,000 – 5,000 (depending on tenure) "Pay to Quit" resignation fund for employees that decide to pursue other career options. |
| Best Buy | Best Buy provides online courses for its employees, who are paid for their time. Additionally, employees are rewarded with event tickets, merchandise, gift cards and travel for attaining different levels of training as part of the company's professional development program. |
| Gap | Gap offers tuition reimbursement for approved work-related courses for full-time employees. |
| Lowe's | In addition to tuition reimbursement for full-time employees, the company also has multiple leadership training programs for employees at different levels of the organization. |
| O'Reilly Automotive | Provides technical programs to help employees achieve certification by the National Institute for Automotive Service Excellence |
| Staples | An annual scholarship program for external training, and offer discounts on classes at partner universities. |
| Target | Target provides professional training on various aspects of its operation (e.g., retail, logistics, and project management) and offers tuition reimbursement of up to USD 5,000 for its full-time employees. The company's career development programs and training opportunities have (as of January 2015) been further strengthened by the introduction of a yearlong management training program for store employees who show potential in developing managerial skills. |
| Wal-Mart | Wal-Mart makes some training programs available to part-time workers, including a 15% tuition grant at American Public University which allows employees to earn degrees online. |

Source: Company reports, Cornerstone Capital Group

Public perception and social policies

The final investment implication identified is the public's perception of the company as determined by 1) the importance it appears to place on labor issues and 2) its social policies.

Employee practices were more important in retail than in any other sector included in the survey except lodging and recreation

The Consumers Want Impact¹ survey developed by Mission Measurement surveyed 24,000+ people to identify and measure the sustainability factors that are important to consumers. Mission Measurement's survey considered consumer-facing industries, sectors and sub-sectors as well as specific companies. A clear takeaway was that the most important sustainability factor to consumers in the retail industry was how a company treated its employees and, within that factor, whether the company paid a fair wage. Employee practices were more important in retail than in any other sector included in the survey except lodging and recreation². Within retail sub-sectors, consumers viewed fair

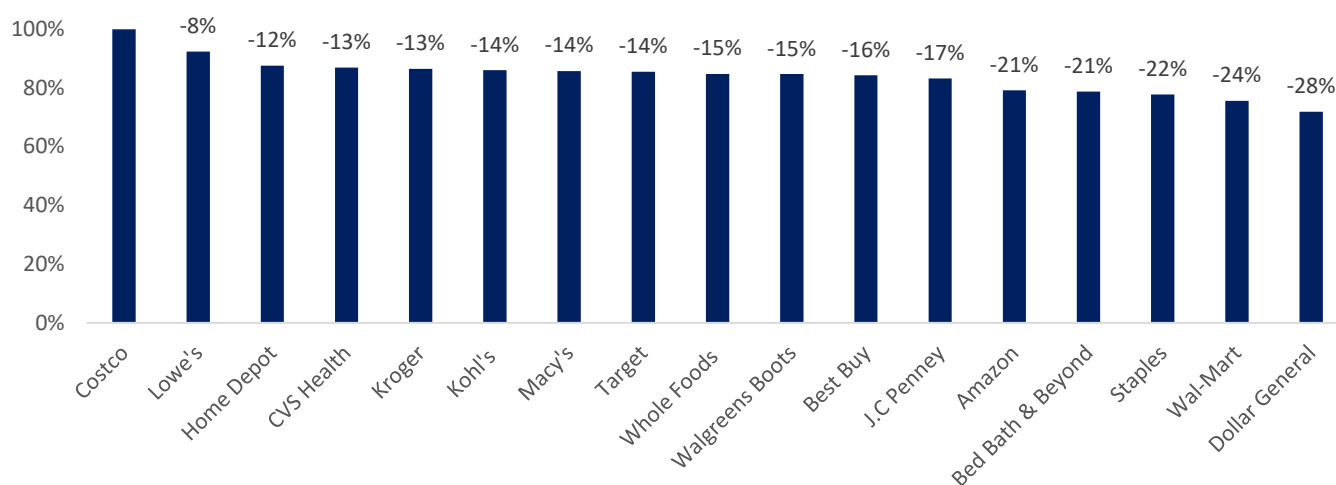
¹ <https://www.consumerswantimpact.com/>

² Industries included airlines, autos, food, consumer finance

wages as materially more influential on their purchasing practices in groceries and retail stores compared to pharmacies and online stores.

