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Making It in America

IN THE PAST DECADE, THE FLOW OF GOODS EMERGING FROM U.S. FACTORIES HAS RISEN BY ABOUT A THIRD. FACTORY EMPLOYMENT HAS FALLEN BY ROUGHLY THE SAME FRACTION. THE STORY OF STANDARD MOTOR PRODUCTS, A 92-YEAR-OLD, FAMILY-RUN MANUFACTURER BASED IN QUEENS, SHEDS LIGHT ON BOTH PHENOMENA. IT'S A STORY OF HUSTLE, INGENUITY, COMPETITIVE SUCCESS, AND PROMISE FOR AMERICA'S ECONOMY. IT ALSO ILLUMINATES WHY THE JOBS CRISIS WILL BE SO DIFFICULT TO SOLVE.

By Adam Davidson

Image credit: Dean Kaufman

I FIRST MET MADELYN "Maddie" Parlier in the "clean room" of Standard Motor Products' fuel-injector assembly line in Greenville, South Carolina. Like everyone else, she was wearing a blue lab coat and a hairnet. She's so small that she seemed swallowed up by all the protective gear.

Tony Scalzitti, the plant manager, was giving me the grand tour, explaining how bits of metal move through a series of machines to become precision fuel injectors. Maddie, hunched forward and moving quickly from one machine to another, almost bumped into us, then shifted left and darted away. Tony, in passing, said, "She's new. She's one of our most promising Level 1s."

Also see:

Live Chat With Adam Davidson
The author will be answering questions about his article and American jobs on January 31 at 4 p.m. Click the link above for details.

Later, I sat down with Maddie in a quiet factory office where nobody needs to wear protective gear. Without the hairnet and lab coat, she is a pretty, intense woman, 22 years old, with bright blue eyes that seemed to bore into me as she talked, as fast as she could, about her life. She told me how much she likes her job, because she hates to sit still and there's always something going on in the factory. She enjoys learning, she said, and she's learned how to run a lot of the different machines. At one point, she looked around the office and said she'd really like to work there one day, helping to design parts rather than stamping them out. She said she's noticed that robotic arms and other machines seem to keep replacing people on the factory floor, and she's worried that this could happen to her. She told me she wants to go back to school—as her parents and grandparents keep telling her to do—but she is a single mother, and she can't leave her two kids alone at night while she takes classes.

I had come to Greenville to better understand what, exactly, is happening to manufacturing in the United States, and what the future holds for people like Maddie—people who still make physical things for a living and, more broadly, people (as many as 40 million adults in the U.S.) who lack higher education, but are striving for a middle-class life. We do still make things here, even though many people don't believe me when I tell them that. Depending on which stats you believe, the United States is either the No. 1 or No. 2 manufacturer in the world (China may have surpassed us in the past year or two). Whatever the country's current rank, its manufacturing output continues to grow strongly; in the past decade alone, output from American factories, adjusted for inflation, has risen by a third.

Yet the success of American manufacturers has come at a cost. Factories have replaced millions of workers with machines. Even if you know the rough outline of this story, looking at the Bureau of Labor Statistics data is still shocking. A historical chart of U.S. manufacturing employment shows steady growth from the end of the Depression until the early 1980s, when the number of jobs drops a little. Then things stay largely flat until about 1999. After that, the numbers simply collapse. In the 10 years ending in 2009, factories shed workers so fast that they erased almost all the gains of the previous 70 years; roughly one out of every three manufacturing jobs—about 6 million in total—disappeared. About as many people work in manufacturing now as did at the end of the Depression, even though the American population is more than twice as large today.

I came here to find answers to questions that arise from the data. How, exactly, have some American manufacturers continued to survive, and even thrive, as global competition has intensified? What, if anything, should be done to halt the collapse of manufacturing employment? And what does the disappearance of factory work mean for the rest of us?

Across America, many factory floors look radically different than they did 20 years ago: far fewer people, far more high-tech machines, and entirely different demands on the workers who remain. The still-unfolding story of manufacturing's transformation is, in many respects, that of our economic age. It's a story with much good news for the nation as a whole. But it's also one that is decidedly less inclusive than the story of the 20th century, with a less certain role for people like Maddie Parlier, who struggle or are unlucky early in life.

The Life and Times of Maddie Parlier

The Greenville Standard Motor Products plant sits just off I-85, about 100 miles southwest of Charlotte, North Carolina. It's a sprawling beige one-story building, surrounded by a huge tended lawn. Nearby are dozens of other similarly boxy factory buildings. Neighbors include a big Michelin tire plant, a nutrition-products factory, and, down the road, BMW's only car plant on American soil. Greenville is at the center of the 20-year-old manufacturing boom that's still taking place throughout the "New South." Nearby, I visited a Japanese-owned fiber-optic-material manufacturer, and a company that makes specialized metal parts for intercontinental ballistic missiles.

