Global Thematic Research

The Economics of Automation: Quick Serve Restaurant Industry

- **Increasing cost pressure.** Labor and food represent a significant portion of restaurants’ cost structure. While these inputs have been relatively predictable in the past, the twin threats of rising wages and increasingly volatile food prices suggest a more challenging environment ahead. It’s not clear that cost inflation can be consistently offset by raising menu prices, so companies are considering new strategies to protect margins.

- **Is automating an option?** The foodservice industry has been a relative laggard in adopting automation, a factor which may help explain the sector’s modest productivity gains. But converging technologies are yielding faster, cheaper, and more dynamic applications in foodservice. We examine these applications and conduct proprietary analysis to determine their potential impact – both in timing and scale.

- **An acceleration is ahead.** The key reasons for automating are to drive sales growth, to reduce labor costs, or a combination thereof. Our assessment suggests that automation is currently complementing labor, particularly in the ordering process. Should wage pressure intensify, however, the focus will likely shift and companies will look to replace labor.

- **Investment implications.** From an industry perspective, we believe automation will have a positive impact, both by driving sales growth and managing labor costs. All else equal, companies that are focused on integrating automation technology with an already well-compensated and productive labor force are less vulnerable to rising wages.

*Automation Applications Impacting Food Service*

*Source: Cornerstone Capital Group*
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*We thank Juan Martinez at Profitality for his contributions to this report.*
Executive Summary

The quick-serve restaurant industry is undergoing a transformation as it addresses the risk of increasing cost pressures. It's unclear to what extent companies can offset cost inflation by raising menu prices. Meanwhile, converging technologies are creating opportunities to automate foodservice tasks.

In this report, we assess the quick-service restaurant segment's current and potential automation initiatives in the context of cost management (including human capital) and profitability. We conclude that automation will have a positive impact on operating margins both by driving sales growth and keeping labor costs in check. Moreover, those companies that focus on integrating automation technology with an already well-compensated and productive labor force are less vulnerable to rising wages.

Key Questions

Which Factors Are Driving the Automation Conversation?

We identify three factors that create the potential for rapidly escalating costs. First, income distribution trends are increasingly a point of social and political contention, as are the calls for a higher federal minimum wage. Next, restaurant operators broadly agree that the impact of the Affordable Care Act (ACA) is uncertain, making it difficult to forecast health care costs. Finally, the three Cs—corn fuel, China, and climate change—have the industry questioning whether the pronounced recent spike in food price volatility is structural in nature.

With labor and food costs representing 60-70% of industry revenues, these three factors present a significant threat to an industry operating on already slim profit margins.

Can Restaurants Raise Prices to Offset Cost Pressure?

Raising prices to offset food costs is an option, although the success of this strategy is contingent on the nature of food inflation and the overall level of inflation in the economy. Furthermore, research studies on the price elasticity of demand for fast-food arrive at conflicting conclusions, reflecting their extreme sensitivity to a few critical factors, such as the assumed average wage rate of workers.

Taken together, it’s not clear that raising prices to offset cost pressure is a sustainable strategy. As a precautionary measure, we believe the industry will investigate alternative strategies, and that automation will be one avenue of inquiry.

Can Restaurants Automate to Offset Cost Pressure?

We identify seven automation applications that will impact the quick-serve industry. Counter to conventional wisdom, our research indicates that automation is currently complementing labor, particularly in the ordering process. Should wage pressure intensify, however, the focus will likely shift and companies will seek to replace labor.

Our proprietary analysis on kiosks supports this notion. Today, kiosks are delivering revenue benefits to operators by maximizing throughput, increasing average check amount, and enhancing customer loyalty. However, kiosks will be viewed as a potential substitute for labor if operators are faced with materially higher labor costs.
What Are the Investment Implications?

We believe automation will have a positive impact on the industry by driving sales growth and keeping labor costs in check. In assessing the impact of increasing wage pressure on companies, we consider the following:

- **Labor productivity and cost structure** – Companies with higher productivity (average sales per employee) and lower labor costs (labor as a percentage of revenues) will be impacted to a lesser extent by rising wages.

- **Current compensation policy** – Companies that offer employees competitive compensation are less exposed to regulatory-driven wage hikes. To assess this, we compare cashiers’ weighted average hourly rates relative to peers.

- **Technology initiatives** – In order to assess a company’s propensity to automate, we identify technologies that are being considered or have been implemented.

All else equal, companies that employ a low-cost, inefficient labor force and underinvest in automation technology are most at risk in a rising wage environment. In contrast, companies that are focused on integrating automation technology with a well-compensated, productive labor force will have more flexibility in addressing this scenario. This additional flexibility is critical because companies can redeploy capital that would otherwise be spent on labor into other strategic initiatives such as improving food quality.
Which Factors Are Driving the Automation Conversation?

Income Distribution Trends

Income distribution trends have increasingly become a mainstream discussion topic since the Great Recession of 2008-2009. For the third year in a row, in 2014, the World Economic Forum identified an increasing income gap as one of the most significant risks facing the global economy. The IMF, S&P, and OECD have also issued warnings about this increasing disparity. We address this issue more broadly in our recently published report, Income Inequality: Market Mechanism or Market Failure?

There are an estimated 4.1 million fast food workers in the U.S. Quick Service Restaurant (QSR) industry*, of which 3.65 million (~89%) are front-line employees (i.e. cashiers, cooks, crew). Employees in front-line occupations are paid a median wage of $8.94/hour† versus the Federal minimum wage of $7.25/hour. If employed full time, this median wage rate translates into $17,880 per year ($8.94 × 40 hours/week × 50 weeks/year). Furthermore, 70% of fast food employees are over the age of 20 and the median age is about 28, thus challenging the common perception that quick-serve employees are generally teenagers.

Equally important to this topic is the extent to which minimum wage has lagged broad income growth, especially relative to the higher income brackets. (Exhibit 3)

A recent study by UC Berkeley Labor Center and University of Illinois at Urbana-Champaign (funded by Fast Food Forward, an SEIU-funded coalition working to unionize NYC fast-food workers with a secondary goal of gaining a $15 minimum wage) brought more attention to this topic, as it found that the combination of low wages and benefits in the quick-serve industry results in many families of QSR employees relying on taxpayer-funded safety net

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* In this report, we refer to QSRs which include quick-serve and fast casual (FC) restaurants.
† Estimates for fast food wages range depending upon source and employee categorization method. Most estimates we’ve observed are between $8.69-$9.00/hour.
The study asserts that 52% of QSR workers rely on taxpayer-funded public assistance programs, compared with 25% of the workforce as a whole. It also estimates the cost of public assistance to families of workers in the industry at nearly $7 billion per year. Critics of the quick-serve industry suggest that the government is essentially subsidizing corporate profits because the employees depend on taxpayer assistance in order to sustain a living.

