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ECONOMY

Workers: Fear Not the Robot Apocalypse

Automation commonly creates more, and better-paying, jobs than it destroys. A case in point: U.S. retailing



Workers inside Amazon's Fall River, Mass., fulfillment center. PHOTO: ADAM GLANZMAN FOR THE WALL STREET JOURNAL

By Greg Ip

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For retailers, the robot apocalypse isn't a science-fiction movie. As digital giants swallow a growing share of shoppers' spending, thousands of stores have closed and tens of thousands of workers have lost their jobs.

Belinda Duperre, who sold jewelry at Sam's Club in Fall River, Mass., was one. In early 2016, the struggling store closed.

But Ms. Duperre, a lifelong resident of the once-thriving factory town an hour south of Boston, went from victim of the digital revolution to beneficiary. Amazon.com Inc. announced plans to hire 500 full-time workers for a new 1.2-million square foot fulfillment center on the outskirts of town. "I was just dying, waiting for Amazon to open," she recalls. She was among the center's first hires last fall; full-time employment has since soared to about 2,000.

Ms. Duperre earns \$2 more per hour at Amazon than at Sam's, in part because she's a lot more productive. At Sam's, she served perhaps one to 20 customers a day. At Amazon, she packs 75 to 120 boxes an hour that are then whisked via high-speed automated conveyor belts to fleets of trucks that fan out across the region. The work is more physically demanding, but Ms. Duperre, 54, sees a bright side. "I lost 25 pounds working here," she says. "This is a free gym membership."

The brick-and-mortar retail swoon has been accompanied by a less headline-grabbing e-commerce boom that has created more jobs in the U.S. than traditional stores have cut. Those jobs, in turn, pay better, because its workers are so much more productive.

This demonstrates something routinely overlooked in the anxiety about the job-destroying potential of robots, artificial intelligence and other forms of automation. Throughout history, automation commonly creates more, and better-paying, jobs than it destroys. The reason: Companies don't use automation simply to produce the same

thing more cheaply. Instead, they find ways to offer entirely new, improved products. As customers flock to these new offerings, companies have to hire more people.



In the Amazon facility's packing area, computers tell workers precisely which size box to use. PHOTO: ADAM GLANZMAN FOR THE WALL STREET JOURNAL

“Robot apocalypse” is a modern expression, but the underlying anxiety goes back centuries. In 1589 Queen Elizabeth I refused to grant the inventor of a mechanical knitting machine a patent for fear of putting manual knitters out of work. In 1930 the British economist John Maynard Keynes warned of “technological unemployment...due to our discovery of means of economizing the use of labor outrunning the pace at which we can find new uses for labor.”

Those fears have repeatedly proven baseless. James Bessen, an economist at Boston University School of Law, has found in numerous episodes when technology was supposed to annihilate jobs, the opposite occurred. After the first automated tellers were installed in the 1970s, an executive at Wells, Fargo & Co. predicted ATMs would lead to fewer branches with even fewer staff. And indeed, the average branch used one-third fewer workers in 2004 than in 1988. But, Mr. Bessen found, ATMs made it much cheaper to operate a branch so banks opened more: Total branches rose 43% over that time.

Today, banks employ more tellers than in 1980 and their duties have expanded to things ATMs can't do such as “relationship banking.”

Mr. Bessen witnessed this sort of transformation personally. In 1983 he created an early desktop publishing program, which made typesetting and graphical design vastly simpler and cheaper. Shortly after Sears purchased his program in 1989, its catalog operation laid off 100 employees, he recalls, and he worried, “are we shafting a bunch of people with this product?”

But some customers used his software to increase the number and variety of their publications. The supermarket chain A&P used Mr. Bessen's software to publish 30 or 40 versions of its weekly circular for Atlanta, with different promotions aimed at different neighborhoods. Mr. Bessen found that typesetting and compositor jobs fell about 100,000 over the 1980s, but from 1979 to 2007 the number of designers more than quadrupled to 800,000, making up for the loss many times over.