Standard makes and distributes replacement auto parts, known in the industry as "aftermarket" parts. Companies like Standard directly compete with Chinese firms for shelf space in auto-parts retail stores. This competition has intensified the pressure on all parts makers—American, Chinese, European. And of course it means that Maddie is, effectively, competing directly with workers in China who are willing to do similar work for much less money.

When Maddie says something important, something she wants you to really hear, she repeats it. She'll say it one time in a flat, matter-of-fact voice, and then again with a lot of upstate South Carolina twang.

"I'm a redneck," she'll say. "I'm a *reeeeeedneck*."

"I'm smart," she told me the first time we met. "There's no other way to say it. I am *smaaaart*. I am."

Maddie flips back and forth between being a stereotypical redneck and being awfully smart. She will say, openly, that she doesn't know all that much about the world outside of Easley, South Carolina, where she's spent her whole life. Since her childhood, she's seen Easley transform from a quiet country town to a busy suburb of Greenville. (It's now a largely charmless place, thick with chain restaurants and shopping centers.) Maddie was the third child born to her young mother, Heather. Her father left when Maddie was young, never visited again, and died after he drove drunk into a car carrying a family of four, killing all of them as well.

Until her senior year of high school, Maddie seemed to be headed for the American dream—a college degree and a job with a middle-class wage. She got good grades, and never drank or did drugs or hung out with the bad kids. For the most part, she didn't hang out with anybody outside her family; she went to school, went home, went to church on Sundays. When she was 17, she met a boy who told her she should make friends with other kids at school. He had an easy way with people and he would take Maddie to Applebee's and cookouts and other places where the cool kids hung out. He taught her how to fit in, and he told her she was pretty.

Maddie's senior year started hopefully. She had finished most of her high-school requirements and was taking a few classes at nearby Tri-County Technical College. She planned to go to a four-year college after graduation, major in criminal justice, and become an animal-control officer. Around Christmas, she found out she was pregnant. She did finish school and, she's proud to say, graduated with honors. "On my graduation, I was six months pregnant," she says. "*Six months*." The father and Maddie didn't stay together after the birth, and Maddie couldn't afford to pay for day care while she went to college, so she gave up on school and eventually got the best sort of job available to high-school graduates in the Greenville area: factory work.

If Maddie had been born in upstate South Carolina earlier in the 20th century, her working life would have been far more secure. Her 22 years overlap the final collapse of most of the area's once-dominant cotton mills and the birth of an advanced manufacturing economy. Hundreds of mills here once spun raw cotton into thread and then wove and knit the thread into clothes and textiles. For about 100 years, right through the 1980s and into the 1990s, mills in the Greenville area had plenty of work for people willing to put in a full day, no matter how little education they had. But around the time Maddie was born, two simultaneous transformations hit these workers. After NAFTA and, later, the opening of China to global trade, mills in Mexico and China were able to produce and ship clothing and textiles at much lower cost, and mill after mill in South Carolina shut down. At the same time, the mills that continued to operate were able to replace their workers with a new generation of nearly autonomous, computer-run machines. (There's a joke in cotton country that a modern textile mill employs only a man and a dog. The man is there to feed the dog, and the dog is there to keep the man away from the machines.)

Other parts of the textile South have never recovered from these two blows, but upstate South Carolina—thanks to its proximity to I-85, and to foresighted actions by community leaders—attracted manufacturers of products far more complicated than shirts and textiles. These new plants have been a godsend for the local economy, but they have not provided the sort of wide-open job opportunities that the textile mills once did. Some workers, especially those with advanced manufacturing skills, now earn higher wages and have more opportunity, but there are not enough jobs for many others who, like Maddie, don't have training past high school.

Maddie got her job at Standard through both luck and hard work. She was temping for a local agency and was sent to Standard for a three-day job washing walls in early 2011. "People came up to me and said, 'You have to hire that girl—she is working so hard,'" Tony Scalzitti, the plant manager, told me. Maddie was hired back and assigned to the fuel-injector clean room, where she continued to impress people by working hard, learning quickly, and displaying a good attitude. But, as we'll see, this may be about as far as hustle and personality can take her. In fact, they may not be enough even to keep her where she is.

The Transformation of the Factory Floor

To better understand Maddie's future, it's helpful, first, to ask: Why is anything made in the United States? Why would any manufacturing company pay American wages when it could hire someone in China or Mexico much more cheaply?

I came to understand this much better when I learned how Standard makes fuel injectors, the part that Maddie works on. Like so many parts of the modern car engine, the fuel injector seems mundane until you sit down with an engineer who can explain how amazing it truly is.