The Service Employees International Union (SEIU) has called for, as part of a broader effort to unionize QSRs, workers to receive living wages, implying an increase to $15/hour. Although their demands have not yet been met, pressure on QSRs to increase wages doesn’t appear likely to diminish in the near future.
Uncertainty Surrounding Healthcare Costs

There’s no shortage of opinions when it comes to the potential labor market effects of the Affordable Care Act (ACA). The topic is socially and politically divisive, but many restaurant operators agree that there’s a high level of uncertainty when it comes to implementing the ACA and forecasting health care costs, especially after 2016 when the major provisions have taken full effect. For the purpose of this report, we highlight the key elements of the ACA:

1. The “Over 50 Rule” requires any business with 50 or more employees to provide insurance coverage to all full-time employees
2. The “Over 30 Rule” defines a full-time employee as an employee working more than 30 hours per week

These rules are particularly important because there are questions as to whether companies may try to limit exposure to the ACA. For instance, a company may lay off employees to stay below the 50-employee threshold and may cut hours of full-time workers to remain below the 30-hour threshold.

The National Restaurant Association says the ACA will have a “particularly profound effect on restaurants” due to the fact they are “labor-intensive, with low profits per employee, significant numbers of part-time employees and a young and mobile workforce.”

On the other hand, the Urban Institute conducted a study in 2012 that modeled the effect of ACA’s various provisions on employer behavior had the law been in effect. The study found that ACA would have only resulted in a 2.2% increase in aggregate employer spending, though the results varied depending on firm size. With this in mind, we must acknowledge the broad scope of this study, and recognize that impacts of the ACA will vary across industries.

To further complicate any cost-benefit analysis, one must address other factors such as whether and to what extent providing health insurance to previously uninsured employees improves productivity and reduces turnover.

### Exhibit 6: Changes in Aggregate Employer Spending Due to the ACA (simulated as if ACA were fully implemented in 2012)

<table>
<thead>
<tr>
<th></th>
<th>Without Reform (in billions)</th>
<th>ACA (in billions)</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Employer Spending</strong></td>
<td>553.4</td>
<td>565.8</td>
<td>2.2%</td>
</tr>
<tr>
<td>Employer Premium Contributions</td>
<td>553.4</td>
<td>566.2</td>
<td>2.3%</td>
</tr>
<tr>
<td>Employer Subsidies</td>
<td>0.0</td>
<td>-4.0</td>
<td></td>
</tr>
<tr>
<td>Employer Assessments</td>
<td>0.0</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td><strong>Small Firms (100 or Fewer Employees)</strong></td>
<td>116.5</td>
<td>114.8</td>
<td>-1.4%</td>
</tr>
<tr>
<td>Employer Premium Contributions</td>
<td>116.5</td>
<td>118.5</td>
<td>1.8%</td>
</tr>
<tr>
<td>Employer Subsidies</td>
<td>0.0</td>
<td>-4.0</td>
<td></td>
</tr>
<tr>
<td>Employer Assessments</td>
<td>0.0</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td><strong>Mid-size Firms (101-1,000 Employees)</strong></td>
<td>84.5</td>
<td>92.5</td>
<td>9.5%</td>
</tr>
<tr>
<td>Employer Premium Contributions</td>
<td>84.5</td>
<td>89.7</td>
<td>6.2%</td>
</tr>
<tr>
<td>Employer Subsidies</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Employer Assessments</td>
<td>0.0</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td><strong>Large Firms (More than 1,000 Employees)</strong></td>
<td>278.6</td>
<td>290.4</td>
<td>4.3%</td>
</tr>
<tr>
<td>Employer Premium Contributions</td>
<td>278.7</td>
<td>289.8</td>
<td>4.0%</td>
</tr>
<tr>
<td>Employer Subsidies</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Employer Assessments</td>
<td>0.0</td>
<td>0.7</td>
<td></td>
</tr>
</tbody>
</table>

* Employer spending on persons reporting ESI coverage in households where no policyholder is identified are included in the totals but not in the firm size groups.

**Source:** Urban Institute analysis, HIPSM 2012
In addition to conversations with restaurant operators, we find it informative to scan the landscape with respect to ACA ramifications:

- In 2012, McDonald’s (ticker: MCD) CFO Peter Bensen estimated that each restaurant would incur between $10,000-30,000 in added annual costs, equating to $140-420 million across its stores (company-owned and franchised).

- Steve Hare of Wendy’s (WEN) initially estimated that each of Wendy’s 6,000 stores would incur $25,000 in added annual costs, equating to $150 million across its stores.
  - In March 2013, Hare said that they overestimated costs and that each store would incur about $5,000 in added annual costs (80% below the original estimate). He said they overestimated because they now believe many employees will forgo the health care plan offered by Wendy’s.

- At an investor conference in March 2013, Dunkin Donuts (DNKN) CEO said the costs “are not as high as some people have said….we feel that without increasing prices, we can mitigate those costs very easily.”

- From Chipotle’s (CMG) 2013 Annual Report – Under the comprehensive U.S. health care reform law enacted in 2010, the [ACA], changes that become effective in 2014, and especially the employer mandate and employer penalties that are schedule to become effective in 2015, may increase our labor costs significantly….The costs and other effects of these new healthcare requirements cannot be determined with certainty, but they may have a material adverse effect on our financial and operating results.

While some of the previously dire cost estimates are being adjusted downward, we believe the uncertainty around healthcare costs is still a significant issue that’s clouding financial and operating projections.

**Volatile Food Prices**

The Food and Agriculture Organization (FAO) Food Price Index, a measure of the monthly change in international prices of a basket of food commodities, shows that nominal and real prices remain elevated relative to historical levels. The spike over the last decade is largely attributable to low stock levels that proved inadequate in cushioning the impact of supply or demand shocks. In response to these tight conditions, production increased and

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**Exhibit 7: FAO Food Price Index in Nominal and Real Terms**

<table>
<thead>
<tr>
<th>Year</th>
<th>Nominal</th>
<th>Real</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2004=100</td>
<td>250</td>
<td>200</td>
</tr>
<tr>
<td>2005</td>
<td>220</td>
<td>180</td>
</tr>
<tr>
<td>2006</td>
<td>200</td>
<td>160</td>
</tr>
<tr>
<td>2007</td>
<td>180</td>
<td>140</td>
</tr>
<tr>
<td>2008</td>
<td>160</td>
<td>120</td>
</tr>
<tr>
<td>2009</td>
<td>140</td>
<td>100</td>
</tr>
<tr>
<td>2010</td>
<td>120</td>
<td>80</td>
</tr>
<tr>
<td>2011</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>2012</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>2013</td>
<td>60</td>
<td>20</td>
</tr>
<tr>
<td>2014</td>
<td>40</td>
<td>0</td>
</tr>
</tbody>
</table>

*The real price index is nominal price index deflated by the World Bank Manufacturers Unit Value Index (MUV).*

**Source:** Food and Agricultural Organization of the United Nations
stocks-to-use ratios improved, leading food prices to partially retrace their gains (Exhibit 7)

Despite the recent pullback, the pronounced food price volatility seen over the last several years has taken a toll on the market. According to the National Restaurant Association, rising food costs remain the top challenge for restaurant operators, with three of four operators reporting higher year-over-year food costs. This may be counterintuitive given the recent declines seen in the FAO Food Price Index, but this index is inherently broad and prices in specific categories have continued to press higher.

An increase in food and beverage costs does not necessarily equate to lower restaurant profits; in fact, modest cost inflation (2-3%) can have a favorable impact on earnings if operators pass these increases through in the form of higher menu prices. To illustrate, if food and beverage costs increase 5% (typically they constitute approximately 30% of sales), so long as operators increase menu prices by more than 1.5%, earnings can grow despite lower margins.