At the company level, the Consumers Want Impact survey reveals the current consumer perception of companies' performance on sustainability issues relative to peers. Of the companies evaluated in this report, 18 of the 30 are covered by Mission Measurement's survey. The leader is Costco, and it serves as a baseline to compare consumer perception of employee practices for the rest of the companies covered in this survey (Figure 34).

Figure 34: Consumer perceptions of labor practices relative to leading company, Costco



Source: Mission Measurement, Cornerstone Capital Group

The analysis shows that retailers such as a Dollar General, Wal-Mart and Staples are perceived by consumers as treating their employees significantly worse than Costco. Lowe's is the closest to Costco in how they are perceived to treat their employees.

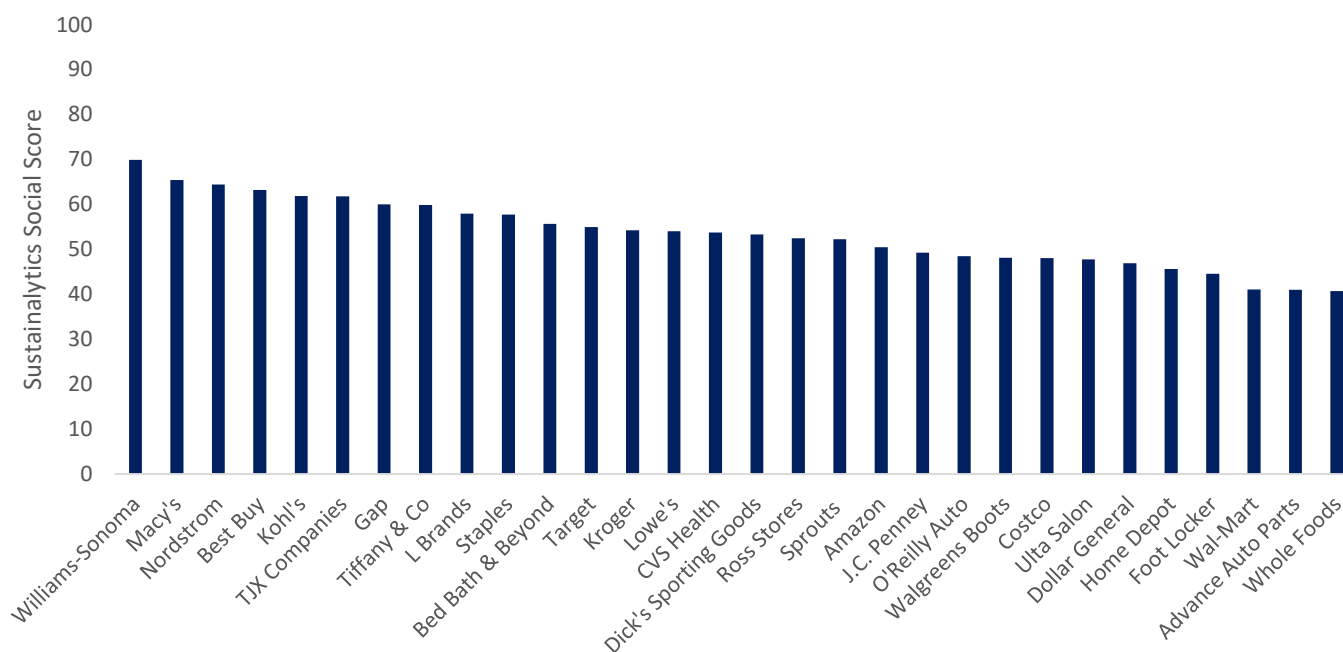
Companies that are perceived more positively are likely to be managing employee issues well and are well-placed to execute their strategies

Strong performance on employee practices is powerful, as the data indicates it is a material issue for consumers. Companies that perceived more positively are likely to be managing employee issues well and are well-placed to execute their strategies. Also, improving the treatment of workers actually alters consumer's purchasing behavior towards the company.