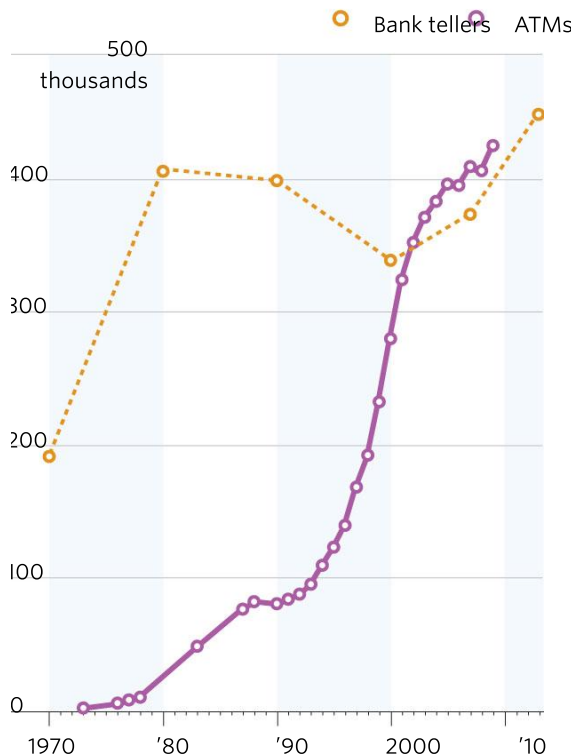
Not until an industry has fully satiated demand for its products, as has happened in automobiles, does automation start to chip away at overall employment.

The process is still disruptive, of course: The people thrown out of work by automation are seldom the same people employed in the new industries that automation makes possible. But over time, the net effect is consistently positive.

Even economists and technologists who know the history worry that this time is different because today's technological advances can do things long thought to be the preserve of human beings. Microsoft co-founder Bill Gates has suggested taxing robots to slow their job-destroying potential. Tesla Inc.'s Elon Musk wants the government to regulate artificial intelligence.

Human Bankers Hold the Line

As the number of ATMs rose, so did the number of bank branches, so the ranks of tellers expanded.



Source: James Bessen, Boston University School of

And yet evidence of the feared apocalypse remains elusive, while evidence of the opposite abounds. In many cities it is cheaper and easier to order a car from Uber or Lyft than a taxi, and as a result the volume of rides and drivers has shot up. Between 2015 and the first half of 2017, yellow cab rides in New York City declined by roughly 75,000 but total rides on Uber and Lyft rose by roughly 210,000, according to Taxi and Limousine Commission figures aggregated by Todd Schneider, a blogger. This suggests ride sharing has uncovered new demand by making car rides cheaper and easier to find, especially outside Manhattan where taxis are much harder to hail.

Retail is easily the largest U.S. industry now facing digital disruption and yet there is strong evidence e-commerce hasn't reduced overall employment and has likely added to it. It is true that thousands of stores have closed. Between the end of

2007 and the middle of 2017, brick-and-mortar retailers lost the equivalent of 140,000 full-time jobs, according to a forthcoming report by Michael Mandel, chief economic strategist at the Progressive Policy Institute, a think tank. Electronic shopping jobs rose by only 126,000 in the same period.

But, Mr. Mandel notes, that excludes many jobs at fulfillment centers such as Fall River, which the federal Bureau of Labor Statistics tends to count in warehousing and storage. He notes that Kentucky had just 3,213 e-commerce workers in 2016 according to the BLS, yet Amazon employs more than 12,000 there. Warehousing has added 274,000 jobs nationwide since 2007. Mr. Mandel argues all of those are attributable to fulfillment centers and that thus total e-commerce employment has grown 401,000, nearly three times the brick-and-mortar drop. Mr. Mandel finds that fulfillment centers pay on average 31% better than brick and mortar stores in the same county.