With this in mind, while the overall level of food prices is an important factor, perhaps even more significant is the volatility of those prices. Abrupt price spikes or declines create uncertainty and make it more difficult to plan and operate a restaurant. Large chain restaurants may have the ability to hedge commodity costs, but this is not always an option for smaller operators.

This begs the question of whether the last several years have been an exception to the rule, or if they are a sign of what’s to come. Restaurant Business Online cites three C’s – corn fuel, China, and climate change – for the changes in the food markets and says the industry is considering structurally higher commodity volatility and congruent strategies that address this trend.

<table>
<thead>
<tr>
<th>Exhibit 8: Food Price Volatility – Three price spikes since 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
</tr>
<tr>
<td>20%</td>
</tr>
<tr>
<td>15%</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>Source: Food and Agricultural Organization of the United Nations, Cornerstone Capital Group</td>
</tr>
</tbody>
</table>

Bringing It Together: Food and Labor Are Major Operational Costs

The quick-serve industry is subject to slim profit margins with large players such as McDonald’s making margins of 15-20% at company-operated stores. Margins at smaller operators and company-franchised stores can be lower (though our contacts tell us franchise margins, in some cases, may be higher due to the fact they are run more
efficiently), with many running at 5-6% operating margins. Given this margin structure, the industry is sensitive to changes in input costs, especially those classified as food/beverages/paper (COGS) and labor (Wages + Benefits). If we consider McDonald’s to be a proxy for the quick-serve industry, Food & Paper and Payroll & Employee Benefits constitute about 60% of revenues, though this can approach 70% for restaurants that lack economies of scale.

Exhibit 9: Cost Structure of Company-Operated McDonald’s Restaurants

Food and labor costs constitute 60-70% of sales at QSRs

Source: Company filings
Can Restaurants Raise Prices to Offset Cost Pressure?

**Food Prices**

Raising prices to offset food costs is an option, although the success of this strategy is contingent on the nature of food inflation and the overall level of inflation in the economy. Restaurants must consider what consumers are paying for food at home relative to what they pay when eating out. Broadly speaking, restaurants have more pricing power when consumers are seeing even larger price increases at grocers (Food at Home).

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**Exhibit 10: CPI Food at Home Less CPI Food Away From Home**

- Beneficial to restaurants
- Beneficial to grocers

*Source:* Bureau of Labor Statistics, Cornerstone Capital Group

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**Labor Costs**

There has been much debate on the ramifications of increasing labor costs on QSRs.* On one side of the issue, a study by the Political Economy Research Institute (PERI) and the University of Massachusetts-Amherst (UMass) finds that “raising the minimum wage to $10.50 would impose a cost increase to the average fast food restaurant equal to 2.7% of their sales revenue,” an increase that could be, all else equal, fully offset by raising prices 2.7%.

On the other hand, research from The Heritage Foundation suggests the impact on fast-food restaurants would be significant and result in substantial price increases. In estimating the effect of a $15 minimum wage (in response to the aforementioned SEIU campaign), they conclude that “without major operational changes, fast food restaurants would have to raise prices by 38% while [still] seeing profits fall by 77%.”

The degree to which these conclusions diverge is curious, but there are a few critical factors that account for the wide range of outcomes (not only with these studies but with many...
PERI/UMass research indicates increasing wages would have a modest impact on QSRs...

<table>
<thead>
<tr>
<th>Exhibit 11: Total Cost Increase Relative to Sales for Limited-Service Restaurant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost increase from minimum wage increases</td>
</tr>
<tr>
<td>Total wage increases</td>
</tr>
<tr>
<td>+ Higher payroll taxes (7.65%)</td>
</tr>
<tr>
<td>Estimated sales of limited-service restaurants</td>
</tr>
<tr>
<td>Total cost increase of limited-service restaurants</td>
</tr>
</tbody>
</table>

Source: PERI/University of Massachusetts, Cornerstone Capital Group

...while the Heritage Foundation concludes that such cost increases cannot be absorbed

<table>
<thead>
<tr>
<th>Exhibit 13: Effects of $15 Min. Wage on Average Fast Food Restaurant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profits</td>
</tr>
<tr>
<td>60%</td>
</tr>
<tr>
<td>40%</td>
</tr>
<tr>
<td>20%</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>-20%</td>
</tr>
<tr>
<td>-40%</td>
</tr>
<tr>
<td>-60%</td>
</tr>
<tr>
<td>-80%</td>
</tr>
<tr>
<td>Sales</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exhibit 14: Research Conclusions on the Responsiveness of Fast Food Demand to Price Changes*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
</tr>
<tr>
<td>Richards and Mancino (2014)</td>
</tr>
<tr>
<td>Jekanowski et al. (2001) - 1992</td>
</tr>
<tr>
<td>Jekanowski et al. (2001) - 1982</td>
</tr>
<tr>
<td>Brown (1990)</td>
</tr>
<tr>
<td>Okrent and Kumcu (2014)</td>
</tr>
<tr>
<td>Okrent and Alston (2012)</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Median</td>
</tr>
</tbody>
</table>

* The elasticities show by how much sales in the fast food industry would fall if restaurants in the industry increased their prices by 1 percentage point. For example, Richards and Mancino find that a 1% increase in prices would reduce sales by 0.74%, and a 10% increase in prices would reduce sales by 7.4%.

Source: The Heritage Foundation

Uncertainties in food and labor costs offer incentives for QSRs to investigate automation

Others on this topic. The first is the assumed average wage rate of fast food workers. If one assumes that a relatively large percentage of workers are making minimum wage or just above it, then the impact on overall labor costs will be more dramatic. Next, the size and extent of "ripple-effect" raises must be considered. In other words, do employees in higher wage groups experience wage inflation or is there wage compression effect? Finally, an analysis needs to account for elasticity of demand to fast food prices. This is crucial in determining the effect on sales and how much of the increased labor cost can be passed on to consumers.

Taken together, volatile food prices and upward pressure on labor costs create meaningful uncertainty for QSRs. As a precautionary measure, we believe the industry will investigate strategies to address these issues, and that automation will be one avenue of inquiry.
Can Restaurants Automate to Offset Cost Pressure?

Traditional Limitations of Automation in the Restaurant Industry

In examining an industry’s propensity to automate, we must consider the nature of the tasks that are required of the workforce.* To do so, we refer to the task model discussed in the November 2003 Quarterly Journal of Economics, as it distinguishes tasks by level of routineness and the extent to which they require manual or cognitive effort. Because machines and computers follow explicit rules, automation has historically been confined to routine tasks. Industries that are heavily dependent on labor for such tasks have automated more quickly, a concept that is particularly evident in the automotive industry where much of the production process is physical and repetitive.