A fuel injector is a bit like a small metal syringe, spraying a tiny, precise mist of gasoline into the engine in time for the spark plug to ignite the gas. The small explosion that results pushes the piston down, turning the crankshaft and propelling the car. Fuel injectors have replaced the carburetor, which, by comparison, sloppily sloshed gasoline around the engine. They became common in the 1980s, helping to solve a difficult engineering problem: how to make cars more efficient (and meet ever-tightening emission standards) without sacrificing power or performance.

To achieve maximum efficiency and power, a car's computer receives thousands of signals every second from sensors all over the engine and body. Based on the car's speed, ambient temperature, and a dozen other variables, the computer tells a fuel injector to squirt a precise amount of gasoline (anywhere from one to 100 10,000ths of an ounce) at the instant that the piston is in the right position (and anywhere from 10 to 200 times a second). For this to work, the injector must be perfectly constructed. When squirting gas, the syringe moves forward and back a total distance of 70 microns—about the width of a human hair—and a microscopic imperfection in the metal, or even a speck of dust, will block the movement and disable the injector. The tip of the plunger—a ball that meets a conical housing to create a seal—has to be machined to a tolerance of a quarter micron, or 10 millionths of an inch, about the size of a virus. That precision explains why fuel injectors are likely to be made in the United States for years to come. They require up-to-date technology, strong quality assurance, and highly skilled workers, all of which are easier to find in the United States than in most factories in low-wage countries.

The main factory floor of Standard's Greenville plant is, at first, overwhelming. It has the feel of a very crowded high-school gym: a big space with high ceilings but not a lot of light, a gray cement floor that's been around for a long time, and row after row of machines, going back farther than the eye can see, some the size of a washing machine, others as big as a small house. The first two machines, in the first row as you enter, are the newest: the Gildemeister seven-axis turning machines, two large off-white boxes each about the size of a small car turned on its side. Costing just under half a million dollars apiece, they gleam next to all the older machines. Inside each box is a larger, more precise version of the lathe you'd find in any high-school metal shop: a metal rod is spun rapidly while a cutting tool approaches it to cut at an exact angle. A special computer language tells the Gildemeisters how fast to spin and how close to bring the cutting tool to the metal rod.

A few decades ago, "turning machines" like these were operated by hand; a machinist would spin one dial to move the cutting tool large distances and another dial for smaller, more precise positioning. A good machinist didn't need a lot of book smarts, just a steady, confident hand and lots of experience. Today, the computer moves the cutting tool and the operator needs to know how to talk to the computer.

Luke Hutchins is one of Standard's newest skilled machinists. He is somewhat shy and talks quietly, but when you listen closely, you realize he's constantly making wry, self-deprecating observations. He's 27, skinny in his dark-blue jacket and jeans. When he was in his teens, his parents told him, for reasons he doesn't remember, that he should become a dentist. He spent a semester and a half studying biology and chemistry in a four-year college and decided it wasn't for him; he didn't particularly care for teeth, and he wanted to do something that would earn him money right away. He transferred to Spartanburg Community College hoping to study radiography, like his mother, but that class was full. A friend of a friend told him that you could make more than $30 an hour if you knew how to run factory machines, so he enrolled in the Machine Tool Technology program.

At Spartanburg, he studied math—a lot of math. "I'm very good at math," he says. "I'm not going to lie to you. I got formulas written down in my head." He studied algebra, trigonometry, and calculus. "If you know calculus, you definitely can be a machine operator or programmer." He was quite good at the programming language commonly used in manufacturing machines all over the country, and had a facility for three-dimensional visualization—seeing, in your mind, what's happening inside the machine —a skill, probably innate, that is required for any great operator. It was a two-year program, but Luke was the only student with no factory experience or vocational school, so he spent two summers taking extra classes to catch up.

After six semesters studying machine tooling, including endless hours cutting metal in the school workshop, Luke, like almost everyone who graduates, got a job at a nearby factory, where he ran machines similar to the Gildemeisters. When Luke got hired at Standard, he had two years of technical schoolwork and five years of on-the-job experience, and it took one more month of training before he could be trusted alone with the Gildemeisters. All of which is to say that running an advanced, computer-controlled machine is extremely hard. Luke now works the weekend night shift, 6 p.m. to 6 a.m., Friday, Saturday, and Sunday.

When things are going well, the Gildemeisters largely run themselves, but things don't always go well. Every five minutes or so, Luke takes a finished part to the testing station—a small table with a dozen sets of calipers and other precision testing tools—to make sure the machine is cutting "on spec," or matching the requirements of the run. Standard's rules call for a random part check at least once an hour. "I don't wait the whole hour before I check another part," Luke says. "That's stupid. You could be running scrap for the whole hour."