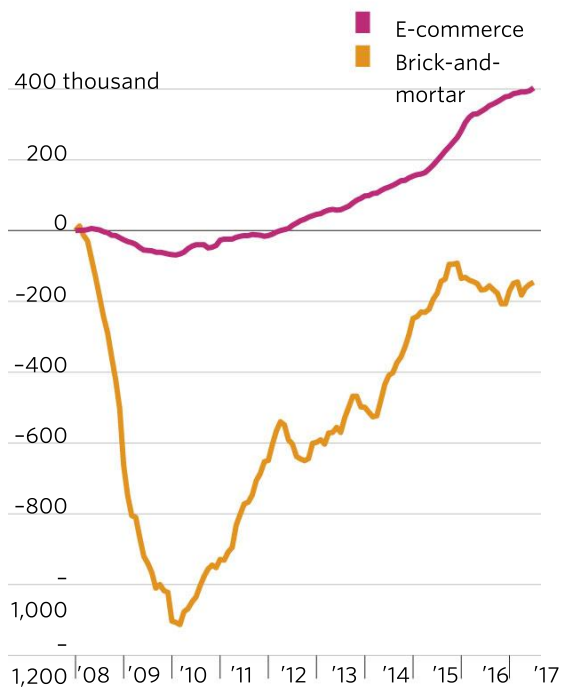
All this raises important questions. If online retailers, based on sales per employee, are much more productive than regular retailers, how can they on net add to total retail employment? And how can they both pay more and keep prices low?

The answer is complicated. In fact, total retail employment might have grown faster absent e-commerce. In a highly critical report of Amazon last fall, the nonprofit Institute for Local Self-Reliance argued that the firm's higher productivity meant retail employment is 149,000 lower than if it had never come along.

But the main reason is that e-commerce doesn't simply sell the same product as a store at a lower price. It enables customers to peruse a vast array of products and select precisely the one they want and have it delivered in a day or two, saving the time, cost and inconvenience of visiting multiple stores. Mr. Mandel estimates e-commerce has saved the average adult 15 minutes a week. Just as Uber and Lyft uncovered hidden

E-Commerce Taketh Away & Giveth

The e-commerce sector has created more jobs since the end of 2007 than brick-and-mortar retailers have lost.



Note: Full-time equivalent employment, three-month average. E-commerce includes electronic shopping and mail-order houses; and warehousing and Source: Michael Mandel, Progressive Policy Institute

demand for rides, e-commerce has uncovered hidden demand for shopping from home. These features don't necessarily add to the price, any more than improvements to cars and appliances do. Nonetheless, e-commerce results in people consuming more retail services, once you adjust for this improved quality, than in the pre-online era.

And often, consumers do pay for this convenience. John Blackledge, an analyst at Cowen & Co., estimates that 42% of U.S. households, 53 million in total, are members of Amazon Prime, which entitles them to one- to two-day delivery, or same-day delivery in some cities, plus a growing list of other perks for \$99 a year. Prime members typically order twice as often as non-Prime customers, according to Mr. Blackledge. To spur demand, e-commerce companies use their greater efficiency to absorb more of the delivery costs. Amazon

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Items that are ready for shipment ride a conveyor belt. PHOTO: ADAM GLANZMAN FOR THE WALL STREET JOURNAL

margin it earns on goods to build and operate the logistics needed to profitably serve customers.

The breadth of that investment becomes apparent on a visit to the Fall River center, which handles large, irregularly shaped items such as appliances, bicycles, tires and even a boat anchor.

When a crate of frying pans arrives, employees don't stack them in a designated shelf for frying pans. Rather, they stow each pan individually wherever it fits. Each pan's location is scanned into Amazon's inventory and becomes instantly available to any customer on the internet. When a customer orders the frying pan, Amazon's software searches across the company's more than 70 fulfillment centers for the one that can be delivered most cheaply, or most quickly. If it's located at the top of one of the 34-foot tall storage racks in a particular aisle of this center, the order shows up on the scanning gun of the nearest

“picker.” The picker’s forklift, guided by sensors communicating with wires in the floor, will lift him or her to the precise bin where the object is located.

Pickers transport those items in metal cages to the packing area, where computers tell packers precisely which size box to use, or transmits its dimensions to other devices that cut boxes out to customized size. Once packed by Ms. Duperre and her colleagues, a box flies down a conveyor belt, over a scale that double checks its weight and contents, then under a scanner that prints and affixes a delivery label. Several hundred feet and a few seconds later, the boxes are automatically nudged off the conveyor belt in front of the truck destined for the customer’s town.