Exhibit 15: The Task Model

<table>
<thead>
<tr>
<th>Routine tasks</th>
<th>Nonroutine tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytic and interactive tasks</td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>Computer Impact</td>
</tr>
<tr>
<td>• Record-keeping</td>
<td>• Substantial substitution</td>
</tr>
<tr>
<td>• Calculation</td>
<td></td>
</tr>
<tr>
<td>• Medical diagnosis</td>
<td>• Strong complementaries</td>
</tr>
<tr>
<td>• Forming/testing hypotheses</td>
<td></td>
</tr>
<tr>
<td>• Persuading/selling</td>
<td></td>
</tr>
<tr>
<td>• Repetitive customer service (e.g., bank teller)</td>
<td>• Limited opportunities for substitution or complementarity</td>
</tr>
</tbody>
</table>

| Manual tasks |
| Examples | Computer Impact |
| • Picking or sorting | • Substantial substitution |
| • Repetitive assembly | | |
| • Truck driving | • Limited opportunities for substitution or complementarity |


Exhibit 16: Robot Density (robots per 10,000 employees)

Source: Kuka, IFR World Robotics 2013

Exhibit 17: Compensation and Productivity: Fast Food versus Private Sector

Source: The Heritage Foundation calculations using data from the Bureau of Labor Statistics, inflation-adjusted

* 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.
On the other hand, the restaurant industry has been a relatively slow adopter of automation. Although labor represents a large share of total costs, the typical task of a QSR employee is non-routine and therefore not easily automated. While other factors are surely at play, this may be a contributing factor to the industry’s modest productivity gains and unremarkable wage growth relative to the broad economy. (Exhibit 17)

**Rapid Advances in Technology Changing the Game**

A convergence of technologies is yielding new applications for automation and opening doors to a larger and more diverse addressable market. Non-routine tasks deemed prohibitively costly or difficult to automate are being re-evaluated, bringing potentially disruptive changes to the aforementioned Task Model and parts of the labor market. Key technologies driving these changes include: 1) cheaper, faster and more efficient computing power, 2) improved software, 3) advanced sensors, 4) machine vision systems, and 5) enhanced user interfaces.

**Computing Power**

Gordon Moore, co-founder of Intel, predicted in 1965 that data density in computing hardware would double every two years. In what ultimately became known as Moore’s law, this statement underscores the concept of exponential growth and supports the notion that digital technologies are improving at an increasing rate. Furthermore, it’s observed that “Moore’s law is both consistent and broad; it’s been in force for a long time (decades, in some cases) and applies to many types of digital progress.” To this end, “many of the critical building blocks of computing – microchip density, processing speed, storage capacity, energy efficiency, download speed, and so on – have been improving at exponential rates for a long time.”

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* We use the term “routine” in a relative sense. While QSR tasks may seem repetitive, they require more flexibility than many factory-line tasks.

† Gordon Moore’s article in *Electronics* magazine, titled “Cramming More Components onto Integrated Circuits,” predicted the number of transistors incorporated in a chip would double every two years. This estimate turned out to be conservative as it’s now believed that computing power doubles every 18 months.

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Please see important disclosures at the back of this report.
**Improved software**

In addition to improvements in computing power (hardware), better software is playing a critical role in enabling automation. To illustrate, in analyzing the speed by which computers could solve a standard optimization problem from 1988 to 2003, it was determined that the effectiveness of computers increased by a factor of 43 million. This improvement was broken down into two factors: faster processors and better algorithms embedded in software. While processor speeds improved by a factor of 1,000, the lion’s share of improvement was attributed to better algorithms, which increased by a factor of 43,000.\(^8\)

More recently, these superior algorithms have benefited from the advent of big data.\(^*\) As described by McKinsey, “...computers with machine learning capabilities no longer rely only on fixed algorithms and rules provided by programmers. They can also modify and adjust their own algorithms based on analyses of the data, enabling them to ‘see’ relationships or links that a human might overlook. Moreover, these machines can ‘learn’ more and get smarter as they go along; the more they process big data, the more refined their algorithms become.”\(^9\)

**Advanced Sensors**

Just as big data is enabling the development of better algorithms, the rise of cloud computing and advanced sensor technology are key precursors and enablers for big data. With respect to the former, big data is often so large and complex that it cannot fit in the memory of a single machine. Rather than investing extensively in computing power (capex), users can access on-demand cloud computing resources including servers, storage and applications (opex). Moreover, the cost of commercially available cloud computing continues to decline as companies such as Amazon, Google and Microsoft build capacity and cut prices. Sensors, on the other hand, are a prominent source of big data as they aid in data collection, monitoring, decision making and optimization. Sensors are also experiencing declining costs as mobile device (i.e. smartphone and tablet) demand drives production efficiencies and economies of scale.

**Machine Vision Systems**

Machine vision (MV) may seem esoteric compared to the other technologies discussed, but industry experts suggest that it’s been underutilized and will be a key enabler of service robots.\(^\dagger\) Simply defined, MV systems capture and analyze visual information and automate tasks that require “seeing.”\(^10\) Most widely used in manufacturing as a tool to detect defects, MV has been limited by its machine-specific, hardware driven and closed-system characteristics.

However, as manufacturing processes demand more flexibility, MV is evolving into a technology empowered by ubiquitous connectivity, cloud data storage, and insights from big data.\(^11\) These capabilities, in turn, are facilitating service robots as they use MV to image, store, and interpret data about their environment, and perform actions based on the data. The commercial deployment of service robots in still questionable in terms of

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* Big data refers to the exponential growth and availability of large, complex data sets. This data can be both structured and unstructured.

\(\dagger\) The International Federation of Robotics (IFR) defines a service robot as one that performs useful tasks for human or equipment excluding industrial automation application.
scope and timing, but it's clear that MV will be necessary to automate non-routine tasks in unique and dynamic environments.

**Enhanced User Interface**

The user interface is where interaction between humans and machines occurs, and it allows the user to control and obtain feedback from the machine. Historically, a technician or engineer is needed to program a machine to perform a specific task. This is particularly challenging if a machine operates in a dynamic environment and has to be intermittently re-programmed.

Progress is being made, however, in making it easier to interface with machines as well as enabling machines to respond to a wider range of requests. For instance, Baxter, a robot designed by Rethink Robotics, can be “trained” by any employee to perform a wide variety of tasks (the employee simply “guides” Baxter to perform a task and the robot remembers and repeats the action). Another example of enhanced user interface is smartphone speech recognition programs (e.g. Apple Siri) which recognize spoken words, interpret the meaning and act accordingly. In sum, with improved machine “trainability” comes increased willingness to employ machines for various tasks.

**Exhibit 20: Converging Technologies Driving Advancements in Automation**

![Diagram showing the interconnection of Automation, Software, Algorithms, Big data, Cloud computing, Sensors, Micro-processors, User interface, Machine vision, and Hardware.]
Automation Applications in the Restaurant Industry

If one believes that income distribution and food price trends will persist, and assumes that advancements in key technologies continue, then it’s reasonable to expect QSRs to investigate the economics of automation. We’ll first discuss some of the current and potential automation initiatives and then look at the investment implications for the industry.

Exhibit 21: Automation Applications Impacting Food Service

![Diagram showing automation applications in the restaurant industry](image)

Source: Cornerstone Capital Group

Pre-Order: Vision Systems

QSRs are installing machine vision systems to better anticipate incoming traffic. Cameras are placed on a restaurant's roof to scan the parking lot for incoming cars, whereby images are transmitted to a computer that references historic traffic patterns and issues cooking orders to employees. By more tightly linking kitchen activity with incoming traffic, restaurants enhance employee productivity, increase throughput and customer satisfaction, and reduce food waste.