The second factor identified is the existence of social policies that are associated with strong social performance as defined by sustainability ratings provider, Sustainalytics. Companies that are rated as having strong social policies and less social controversies such as lawsuits and strikes are viewed as being able to manage social issues better. Figure 35 shows the scores for the list of companies.

Leaders include Williams-Sonoma, Macy's, Nordstrom, and Best Buy due to the relatively low level of controversies relating to workers and customers. Laggards include Wal-Mart, Advance Auto Parts and Whole Foods, which have experienced controversies and have not disclosed policies on worker rights and supply chain management.

Figure 35: Sustainalytics Social Scores



Source: Sustainalytics, Cornerstone Capital Group

Company assessment

There is a dearth of information relating to labor workplace practices and costs in the retail sector

Companies that are not adequately attentive to the issues surrounding the automation of labor face significant consequences, as established in previous sections. However, there is a dearth of information relating to labor workplace practices and costs in the retail sector. Companies do not report employee turnover or satisfaction, labor impacts of technology initiatives, or labor as a percentage of SG&A. This lack of information presents a challenge in analyzing automation and labor.

Therefore, the assessment framework focuses on public disclosures, identified risks, and external ratings groups to interpret the companies' positions regarding automation and labor. This analysis offers a starting point for direct company engagement and further investor-specific analysis.

To supplement disclosure found in company filings (annual reports, earnings transcripts, sustainability reports, websites, etc.), conversations were had with investor relations teams and industry consultants. Each company was reviewed with respect to the following criteria:

Companies exposed to states with upcoming minimum wage increases may pursue automation more rapidly to offset labor cost headwinds

- **Public discussion of automation initiatives** – Public disclosure and discussion of technology initiatives including discussion on impacts to labor suggests that a company is appropriately attentive to the issue.
- **Changing labor profile** – A changing labor profile can be indicative of a company's future management of its labor force, as well as its relationship with its consumer base. The framework provides an indication of companies' positioning towards an experience or convenience consumer strategy. The ability of a company to execute its strategy will be impacted by its exposure to minimum wage risk, current investment in labor, and public perception.
- **Minimum wage risk exposure and government subsidization** – The research suggests that minimum wage increases prompt automation. Companies exposed to states with upcoming minimum wage increases may pursue automation more rapidly to offset labor cost headwinds. In addition, retailers that pay wages below the poverty line may be perceived by stakeholders as taking advantage of government support schemes. Growing stakeholder concern could lead to public campaigns and calls for minimum wage increases.
- **Investing in labor to support the strategy** – Based on the analysis, retailers that invest in training and development programs are likely to be developing a motivated and skilled employee base that will support technology initiatives. Public announcements of tuition support and training that go beyond existing day-to-day job development signal such an intention.
- **Public perception of employee practices, social policies, and prior reputation** – As indicated by Mission Measurement data, companies with strong consumer perception of employee treatment and fair wages may face less scrutiny should they have to reduce their labor force. Additionally, a high social score from Sustainalytics shows an ability to manage social issues, which could protect companies from being perceived negatively by stakeholders.