A worker builds custom-sized boxes at the Amazon fulfillment center. PHOTO: ADAM GLANZMAN FOR THE WALL STREET JOURNAL

Humans are used throughout the process in what are often physically demanding activities, but Amazon’s technology vastly multiplies how many items each can pick, pack and ship, all of which shaves minutes and costs off delivery. Incremental improvements and a growing network of fulfillment centers filter through to customers such as the ability to order as late as 11:59 p.m. and still qualify for two-day delivery.

It isn’t skilled work, and the wages reflect that. The starting salary at Fall River is \$13.05 to \$13.55 per hour. But including overtime, the Amazon shares every new employee receives, and benefits such as tuition aid, annual compensation is comparable to what local textile mills once paid, according to Kenneth Fiola, executive vice president of the city’s economic development office. It’s also more than traditional retail, which typically pays the state minimum wage of \$11.

“The vast majority of our workforce never had experience in a warehouse, never had any experience driving a forklift or powered industrial equipment, and we provide them that skill and training, we teach them the new retail,” says Andrew Sweatman, general manager at the fulfillment center.

Like Ms. Duperre, Tarrah Tripp also used to work in retail, as a cake decorator at a family-run grocery. At Amazon, she operates custom box-cutting machinery for awkwardly shaped items. It isn’t high-tech, but it uses more technology than her last job, she says, “unless you think cutting bread is technology intensive.” The pay is a bit better and she gets a full week’s worth of hours in four days, which gives her three days off every week. She doesn’t intend to spend her career here, and soon plans to train as a veterinary technician, for which Amazon will help pay the tuition.

For Fall River, Amazon’s arrival is bittersweet. While courting infamy—Lizzie Borden was accused of murdering her father and stepmother here—the city became a bustling center for textile manufacturing. The mills were a magnet to uneducated immigrants from France, Portugal and Poland and their children.

As recently as 1991, the city boasted 20,000 manufacturing jobs. But by 2015, that had fallen below 4,000, according to Mr. Fiola, as jobs were outsourced to the south and then overseas, or were automated. Unemployment is above 6%, higher than both the national and state average. Though Hillary Clinton beat Donald Trump in surrounding Bristol County by 9 percentage points last fall, that was one her worst showings in the solidly blue state and less than half Barack Obama’s winning margin four years earlier.

City leaders rolled out the red carpet for Amazon with generous tax incentives and a prime location on Innovation Way. Its arrival was the single biggest job creation event anyone could remember.



Fall River Mayor Jasiel F. Correia II says Amazon fills a gap left by layoffs in the textile industry. PHOTO: ADAM GLANZMAN FOR THE WALL STREET JOURNAL

“We had people with a skill set that was nontransferable,” says Jasiel F. Correia II, Fall River’s 25-year-old mayor and a first-generation child of immigrants from the former Portuguese territory of Cape Verde. “Where does a person who sewed textiles for 20 years go if they’re laid off? Places such as Amazon fill that gap,” he says. “They got a chance to work for a Fortune 500 company. This community doesn’t get those chances very often.”

While the e-commerce job boom is real, the question is whether it will last. Amazon and its ilk continue to seek ways to automate fulfillment. The company is exploring using drones, rather than people, to deliver packages, and is studying driverless vehicle technology. In 2012 Amazon bought robot manufacturer Kiva Systems, and it is working on robots to replace pickers.

Yet the day when Amazon needs fewer humans still appears far off. Its volume is growing so quickly it is adding employees. Thus far, the key benefit of robots deployed in Amazon’s fulfillment center in Baltimore is to reduce the demand for space, not labor: Inventory can be stored more closely together since robots now take items to where the pickers are, instead of pickers walking the aisles. The Baltimore center employs more than 3,500, up from 2,500 when it opened in 2015. At a one-day nationwide jobs fair last month, Amazon accepted 100,000 applications and has already made 40,000 job offers.

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