We don’t believe this technology competes with human labor, though it can reduce labor costs by limiting the number of employees required to meet unpredictable customer traffic (especially during peak hours). Moreover, by anticipating incoming traffic, less stress is placed on employees, potentially bolstering morale and reducing turnover.

Pre-Ordering/Ordering: Mobile platform

Mobile ordering platforms are being developed to capitalize on increasing smartphone penetration, increasing mobile data usage and government-led initiatives. According to a report by Transparency Market Research, the global market of mobile wallet is projected to reach a value of approximately $1.6 trillion by 2018, with a CAGR of 30.7% during the forecast period 2012-2018. The impacts of this are already being realized within the industry as QSRs seek to spur sales and improve the speed of service.

Many large QSRs, such as Wendy’s, Domino’s (DPZ), and McDonald’s have built or are in the process of building in-house mobile platforms. Quite a few are collaborating with firms like Apple and Google to integrate their payment technology (Apple Pay and Google Wallet). Meanwhile, others are working with external vendors, such as Olo, that develop...
and integrate digital platforms into restaurants' current systems and in-store operations. Smaller operators that lack technical expertise are also able to engage external vendors due to the fact that a relatively robust platform can be delivered without requiring significant upfront investment.

Our research indicates that mobile ordering platforms aren't viewed as a substitute for human labor (i.e. cashiers). Rather, QSRs recognize that a digital strategy is necessary to capture their share of the aforementioned growing mobile wallet. It’s also a strategy to maximize customer visit frequency and drive an increase in average order size.

As noted by Wendy’s CEO, Emil Brolick, on the company’s 3Q14 earnings call:

*As noted in our release, we plan to realign our G&A resources with investments in consumer-facing technology to drive our brand transformation and enhance brand access. Platforms such as mobile payment, mobile ordering and loyalty programs are rapidly growing in the retail marketplace and provide potential benefits, such as consumer convenience, increased transactions, higher check, faster speed of service and a seamless brand experience. These initiatives are essential elements of our growth strategy to increase brand relevance and economic model relevance.*

In order to maximize the impact of mobile ordering (and online ordering), the back-of-house (i.e. kitchen) has to be fine-tuned as well. Otherwise, more orders could come in than the store is equipped to efficiently handle. Absent the deployment of technology or other re-engineering initiatives that make current employees more productive, mobile ordering platforms may lead to greater labor deployment and increasing labor costs in the near-term. As long as revenue growth outpaces labor costs, however, margins and profits should experience a positive impact.

**Ordering: Kiosks**

As part of a broader digital platform, operators are assessing the business case for in-store kiosks. Similar to mobile ordering platforms, kiosks are delivering revenue benefits to operators by maximizing throughput, increasing average check amount, and building customer loyalty.

Kiosks enable customers to order and pay for their meals more quickly, particularly during the busiest times of the day. They also enhance order accuracy by reducing mistakes at the order input level. This benefit should not be overlooked – during an interview with Businessweek, Panera’s CEO said one in seven orders in the food industry is incorrect and half of those inaccuracies occur during order input.\(^{13}\)

Furthermore, kiosks have the ability to offer upgrades and selectively cross sell items more subtly than cashiers. Customers can customize their orders and customer loyalty programs can be integrated into the kiosk ordering interface.*

Unlike mobile ordering platforms, we view kiosks as potentially disruptive to labor despite comments from QSRs that suggest otherwise. When McDonald’s Europe installed kiosks in Europe, the company said the kiosks weren’t designed to replace front-counter service, but

* Some believe enabling a greater degree of customization may increase labor costs due to the flexibility required to deliver a customized order. For instance, investors are concerned that increased labor costs and longer order delivery times will be a challenge for McDonald’s as rolls its out its “Create Your Taste” effort. It’s our belief that potential inefficiencies can be eliminated rather quickly, and that they will become less pronounced as the technology is rolled out broadly.
to provide better customer service. They also stated that labor would be redeployed to the kitchen in order to meet food production requirements, and that increased output of kiosk-equipped restaurants could result in increased need for labor.  

One must consider the perspective of QSRs with regards to their comments on labor replacement. The industry is currently at the center of a socially divisive minimum wage debate, so publicly disclosing intent to replace a segment of the workforce with kiosks may be a risky proposition. Negative publicity could impact sales and impair a company’s brand. It also risks damaging employee morale, which could affect productivity and turnover. To mitigate such risks, operators may look to implement a more gradual, subtle strategy where kiosks replace labor through employee attrition and new store openings.

**Historical Perspective – Kiosks in the Banking and Airline Industries**

Referencing prior cases of kiosk deployment is also instrumental in assessing kiosks’ potential impact on labor. To this end, we examine the emergence of ATMs and airport self-service kiosks and their congruent impact on labor in the banking and airline industries, respectively.

The first automated teller machines (ATMs) were deployed in the late 1960s, but it wasn’t until the mid-1980s that ATMs ultimately became ubiquitous. Following an ATM surcharge ban being lifted in 1996, the industry witnessed unprecedented ATM deployment growth. While this provided banks with the ability to drive revenues through convenience fees, cost also was a major consideration in ATM deployment. According to the American Bankers Association, in 1996 a teller transaction cost a bank about $1.07 while the same transaction conducted at an ATM cost $0.27.  

In many cases, banks claimed that ATMs weren’t a threat to bank tellers’ jobs as they would relieve tellers from menial tasks. However, during a period of ATM deployment growth, data reveals declining bank tellers jobs and lackluster wage growth. While other factors are surely at play, this begs the question of whether ATMs are truly inconsequential to the future of bank tellers.

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**Exhibit 22: Number of Bank Tellers versus ATMs in U.S.**

![Exhibit 22: Number of Bank Tellers versus ATMs in U.S.](image)

**Exhibit 23: Nominal Wage Growth- Bank Tellers vs. All U.S. Occupations**

![Exhibit 23: Nominal Wage Growth- Bank Tellers vs. All U.S. Occupations](image)

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

**Source:** Federal Reserve Bank of St. Louis, Bureau of Labor Statistics, Cornerstone Capital Group
In its August 1996 Monthly Labor Review, the BLS notes:

- Banks are adding ATM functions and incentives intended to lead customers away from transactions with a human teller.
- The decline in banking employment stands in sharp contrast to the continuing growth in ATM volume and there may be a strong correlation between the increased use of ATMs and the drop in the number of jobs in banking.
- ATMs have contributed to a decline in the number of employees needed to process checks.

Turning to 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. Airlines said that ticket agent jobs wouldn’t be eliminated as a result of kiosk deployment because agents would instead be afforded the ability to focus on customer service. This notion may have been overly optimistic in light of the economics that were soon realized. According to 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).

With this in mind, it’s not surprising that job and wage growth for reservation and ticket agents are challenged. It’s true that many airline and airport occupations are experiencing similar challenges, but a UC Berkeley Labor Center report makes an interesting observation. In contrast to many other occupations that are being outsourced, the share of reservation and ticket agent jobs outsourced is small and only increased slightly (from 4% to 5%) from 2002 to 2012. The report notes “these [reservation and ticketing agent jobs] faced downward wage pressure from automation as kiosks and Internet reservations became even more common.”