Luke says that on a typical shift, he has to adjust the machine about 20 times to keep it on spec. A lot can happen to throw the tolerances off. The most common issue is that the cutting tool gradually wears down. As a result, Luke needs to tell the computer to move the tool a few microns closer, or make some other adjustment. If the operator programs the wrong number, the tool can cut right into the machine itself and destroy equipment worth tens of thousands of dollars.

Luke wants to better understand the properties of cutting tools, he told me, so he can be even more effective. "I'm not one of the geniuses on that. I know a little bit. A lot of people go to school just to learn the properties of tooling." He also wants to learn more about metallurgy, and he's especially eager to study industrial electronics. He says he will keep learning for his entire career.

In many ways, Luke personifies the dramatic shift in the U.S. industrial labor market. Before the rise of computer-run machines, factories needed people at every step of production, from the most routine to the most complex. The Gildemeister, for example, automatically performs a series of operations that previously would have required several machines—each with its own operator. It's relatively easy to train a newcomer to run a simple, single-step machine. Newcomers with no training could start out working the simplest and then gradually learn others. Eventually, with that on-the-job training, some workers could become higher-paid supervisors, overseeing the entire operation. This kind of knowledge could be acquired only on the job; few people went to school to learn how to work in a factory.

Today, the Gildemeisters and their ilk eliminate the need for many of those machines and, therefore, the workers who ran them. Skilled workers now are required only to do what computers can't do (at least not yet): use their human judgment. This change is evident in the layout of a factory. In the pre-computer age, machines were laid out in long rows, each machine tended constantly by one worker who was considered skilled if he knew the temperament of his one, ornery ward. There was a quality-assurance department, typically in a lab off the factory floor, whose workers occasionally checked to make sure the machinists were doing things right. At Standard, today, as at most U.S. factories, machines are laid out in cells. One skilled operator, like Luke, oversees several machines, performing on-the-spot quality checks and making appropriate adjustments as needed.

The combination of skilled labor and complex machines gives American factories a big advantage in manufacturing not only precision products, but also those that are made in small batches, as is the case with many fuel injectors. Luke can quickly alter the program in a Gildemeister's computer to switch from making one kind of injector to another. Standard makes injectors and other parts for thousands of different makes and models of car, fabricating and shipping in small batches; Luke sometimes needs to switch the type of product he's making several times in a shift. Factories in China, by contrast, tend to focus on long runs of single products, with far less frequent changeovers.

It's no surprise, then, that Standard makes injectors in the U.S. and employs high-skilled workers, like Luke. It seems fairly likely that Luke will have a job for a long time, and will continue to make a decent wage. People with advanced skills like Luke are more important than ever to American manufacturing.

But why does Maddie have a job? In fact, more than half of the workers on the factory floor in Greenville are, like Maddie, classified as unskilled. On average, they make about 10 times as much as their Chinese counterparts. What accounts for that?

The Remnant Workforce

Tony Scalzitti, the factory manager, guides me through the logic of Maddie's employment. He's bookish and thoughtful—nothing like my mental image of a big, hulking factory manager. Trained as an engineer, he is constantly drawing charts and making lists as he talks, in order to explain modern American manufacturing. Sitting at a table in his office in the administrative area off the factory floor, Tony takes out a pen and writes down the definitions.

"Unskilled worker," he narrates, "can train in a short amount of time. The machine controls the quality of the part."

"High-skill worker," on the other hand, "can set up machines and make a variety of small adjustments; they use their judgment to assure product quality."

To show me the difference between the two, Tony takes me from Luke's station through an air lock and into Standard's bright-white clean room—about a quarter the size of the dirtier, louder factory floor—where dozens of people in booties, hairnets, and smocks, most of them women, stand at a series of workstations.

Tony points out that most of the factory's parts go through roughly the same process. Metal is cut into a precise shape in the "unclean" part of the factory and is then washed in a huge industrial washing machine to remove any bits of dirt, flakes of skin, or other contaminants, and, pristine, enters the clean room. Here, machines build the outer housing of the fuel injector, the part that is open to the engine and doesn't require anything like the precision of the inner workings.

The injectors progress through a series of stations, at each of which an unskilled worker and a simple machine perform one task. The machines here are much smaller, and are in one key respect the opposite of the Gildemeisters; these machines can work in only one way and require little judgment from the operator. This is not a throwback to the old system, in which workers manually ran single-purpose machines. This new technology is the other side of the computer revolution in manufacturing. Computers eliminate the need for human discretion; the person is there only to place the parts and push a button.