Results

The results of the assessment in Appendix A are summarized below:

Approximately 35% of the assessed retailers are positioning towards an experience strategy

- No retailers were observed pursuing a clear convenience strategy¹. Approximately 35% of the assessed retailers are positioning towards an experience strategy. Of concern are the remaining companies which may lack a clear strategy or those shifting strategy without appropriately considering the labor impact.
- On average, retail companies are moderately exposed to state minimum wage increases, although *Sprout's* is significantly more exposed than others. However, only four companies pay their cashiers and associates a wage above the federal poverty level supporting a family of four. This may expose retailers to public criticism if the industry is perceived as taking advantage of government support schemes.
- *Amazon*, *Best Buy*, *Lowe's*, *Staples*, *Target* and *Wal-Mart* stand out as investing in their labor, which is consistent with their strong ratings from employees. These companies offer tuition reimbursement, which prepares their current labor force for future career advancement and economic mobility.
- *Dollar General* and *Wal-Mart* receive the most negative ratings on social issues and reputation from the data sources utilized, while *Costco* looks most favorable. *Amazon* and *Whole Foods* are noteworthy in scoring below average, which seems to contradict their strong brand values.
- *Wal-Mart's* technology disclosure and tuition reimbursement programs could signal the company's acknowledgement of an evolving retail industry. The company may be attempting to best position and help its labor force during this transition. That said, the sheer size of *Wal-Mart* places it at higher risk for public criticism should the company downsize its labor force.

We view Wal-Mart's technology disclosure and tuition reimbursement programs as signaling the company's acknowledgement of an evolving retail industry

¹ AmazonGo is an example of a convenience strategy but is not included in this analysis because it is still in beta phase.

Research reveals a lack of discussion around this topic – a concerning revelation given the magnitude of the potential impact on the labor force

Appendix A: Shareholder engagement questions

The research highlights wage pressure and “The Amazon Effect” as key drivers of retail automation. Historical precedents, academic research, and advancements in technology also point to an increasing opportunity for retailers to automate labor. Based on the assessment framework, the potential implications were identified for investors as well as leaders and laggards within the retail industry. Importantly, the research reveals a lack of discussion around this topic—a concerning revelation given the magnitude of the potential impact on the labor force. Company announcements of store closures, labor force cuts, and technological investments are among the largest in recent memory. Investors should focus on key questions to better understand how a company is thinking about automation and labor from a strategic standpoint.

To that end, a set of questions for investors to include in their engagement with retailers on this issue was developed.

- What is the long-term strategy of the retail company and how does labor policy inform or drive this strategy?
- How does technology catalyze business and labor strategy?
- Given its current wage structure, how does the company consider potential minimum wage increases?
- How will the workforce evolve to achieve the long-term strategy? What metrics are used to monitor the labor strategy?
- How are labor stakeholders engaged in development of the long-term strategy?
- What management challenges are created by the “hollowing-out” of labor?
- What are expectations for employee turnover?
- Where does responsibility lie in the organization for labor strategy? To what extent does this occur at the store level or with Board involvement?