Exhibit 24: Airport Ticket Agents Under Pressure...But Not Because of Outsourcing

<table>
<thead>
<tr>
<th></th>
<th>Number of workers, change 2002-2012</th>
<th>Average real wages, change 2002-2012</th>
<th>Share outsourced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Across air transportation*</td>
<td>-19%</td>
<td>-10%</td>
<td>4%</td>
</tr>
<tr>
<td>Reservation &amp; transportation ticket agents</td>
<td>-17%</td>
<td>-15%</td>
<td>5%</td>
</tr>
</tbody>
</table>

* 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).

Source: UC Berkeley Labor Center, Cornerstone Capital Group

It’s true that many airline and airport occupations are experiencing similar challenges, but a UC Berkeley Labor Center report makes an interesting observation. In contrast to many other occupations that are being outsourced, the share of reservation and ticket agent jobs outsourced is small and only increased slightly (from 4% to 5%) from 2002 to 2012. The report notes “these [reservation and ticketing agent jobs] faced downward wage pressure from automation as kiosks and Internet reservations became even more common.”
Kiosk: Total Cost of Ownership Analysis

Provided this historical perspective, we model the total cost of kiosks versus human labor in a hypothetical US-based burger restaurant. Several assumptions must be made to estimate the total costs of each.

- **Capex and integration costs** – These costs vary depending on kiosk quality. In 2007, EMN8, a developer of self-service touchscreen displays and systems, said that basic machines cost about $3,000 while full-service models may cost up to $17,000. However, technology has become more affordable over time and our research indicates that a high-end two-kiosk system will cost about $12,000 ($6000/kiosk).

- **Maintenance costs** – These are ongoing costs including software maintenance programs, support and other hardware maintenance costs. The rule of thumb for robot maintenance is 10% of initial capex, but we determine that providing software updates ranges from 12-18% of the cost of the software being updated and therefore believe 15% is appropriate.

- **Labor reduction ratio** – Based on our research, we assume that three cashiers are needed at the front-counter during peak periods while only one is needed during non-peak periods. Peak periods represent 3 hours out of a 12 hour operating day (25%) on weekdays, and we assume no peak hours during weekends. During peak periods, we assume that two kiosks can provide an equivalent level of service as one cashier, while no human labor is replaced during non-peak periods. This is because many QSRs bring on an employee that multitasks during non-peak hours, so a kiosk is not a viable replacement.

- **Cost of capital** – Using the WACC of a basket of QSRs, we assume 7% cost of capital.

- **Labor costs** – We reference the proposed Fair Minimum Wage Act of 2013 which would increase the minimum wage to: 1) $8.20/hr on the first day of the third month after enactment (to simplify we assume this is in 2015); 2) $9.15/hr after one year; 3) $10.10/hr after two years; and 4) indexed to inflation each year thereafter. We also assume that all cashiers receive minimum wage, which is an inherently conservative assumption. As it pertains to non-wage compensation (i.e., benefits), we utilize the methodology applied in the aforementioned PERI/UMass research brief (see endnote 4) and assume non-wage pay equates to 16% of wages.

Using these assumptions, we calculate the total cost of ownership (TCO) for kiosks and cashiers in our hypothetical restaurant. Kiosks preferred when their TCO is lower than the equivalent labor savings. As shown in Exhibit 25, kiosks break even between the second and third year after deployment. The sensitivity analysis indicates that our restaurant will typically see a payback period of less than three years, except under the most conservative assumptions (high kiosk cost and low wages). As a point of reference, many automation projects seek payback periods of 1-2 years. This implies that kiosks aren’t a “slam dunk” from a TCO standpoint (not taking into account revenue benefits), but are viable candidates for consideration.

In summary, kiosks are delivering revenue benefits to operators by maximizing throughput, increasing average check amount, and building customer loyalty. However, based on historical perspective and our TCO analysis, we conclude that kiosks may be viewed as a potential substitute for labor if QSRs are faced with materially higher labor costs.
Ordering: Centralized Ordering System

There is well-deserved focus on the rollout of mobile and online ordering platforms. That said, it’s still early days and only 5-25% of carry-out, delivery and catering orders are placed online, while the remaining orders are taken over the phone. In an effort to compete in a rapidly evolving industry, firms are turning to companies such as Onosys and Stellar Restaurant Solutions (SRS), which offer call center solutions, to streamline the phone ordering process. Centralized ordering systems can drive sales by increasing average check size and improving customer service, but they also address wage pressure in the industry.

Both Onosys and SRS highlight a reduction in labor costs as a benefit of their services. This is partly due to consolidation and employee sharing, but technology is also an enabling factor. For instance, intelligent voice recognition software is being deployed to receive incoming orders. According to SRS, their Mobile Mouth system can reduce order-processing costs by up to 80%.

While carryout and drive-thru have long been a part of the QSR business, many operators are looking to the catering channel - historically left to private companies and casual-dining restaurants - as an avenue for growth. Apart from generating a new revenue stream, a properly implemented catering business can drive labor efficiency by utilizing labor during

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*While this term isn’t one we’d choose, it is industry parlance and we use it to avoid confusion
† The sensitivity analysis is calculated under the assumption that the wage rate in 2015 grows at the rate of inflation (2.3%)

Source: Cornerstone Capital Group estimates and analysis
off-peak hours. Centralized ordering systems field incoming order calls, questions about catering, and order modifications, allowing the restaurant to concentrate on producing and executing fulfillment of food orders.

We view centralized ordering systems as a potential threat to labor if front-of-house employees aren’t redeployed elsewhere. Developing a catering business, for instance, likely requires employees to be transferred from order-taking roles into delivery or food production roles.

**Food Production: Automated Kitchen Equipment**

Many of the larger QSRs have long been investigating the feasibility of automating kitchen equipment and processes. Deployment of this technology has largely been limited to individual machines or discrete tasks. For instance, McDonald’s (along with Coca-Cola and Cornelius) rolled out an Automated Beverage System (ABS). They say it “delivers uniform ice and beverage volumes, providing proven labor savings and consistent yields” and “presents beverage orders in a systematic fashion, improving order accuracy and helping reduce crew confusion.”

In addition, U.S. Patent and Trademark Office records indicate that either McDonald’s or Restaurant Technology Inc., which is housed within McDonald’s, has filed patents for several automated cooking devices including an automated French fry machine and an automated grill that transports food from freezer to grill to heated holding area.

As it relates to fully automating the food production function, Silicon Valley-based Momentum Machines introduced a robot that produces gourmet quality hamburgers from start to finish without human interaction. The robot can produce 360 burgers per hour and future generations of the robot will be able to offer customized meats grinds (e.g. 1/3 pork and 2/3 bison).

While some of these technologies complement labor, others present a clear threat to QSR employees. Momentum Machines says their robot isn’t intended to make employees more efficient, but to “completely obviate them.” In doing so, the company claims that their device saves the average QSR approximately $135,000 per year, enabling restaurants to sell higher quality food at fast food prices. Momentum Machines doesn’t disclose the ROI.
or payback period on their robot, but their device highlights the progress being made in bringing automation to the restaurant industry.