Take Maddie's station. She runs the laser welding machine, which sounds difficult and dangerous, but is neither. The laser welder is tiny, more like a cigarette lighter than like something you might aim at a Klingon. Maddie receives a tray of sealed injector interiors, and her job is to weld on a cap. The machine looks a little like a microscope; she puts the injector body in a hole in the base, and the cap in a clamp where the microscope lens would be. The entire machine—like most machines in the clean room—sits inside a large metal-and-plexiglass box with sensors to make sure that Maddie removes her hands from the machine before it runs. Once Maddie inserts the two parts and removes her hands, a protective screen comes down, and a computer program tells the machine to bring the cap and body together, fire its tiny beam, and rotate the part to create a perfect seal. The process takes a few seconds. Maddie then retrieves the part and puts it into another simple machine, which runs a test to make sure the weld created a full seal. If Maddie sees a green light, the part is sent on to the next station; if she sees a red or yellow light, the part failed and Maddie calls one of the skilled techs, who will troubleshoot and, if necessary, fix the welding machine.

The last time I visited the factory, Maddie was training a new worker. Teaching her to operate the machine took just under two minutes. Maddie then spent about 25 minutes showing her the various instructions Standard engineers have prepared to make certain that the machine operator doesn't need to use her own judgment. "Always check your sheets," Maddie says.

By the end of the day, the trainee will be as proficient at the laser welder as Maddie. This is why all assembly workers have roughly the same pay grade—known as Level 1—and are seen by management as largely interchangeable and fairly easy to replace. A Level 1 worker makes about $13 an hour, which is a little more than the average wage in this part of the country. The next category, Level 2, is defined by Standard as a worker who knows the machines well enough to set up the equipment and adjust it when things go wrong. The skilled machinists like Luke are Level 2s, and make about 50 percent more than Maddie does.

For Maddie to achieve her dreams—to own her own home, to take her family on vacation to the coast, to have enough saved up so her children can go to college—she'd need to become one of the advanced Level 2s. A decade ago, a smart, hard-working Level 1 might have persuaded management to provide on-the-job training in Level-2 skills. But these days, the gap between a Level 1 and a 2 is so wide that it doesn't make financial sense for Standard to spend years training someone who might not be able to pick up the skills or might take that training to a competing factory.

It feels cruel to point out all the Level-2 concepts Maddie doesn't know, although Maddie is quite open about these shortcomings. She doesn't know the computer-programming language that runs the machines she operates; in fact, she was surprised to learn they are run by a specialized computer language. She doesn't know trigonometry or calculus, and she's never studied the properties of cutting tools or metals. She doesn't know how to maintain a tolerance of 0.25 microns, or what *tolerance* means in this context, or what a micron is.

Tony explains that Maddie has a job for two reasons. First, when it comes to making fuel injectors, the company saves money and minimizes product damage by having both the precision and non-precision work done in the same place. Even if Mexican or Chinese workers could do Maddie's job more cheaply, shipping fragile, half-finished parts to another country for processing would make no sense. Second, Maddie is cheaper than a machine. It would be easy to buy a robotic arm that could take injector bodies and caps from a tray and place them precisely in a laser welder. Yet Standard would have to invest about $100,000 on the arm and a conveyance machine to bring parts to the welder and send them on to the next station. As is common in factories, Standard invests only in machinery that will earn back its cost within two years. For Tony, it's simple: Maddie makes less in two years than the machine would cost, so her job is safe—for now. If the robotic machines become a little cheaper, or if demand for fuel injectors goes up and Standard starts running three shifts, then investing in those robots might make sense.

"What worries people in factories is electronics, robots," she tells me. "If you don't know jack about computers and electronics, then you don't have anything in this life anymore. One day, they're not going to need people; the machines will take over. People like me, we're not going to be around forever."

The Fragility of Industrial Profit

It's tempting to look to the owners of Standard Motor Products and ask them to help Maddie out: to cut costs a little less relentlessly, take slightly lower profits, and maybe even help solve America's jobs crisis in some small way.

I tracked down the people who run Standard to put this possibility to them. I was surprised to learn they were based in Long Island City, Queens, a quick subway ride from my house.

Standard's headquarters is in the same massive but elegant Art Deco building, curving along Northern Boulevard, that has been its home since 1936. Until the late 1990s, Standard made many of its auto parts here as well; the company filled the six floors with machinery and workers. But running a factory in New York City is expensive and filled with logistical hassles, and over time, these problems became more severe. As early as the 1960s, the company had begun to move some production to lower-cost locations: Puerto Rico; Independence, Kansas; Grapevine, Texas; Mexico; Poland; and, of course, Greenville. The last part made in Queens—a distributor—came off the line in 2008. The building was sold soon after and is now home to a variety of small offices and an art gallery. Senior executives of Standard Motor Products and a host of engineers and salespeople occupy much of the second and sixth floors.