Appendix B: Company assessments

| | Labor Profile | Technology | Minimum Wage and Poverty Level Exposure | | Labor Investment | | Social Issues and Reputation | |
|-----------------------|--|---|---|--|--|---|--|--|
| | Strategy Implied by Labor Cost and Employee Change (more/ fewer) | Tech Initiative Disclosure | Minimum Wage Exposure (% of stores) | Hourly Wages Relative to Poverty Level | Disclosed Reimbursement or Training Programs | Employee Rating from Glassdoor | Sustainalytics Social Rating | Mission Measurement Score (Relative to Top) |
| | | | Green = 20% or less Yellow = 21% to 30% Red = 31% or more | Green = within 10% Yellow = within 20% Red = below | Green = Offers Red = no disclosure | Green = top 1/3 Yellow = middle 1/3 Red = bottom 1/3 Arrow = past 2 yrs' chg | Green = 60 + Yellow = 50 - 59 Red = 49 and below | Green = within 10% Yellow = 10% to 20% Red = >20% away |
| Advance Auto Parts | Unclear/fewer | Not disclosed | | | | ↑ | | N/A |
| Amazon | N/A | Sensor-based checkout; smart shelves; robots | N/A | N/A | | ↓ | | |
| Bed Bath & Beyond | Unclear/more | Digital kiosks | | | | ↑ | | |
| Best Buy | Unclear/fewer | Not disclosed | | | | ↑ | | |
| Costco | Experience | Not disclosed | | | | ↔ | | |
| CVS Health | Unclear/fewer | Self-checkout; proximity beacons | | | | ↑ | | |
| Dick's Sporting Goods | Experience | Not disclosed | | | | ↑ | | N/A |
| Dollar General | Unclear/fewer | Not disclosed | | | | ↑ | | |
| Foot Locker | Experience | Labor & mgmt systems | N/A | | | ↓ | | N/A |
| Gap | Experience | Not disclosed | | | | ↔ | | |
| Home Depot | Unclear/more | Self-checkout; digital kiosks; labor & mgmt systems | | | | ↑ | | |
| J. C. Penney | Unclear/fewer | Proximity beacons | | | | ↔ | | |
| Kohl's | Unclear/fewer | RFID | | | | ↑ | | |
| Kroger | Experience | Labor & mgmt systems; smart price tags | | | | ↑ | | |
| L Brands | Unclear/fewer | Not disclosed | | | | ↑ | | N/A |
| Lowe's | Experience | Self-checkout; robots; labor & mgmt systems | | | | ↔ | | |

| | Labor Profile | Technology | Minimum Wage and Poverty Level Exposure | | Labor Investment | | Social Issues and Reputation | |
|-----------------|--|--|---|--|--|---|---|--|
| | Strategy Implied by Labor Cost and Employee Change (more/ fewer) | Tech Initiative Disclosure | Minimum Wage Exposure (% of stores) | Hourly Wages Relative to Poverty Level | Disclosed Reimbursement or Training Programs | Employee Rating from Glassdoor | Sustainalytics Social Rating | Mission Measurement Score (Relative to Top) |
| | | | Green = 20% or less Yellow = 21% to 30% Red = 31% or more | Green = within 10% Yellow = within 20% Red = below | Green = Offers Red = no disclosure | Green = top 1/3 Yellow = middle 1/3 Red = bottom 1/3 Arrow = past 2 yrs' chg | Green = 60+ Yellow = 50 - 59 Red = 49 and below | Green = within 10% Yellow = 10% to 20% Red = >20% away |
| Macy's | Unclear/more | Mobile devices; digital kiosks; proximity beacons; RFID | | | | ↑ | | |
| Nordstrom | Experience | Proximity beacons | | | | ↔ | | N/A |
| O'Reilly Auto | Unclear/more | Not disclosed | | | | ↑ | | N/A |
| Ross Stores | Unclear/more | Labor & mgmt systems | | | | ↑ | | N/A |
| Sprouts | Unclear/fewer | Not disclosed | | | | ↑ | | N/A |
| Staples | N/A | Not disclosed | | | | ↑ | | |
| Target | Unclear/fewer | Self-checkout; proximity beacons; RFID in store & warehouse; smart price tags | | | | ↑ | | |
| Tiffany & Co | Experience | Not disclosed | | | | ↑ | | N/A |
| TJX Companies | Experience | Not disclosed | | | | ↑ | | N/A |
| Ulta Salon | Experience | Not disclosed | | | | ↑ | | N/A |
| Walgreens Boots | Unclear/fewer | Digital kiosks | | | | ↑ | | |
| Wal-Mart | Unclear/fewer | Digital kiosks; robots; proximity beacons; self-checkout; labor and mgmt systems | | | | ↑ | | |
| Whole Foods | Experience | Digital kiosks | | | | ↓ | | |
| Williams-Sonoma | Experience | Digital kiosks | | | | ↔ | | N/A |



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