**Post-Production: Automatic Waste Receptacles**

Automatic waste receptacles can be deployed across various industries including QSRs (specifically when customers must put their own waste in the garbage). Since nearly all food and beverage containers, utensils for customers' use, and packaging materials at QSRs are disposable, dine-in sales generate a significant volume of waste. Non-compacted waste collected by traditional receptacles incurs not only high hauling and transportation costs, but also considerable labor expenses, as employees need to empty and clean up bins frequently.

WasteCare, a provider of waste equipment, developed the Smart-Pack automatic compacting receptacle which automatically compacts trash at the source based on customer traffic flow. According to the company, the Smart-Pack receptacle can hold 400-750 customers' waste deposits before it needs to be tended to, compared to 40-50 customer per conventional QSR trash bins. As such, the Smart-Pack needs to be emptied once for every eight to ten times that conventional trash bins are emptied. Furthermore, when compacted, QSR waste occupies 70% less dumpster space, which can reduce waste hauling and transportation charges.

According to data accumulated by the WasteCare, among the QSR users of the Smart-Pack, installing the device saves approximately $1,700 on waste hauling costs and $2,100 on labor costs on average for each restaurant annually, and the reported paybacks are typically less than two years.

Because employees typically have responsibilities that extend beyond emptying trash, we view automatic waste receptacles as a driver of employee productivity rather than a threat to labor. Should QSRs consider these devices as part of a comprehensive automation solution, however, labor may be impacted at the margin.

**Throughout the Process: Restaurant Management System**

Advancements in technology have led to the deployment of cloud-based, enterprise level systems that fully integrate POS (point-of-sales), timekeeping and scheduling, and inventory management. Because these components talk to each other, restaurants are able to drive labor efficiency and reduce food costs. Labor efficiency improvements occur through:

- Automating the employee decision making process (i.e. what to cook and when to cook it)
- Controlling overtime and getting control of labor rules compliance (i.e. tracking employee hours in real time and sending alerts for those approaching ACA limits)
- Forecasting labor requirements based on historical sales data or task analysis (i.e. prepping a certain dollar volume of one item requires more labor than prepping an equivalent dollar volume of another item)
*Bringing it Together: Automation is underway, and the pace will accelerate with rising wage pressure*

Restaurants have long been investigating automation, and we’re now seeing several applications being deployed broadly. The primary objective for automating will vary, but in its simplest form the technology will need to drive sales, reduce labor costs, or a combination thereof.

With advancements in technology driving down prices, certain applications are becoming a viable option for a greater number of restaurants (i.e. single unit owners). While it appears that applications focused on driving sales or driving sales/reducing labor are currently in focus (we’re cognizant that companies are more likely to discuss these because they are customer facing applications), restaurants are conducting time-and-motion analysis to determine where labor is being spent today. Such analyses provide the ability to understand the impact of technology and the optimum deployment of labor, as well as data that provides insights into which processes need to be re-engineered.

**Exhibit 27: New restaurant management systems provide an increased level of control for operators**

- Labor costs
- Temperature and product quality
- Cleaning and maintenance

**Exhibit 28: Driving Sales or Reducing Labor?**

- Devices deployed throughout restaurant
- POS (point-of-sales) data
- Timekeeping data

- Transactional volume
- Labor efficiency
- Seasonality
- Market trends

*Source: Cornerstone Capital Group*
Investment Implications

In aggregate, Restaurant Industry (Quick Serve/Fast Casual & Casual Restaurants) operating margins are down slightly (from 9.1% in 2004 to 8.4% in 2013) due to industry consolidation and price-based competition on menu items. Looking at specific restaurant categories, however, reveals a more nuanced situation. It’s evident that many larger QSR chains have witnessed margin uplift related to technology that’s driving efficiency and labor productivity.

Exhibit 29: Operating Margins

*Burger King merged with Tim Hortons in 2014 to form Restaurant Brands International. The strong margin uplift from 2012-2013 was unrelated to this merger, but rather due to the company’s refranchising initiative.

Source: Company filings, Bloomberg, Cornerstone Capital Group

In assessing the impact of increasing wage pressure on companies, investors would be wise to consider:

1. **Labor productivity and cost structure** – As seen in the charts below, QSRs have generally increased employee productivity and, in turn, reduced labor’s contribution

Exhibit 30: Sales per Employee*
Companies with higher productivity/lower labor costs would be impacted to a lesser extent in an environment categorized by rising wages.

It’s worth noting that differences in business models and reporting methods may, in some instances, be limiting factors in comparing companies. For instance, a company’s method of reporting employee count (i.e., total, company-owned vs franchised, full-time vs part-time) and geographic exposure will impact data. Despite these differences, we believe evaluating this data is important to understand how productivity and costs are evolving over time.

2. **Current compensation policy** – Companies that offer employees competitive compensation are less exposed to regulatory-driven wage hikes. To assess the landscape, we compare cashiers’ weighted average hourly rates relative to peers.

3. **Technology initiatives** – In order to assess a company’s propensity to automate, we identify technologies that are being considered or implemented. It’s quickly evident that companies are focused on the digital opportunity (online, mobile, kiosks), but aren’t as explicit in discussing other initiatives. This doesn’t imply other technologies are being ignored. Instead, details around other technologies are likely withheld for competitive reasons.
### Exhibit 33: Announced Technology Initiatives of Select Quick Serve and Fast Casual Restaurants

<table>
<thead>
<tr>
<th>Company</th>
<th>Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>McDonald's</td>
<td>• Implementing digital and mobile tech along with ordering kiosks to appeal to Millennials.</td>
</tr>
<tr>
<td></td>
<td>• Providing customers with the option to build custom burgers using a touchscreen interface as part of a pilot program (Create Your Taste) that is expanding to 2,000 US restaurants.</td>
</tr>
<tr>
<td></td>
<td>• Automated Beverage System</td>
</tr>
<tr>
<td>Burger King</td>
<td>• Providing online ordering as well as a delivery option (BKDelivers.com) in some markets</td>
</tr>
<tr>
<td></td>
<td>• Tested digital platform and mobile app in 5-6 markets with strong results, and looking to enable mobile payment capabilities.</td>
</tr>
<tr>
<td>Tim Hortons</td>
<td>• TimmyMe app features restaurant locator, Tim Card Reload, and payment feature</td>
</tr>
<tr>
<td></td>
<td>• Self-serve kiosks</td>
</tr>
<tr>
<td>Jack in the Box</td>
<td>• Qdoba online ordering; Mobile-optimized version of Qdoba Rewards program rolled out nationwide</td>
</tr>
<tr>
<td></td>
<td>• Jack in the Box has kiosks in many company-owned and franchise restaurants and they’re reviewing to identify opportunities to integrate systems across both brands</td>
</tr>
<tr>
<td>Taco Bell</td>
<td>• Mobile app allows for order and payment</td>
</tr>
<tr>
<td>Pizza Hut</td>
<td>• Online ordering and payment available</td>
</tr>
<tr>
<td></td>
<td>• Enhanced its mobile app in 4Q14; 40% of delivery and carry-out orders were digital and over 50% of all digital orders occurred through the app and mobile devices; Digital sales grew 40% YoY in 4Q14</td>
</tr>
<tr>
<td></td>
<td>• Announced a concept interactive table that functions as a giant tablet app, though no firm plans to roll out yet; Locations in the UK are testing eye-tracking software on tablet menus to accurately predict what customers wants to order</td>
</tr>
<tr>
<td>KFC</td>
<td>• Online order and payment for catering</td>
</tr>
<tr>
<td></td>
<td>• Mobile app and advanced ordering and payments (KFC Fast Track) launch in UK/Ireland in 2013</td>
</tr>
<tr>
<td>Wendy’s</td>
<td>• Basic mobile payment system (Pay 1.0) available in over 80% of restaurants; Pay 2.0 (coupons, rewards, payment) is in beta-testing; Beacon-based mobile ordering system (Ordering 1.0)</td>
</tr>
<tr>
<td></td>
<td>• Kiosks (Ordering 1.0) is in test</td>
</tr>
<tr>
<td></td>
<td>• App 2.0 (ordering + payment + offers + more) is still in development</td>
</tr>
<tr>
<td>Chipotle</td>
<td>• Online ordering available</td>
</tr>
<tr>
<td></td>
<td>• Mobile app provides ability to order and pay, access recent order and save payment info</td>
</tr>
<tr>
<td>Panera</td>
<td>• Launched Panera 2.0 which includes online/mobile ordering for both to-go (Rapid Pick-up) and dine-in (Delivery to the Table) customers and fast lane kiosks. Goal is to convert approximately 300 cafes to 2.0 in 2015, bringing the total number of cafes converted to around 400.</td>
</tr>
<tr>
<td></td>
<td>• 8% of company sales occurred digitally in 4Q14, more than double the rate at the end of 2Q14</td>
</tr>
</tbody>
</table>