Larry Sills, age 72, is nothing like what I imagined the CEO of one of America's largest aftermarket auto-parts companies would look like. His easy smile, scattered curiosity, and rumpled look seem more characteristic of a college professor. His hair—thick, brown, and tightly curled—looks almost like a joke wig sitting on his head. I met him in his large office—dominated by his wife's paintings and mementos of their time in Africa—and asked him about his business. But before he got into that, he said he wanted to show off the crazy thing up on the roof, an organic farm: some young hipsters had brought 650 tons of dirt to start it. ("That was scary," Larry says. "We didn't know if the building could hold it.") They grow fresh vegetables and have a farmers' market every Wednesday. "Sometimes someone gets a bit excited with a pitchfork and cuts through our roof and we got water on a desk. But I love it. I love it."

Larry was born into Standard Motor Products. The company was founded by his grandfather, Elias Fife, a Jewish immigrant from Lithuania who knew nothing about cars but saw an opportunity, in 1919, when he learned that many people were frustrated with Ford and the other car manufacturers because they never made enough replacement parts, since all the money was in building new cars. The tiny aftermarket auto-parts industry was a mess: countless mechanics and hobbyists made parts by hand in their garages, and many of these parts didn't fit or would break. Fife decided to build a trustworthy, reliable brand whose products met or exceeded the quality of the original parts.

Elias worked until he died, at which point his son, Bernard, and son-in-law, Nathaniel Sills, took over the company. Larry, Nathaniel's son, was never particularly interested in cars and dreamed of being a reporter for *The New York Times*. He spent a few years as a country manager for Pfizer in Ghana, where he had some adventures. But by 1967, he knew it was time to come home and start work at Standard. "Nobody ever told me I had to," he says. "I just knew it was expected." He's never regretted that decision, he told me.

When Larry came to work, the aftermarket had matured since its wild early years, but was still a fairly sleepy business. Standard was one of hundreds of aftermarket manufacturers and distributors, many still owned by the founder, in many cases an immigrant, or his children. These companies sold to thousands of small garages or distribution warehouses, many also run by old families that the Sillses had known for years. It was rare for a customer to demand lower prices or to stop buying from Standard altogether. Even if one did, the bottom line didn't suffer all that much.

"Our biggest customer was about 1 percent of our business," Larry says. "That's changed. Now, our biggest four customers are more than 50 percent of our business."

As Autozone, Napa, and other huge auto-parts stores expanded their reach, they used the bargaining power that comes with size to pressure companies like Standard to lower their prices. Failure to do so could cost them the chain stores' business, which could mean bankruptcy. Larry says this new price pressure came exactly when many of his old friends in the parts trade were retiring and couldn't persuade their kids to join the business. Throughout the 1970s, '80s, and '90s, dozens of Larry's old friends and competitors gave up and sold out. Larry's son, Eric, decided to work at Standard after college and now runs many of the company's manufacturing operations.

As his friendly competitors retired, Larry bought many of their companies. He paid for these acquisitions by borrowing money or selling more company shares. For years, Standard had been, technically, a publicly traded company, but since the Sills and Fife families owned most of the stock, it had been run more like a family business. But eventually, to fund acquisitions, the families gave up majority ownership. They now hold less than 10 percent of the company stock.

Standard might have grown too quickly. The company was deeply in debt in 2009 when the financial markets seized up. Like countless companies during that chaotic time, Standard couldn't raise enough money to pay off the bonds it had already sold. Larry began to fear bankruptcy. "It was awful," he says. "The only time in my career I lay awake worrying."

Acting quickly, he sold the building in Queens, laid off 10 percent of the administrative staff, and cut costs everywhere he could. Standard did survive, of course, and is actually doing quite well now. Larry paid off most of the debt, and by concentrating on what the company is best at, he has increased its profits. Economic slowdowns are, perhaps paradoxically, a good time for the aftermarket auto-parts business. Many people delay the purchase of a new car, instead replacing parts on their old one.

While the business is doing well today, "the main thing I think about is survival," Larry says. Standard is now the last of the old breed of family-run companies. Its stock is worth about $400 million, which is far more than Larry's grandfather would have dreamed of; but that's only a small fraction of the market value of Bosch, Denso, or NGK—three of the big, global parts suppliers the company competes with.

To keep the business of the giant auto-parts retailers, Standard has to constantly lower costs while maintaining quality. High quality is impossible without good raw materials, which Standard has to buy at market rates. The massive global conglomerates, like Bosch, might be able to command discounts when buying, say, specially formulated metals; but Standard has to pay the prevailing price, and for years now, that price has been rising. That places an even higher imperative on reducing the cost of labor. If Standard paid unskilled workers like Maddie more or hired more of them, Larry says, the company would have to charge its customers more or accept lower profits. Either way, Standard would collapse fairly soon. (Industrial profit margins are notoriously thin to begin with—typically in the low single digits—and reduced profits or losses would drive down Standard's stock price, making it a likely target for predatory acquisition.)

The Continual Offshoring Calculus

I came to think of Standard Motor Products as an enormous machine that regularly scans every tiny part of every engine in every car on the streets of the United States to answer two closely related questions: What makes sense to manufacture here in the U.S., and what should be made in a low-wage country, like Mexico or China?

Standard's customers, the big auto-retail stores and wholesalers, see the company more as a distributor than as a manufacturer. They expect Standard to be able to deliver any part in its categories—known as engine management and temperature control—to any place in the U.S. in less than 48 hours. Standard doesn't sell the big stuff—batteries, engine blocks—but it does sell many of the cables and sensors and electrical components that surround those large things. If you look at your car's engine, Standard has, in stock, many of the small parts that you can't identify—for your car and for every other make and model with more than 10,000 vehicles on American roads. Standard's enormous warehouse in Disputanta, Virginia, has tens of thousands of different sorts of parts ready to ship at any moment.

Standard makes only about half of the parts it stocks; it buys the rest from other manufacturers, most of them in China. The company's engineers are constantly reviewing the parts they buy, to see whether they could make the parts more cheaply in-house. Not infrequently, Standard finds that by doing so it can control costs, quality, and delivery speed far better, and thus can better serve the superstores.

I sat in on a meeting between two engineers—the tall and talkative John Gasiewski, and the shorter, less outgoing Marty Doelger—who were reviewing a new batch of crankshaft-position sensors, tiny parts that monitor precisely where in its rotation a crankshaft is at any microsecond.

Marty dumps a box of the sensors—each about the size of a thumb drive—on the table. The new sensor that General Motors uses is a no-brainer, he says: of course Standard should make it. More than 3.5 million cars on the road are equipped with this family of sensors, and many of those cars are brand-new, which means this business will be huge, peaking many years from now. “We’ll be selling a lot of these in 2018,” John says, smiling.

The sensor is made up of a magnet and coil inside a plastic housing attached to a mounting bracket. Its size can vary considerably without causing any problems in the engine, and for that and other reasons, John says, its manufacture requires nothing like the precision needed for making a fuel injector, so it doesn’t need to be made on the most expensive machinery by the most highly skilled workers. The part’s mounting bracket is even less precise. “Feel it,” Marty says. “It’s rough. They just shear it. There’s no precision at all.” So while Standard will make this part, it will do so at its plant in Reynosa, Mexico.

A few months ago, in a meeting like this one, Standard engineers evaluated a type of ignition coil—the tiny voltage transformer that sits on top of a spark plug and converts the battery’s 12 volts into the 30,000 volts needed to fire a spark. It’s a precision part, since the wires on the coil need to be wrapped just so, and Standard was at the time manufacturing the coil in Greenville. Recently, though, the plant Standard owns in Bialystok, Poland, had been impressing the company’s top engineers, and the production of some of these coils will be moving there. “Poland is also low-cost, and they’ve got some really qualified engineers,” Larry says. “They do good work.”

These meetings can lead the company to move dozens of jobs to another country or, in some cases, to create new jobs in the U.S. When Standard decided to increase its fuel-injector production, it chose to do that in the U.S., and staffed up accordingly (that’s how Maddie got her job). Standard will not drop a line in the U.S. and begin outsourcing it to China for a few pennies in savings. “I need to save a lot to go to China,” says Ed Harris, who is in charge of identifying new manufacturing sources in Asia. “There’s a lot of hassle: shipping costs, time, Chinese companies aren’t as reliable. We need to save at least 40 percent off the U.S. price. I’m not going to China to save 10 percent.” Yet often, the savings are more than enough to offset the hassles and expense of working with Chinese factories. Some parts—especially relatively simple ones that Standard needs in bulk—can cost 80 percent less to make in China.

Nearly every manufacturing company in the U.S. goes through this same process: regularly, carefully studying its products to see if they could be made more cheaply in a lower-wage country. The calculation constantly changes, because the world changes. Sometimes that’s bad news for American industrial workers, other times it’s good news. Workers in China and Poland and Mexico, for example, have become more highly skilled, and their factories are now able to produce more-precise goods than they could a decade ago. But at the same time, the wages of those workers have risen, as have shipping costs. Unrest in northern Mexico or an oil-price spike caused by trouble in the Middle East can encourage manufacturers to keep production lines in the United States. The development of increasingly complex machinery can do the same: because expensive machines are more likely to pay off when they can be counted on to run 24 hours a day, every day, the availability of steady electricity, for instance, is essential.

Yet however chaotic and contradictory these forces can be at any moment, over the years and decades they point in one direction: toward fewer jobs for low-skilled American workers. People who can be replaced by machines or lower-paid workers somewhere else, eventually will be. Unless people like Maddie learn how to do things that computers and overseas workers aren't able to do, they are likely to lose their jobs one day.