*Source: Company filing and earnings calls, Cornerstone Capital Group*
Bringing it Together: Investment Implications

From an industry perspective, we believe restaurants will be able to keep labor costs in check through the deployment of automation technology. While QSR/FCs are better positioned to benefit from automation in the near-to-medium term (food prep is more complicated in Casual Restaurants and human service element required), CRs are investing in technology to reduce their reliance on labor as well.

On the company level, all else equal, those dependent on a low-cost, inefficient labor force and underinvesting in automation technology are most at risk in a higher labor cost environment. In contrast, companies that are focused on integrating automation technology with a well-compensated, productive labor force will have more flexibility in addressing such a scenario. This additional flexibility is critical because companies can redeploy capital that would otherwise be spent on labor into other strategic initiatives such as improving food quality.

To this end, Panera (PNRA) appears to be well positioned given its competitive compensation policy and innovative investments in technology. There is, however, controversy surrounding Panera and its rollout of Panera 2.0, an integrated set of improvements designed to reduce friction in the food ordering and delivery process (see Exhibit 33 for detail).

Investor uncertainty stems from a lack of earnings visibility, which in turn is due to continued 2.0 investment. Labor costs accelerated with the rollout of 2.0 to meet higher levels of demand that will be generated from the digital platform (online, mobile, kiosks). This is in line with our assessment that some automation technologies aren't designed to reduce labor costs but to drive sales through increased check size, additional throughput, and improved customer loyalty.

Panera is now in the process of evaluating several iterations of 2.0 and optimizing costs based on what they've learned. Relative to the earliest iteration (which was only launched 9 quarters ago), labor as a percentage of sales isn't initially rising as much and is coming down more quickly. This supports the notion that 2.0 will drive sales and margins over time.

Going forward, it’s important to monitor how companies like Panera address the greater need for labor in the back-of-house to meet higher levels of demand. Though fully-automated kitchens aren't yet commercially viable, we believe there will be a concerted focus on technology that prevents labor simply from being shifted from front-of-house to back-of-house.
Where Could We Be Wrong?

1. We believe a first-mover advantage exists for companies that invest in innovative automation technology. This is premised on the ability to drive sales and margins and redeploy those profits into other growth initiatives. If this premise is overly optimistic, then followers will likely be able to learn from first-movers and compete effectively.

2. Based on early observations, we assume that increased labor costs associated with higher levels of technology-driven demand moderate over time. Margins may be negatively impacted should this not occur.

3. Significant growth in digital sales points to continued consumer uptake - a trend we believe will persist. If consumer willingness to engage with technology (i.e. kiosks) reverses, the industry’s ability to offset higher wages may be limited.

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**Exhibit 34: Peer Group Comp Table**

<table>
<thead>
<tr>
<th>Ticker</th>
<th>Company Name</th>
<th>Share Price</th>
<th>NTM EPS</th>
<th>NTM EPS Multiple</th>
<th>L/T Growth Rate Estimate</th>
<th>PEG</th>
<th>Enterprise Value</th>
<th>NTM EBITDA</th>
<th>EV/NTM EBITDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNRA</td>
<td>Panera Bread Company</td>
<td>162.91</td>
<td>6.26</td>
<td>26.0x</td>
<td>16%</td>
<td>1.7</td>
<td>4,272</td>
<td>404</td>
<td>10.6x</td>
</tr>
<tr>
<td>QSR</td>
<td>Restaurant Brands Inc.</td>
<td>43.34</td>
<td>1.04</td>
<td>41.9x</td>
<td>20%</td>
<td>2.1</td>
<td>32,065</td>
<td>1,598</td>
<td>20.1x</td>
</tr>
<tr>
<td>CMG</td>
<td>Chipotle Mexican Grill</td>
<td>667.62</td>
<td>17.16</td>
<td>38.9x</td>
<td>21%</td>
<td>1.9</td>
<td>19,953</td>
<td>1,005</td>
<td>19.9x</td>
</tr>
<tr>
<td>JACK</td>
<td>Jack in the Box Inc.</td>
<td>97.66</td>
<td>3.01</td>
<td>32.5x</td>
<td>15%</td>
<td>2.2</td>
<td>4,268</td>
<td>296</td>
<td>14.4x</td>
</tr>
<tr>
<td>MCD</td>
<td>McDonald’s Corporation</td>
<td>99.99</td>
<td>5.03</td>
<td>19.9x</td>
<td>8%</td>
<td>2.4</td>
<td>109,014</td>
<td>9,153</td>
<td>11.9x</td>
</tr>
<tr>
<td>WEN</td>
<td>The Wendy’s Company</td>
<td>11.05</td>
<td>0.34</td>
<td>33.0x</td>
<td>11%</td>
<td>3.0</td>
<td>5,243</td>
<td>397</td>
<td>13.2x</td>
</tr>
<tr>
<td>YUM</td>
<td>Yum! Brands, Inc.</td>
<td>81.08</td>
<td>3.44</td>
<td>23.6x</td>
<td>11%</td>
<td>2.1</td>
<td>37,949</td>
<td>2,785</td>
<td>13.6x</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>30.8x</strong></td>
<td><strong>14%</strong></td>
<td><strong>2.2</strong></td>
<td></td>
<td></td>
<td><strong>14.8x</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Bloomberg, Consensus estimates*
We extend our thanks to Juan Martinez, PhD, a 31-year foodservice veteran for his contributions to this report. A licensed professional engineer, Martinez is Principal and Founder of PROFITALITY®, an industrial engineering consultancy that helps multi-unit foodservice brands improve their “unit economics” to support brand growth by streamlining capital and operating costs, while delivering better customer service and product quality and consistency.
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