Workers' Paradise?

Since at least the 1970s, when the farsighted could see the consequences of Japan's rising manufacturing power, some observers have declared a crisis in American manufacturing, and have called for the federal government to fix it. Some suggestions, such as higher tariffs or fewer free-trade agreements, have been politically attractive but economically unconvincing. (Retreating from global trade might help save some manufacturing jobs in the short term, but at the cost of making the entire country poorer.) Other proposals have been self-serving and unlikely to have much impact, like subsidies and tax cuts for manufacturers (the benefits of which go disproportionately to the owners of factories, not to the workers, who still must compete with legions of ever-cheaper robots). Probably the most popular rallying cry lately has been the demand that China stop interfering with currency markets. Just about every economist would argue that China should stop artificially cheapening its currency, but getting it to do so would not dramatically increase low-skill manufacturing employment in the U.S. Most analyses show that in response to a rising yuan, American manufacturing companies would more likely shift production to other low-wage countries—like Indonesia, Bangladesh, or Mexico—than to U.S. factories.

Is there a crisis in manufacturing in America? Looking just at the dollar value of manufacturing output, the answer seems to be an emphatic no. Domestic manufacturers make and sell more goods than ever before. Their success has been grounded in incredible increases in productivity, which is a positive way of saying that factories produce more with fewer workers.

Productivity, in and of itself, is a remarkably good thing. Only through productivity growth can the average quality of human life improve. Because of higher agricultural productivity, we don't all have to work in the fields to make enough food to eat. Because of higher industrial productivity, few of us need to work in factories to make the products we use. In theory, productivity growth should help nearly everyone in a society. When one person can grow as much food or make as many car parts as 100 used to, prices should fall, which gives everyone in that society more purchasing power; we all become a little richer. In the economic models, the benefits of productivity growth should not go just to the rich owners of capital. As workers become more productive, they should be able to demand higher salaries.

Throughout much of the 20th century, simultaneous technological improvements in both agriculture and industry happened to create conditions that were favorable for people with less skill. The development of mass production allowed low-skilled farmers to move to the city, get a job in a factory, and produce remarkably high output. Typically, these workers made more money than they ever had on the farm, and eventually, some of their children were able to get enough education to find less-dreary work. In that period of dramatic change, it was the highly skilled craftsperson who was more likely to suffer a permanent loss of wealth. Economists speak of the middle part of the 20th century as the "Great Compression," the time when the income of the unskilled came closest to the income of the skilled.

The double shock we're experiencing now—globalization and computer-aided industrial productivity—happens to have the opposite impact: income inequality is growing, as the rewards for being skilled grow and the opportunities for unskilled Americans diminish.

I went to South Carolina, and spent so much time with Maddie, precisely because these issues are so large and so overwhelming. I wanted to see how this shift affected regular people's lives. I didn't come away with a handy list of policies that would solve all the problems of unskilled workers, but I did note some principles that seem important to improving their situation.

It's hard to imagine what set of circumstances would reverse recent trends and bring large numbers of jobs for unskilled laborers back to the U.S. Our efforts might be more fruitfully focused on getting Maddie the education she needs for a better shot at a decent living in the years to come. Subsidized job-training programs tend to be fairly popular among Democrats and Republicans, and certainly benefit some people. But these programs suffer from all the ills in our education system; opportunities go, disproportionately, to those who already have initiative, intelligence, and—not least—family support.

I never heard Maddie blame others for her situation; she talked, often, about the bad choices she made as a teenager and how those have limited her future. I came to realize, though, that Maddie represents a large population: people who, for whatever reason, are not going to be able to leave the workforce long enough to get the skills they need. Luke doesn't have children, and his parents could afford to support him while he was in school. Those with the right ability and circumstances will, most likely, make the right adjustments, get the right skills, and eventually thrive. But I fear that those who are challenged now will only fall further behind. To solve all the problems that keep people from acquiring skills would require tackling the toughest issues our country faces: a broken educational system, teen pregnancy, drug use, racial discrimination, a fractured political culture.

This may be the worst impact of the disappearance of manufacturing work. In older factories and, before them, on the farm, there were opportunities for almost everybody: the bright and the slow, the sociable and the awkward, the people with children and those without. All came to work unskilled, at first, and then slowly learned things, on the job, that made them more valuable. Especially in the mid-20th century, as manufacturing employment was rocketing toward its zenith, mistakes and disadvantages in childhood and adolescence did not foreclose adult opportunity.

For most of U.S. history, most people had a slow and steady wind at their back, a combination of economic forces that didn't make life easy but gave many of us little pushes forward that allowed us to earn a bit more every year. Over a lifetime, it all added up to a better sort of life than the one we were born into. That wind seems to be dying for a lot of Americans. What the country will be like without it is not quite clear.

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