



BMW's new body shop contains 2,000 robots.

LEARNING IN THE FAST LANE

BMW's South Carolina plant is expanding its apprenticeship program in an attempt to grow a tech-savvy workforce

By Helen Fessenden

Dale Phillips, a night-shift maintenance supervisor at BMW's plant in Spartanburg, S.C., is busy balancing a full-time job with online coursework to complete a bachelor's degree in management. He oversees a team of equipment-services associates in the plant's paint shop, whose duties include preventing equipment breakdowns in the conveyors, lifts, pumps, and industrial robots. He says he never envisioned such a career until four years ago, when he started at the plant as an apprentice after spending most of his 20s and 30s as a grocery store manager.

"When I was 17 or 18, I was frustrated about what I was going to do after high school," explains Phillips. "I didn't have any guidance and didn't know how you prepare yourself for a good job. You just took whatever work you could find. But now I'm in a high-tech job, working as a supervisor. This is something I never even thought of."

Phillips is a graduate of the BMW Scholars program, an initiative that the company began in 2011 to secure a steady pipeline of high-skilled workers for its South Carolina operation. Modeled after European apprenticeships, it now trains about 35 workers a year in a partnership with local community colleges. Ninety-nine percent of them join the company full time upon completion, and that success rate is one reason why BMW is now planning to expand the program

to 200 a year. It's also part of a broader effort to ramp up hiring: By 2021, BMW is expected to add another 1,000 workers to its current workforce of 10,000, while it aims to add a fifth model to its production lineup, the new BMW X7.

BMW's use of apprentices — a practice common in many other countries but still unusual in the United States — is only one reason the plant stands out. It's also the largest auto plant in the firm's global operations and one of the longest standing foreign-owned automakers, operating in the South since 1994. (See "When South Carolina Met BMW," *Region Focus*, Second Quarter 2011.) About 70 percent of its vehicles are exported, with most going through the Port of Charleston, a logistical advantage that was key for BMW when it was scouting locations. But like many other carmakers, its operations are increasingly high tech, relying on robots for what was once manual labor and on humans for the more complex and digitized tasks. The goal of the Scholars program, says its manager Ryan Childers, is to train workers to learn the required mix of "soft" and "hard" skills.

"You need to function in a team environment with both robot and human co-workers," he says. "This requires electrical and mechanical training, often some algebra or statistics, and IT know-how. It's a new level of being multiskilled."

PHOTOGRAPHY: FRED ROLLISON

Make Me a Match

Can the BMW Scholars experiment offer broader lessons for the United States? Spokesman Steve Wilson says the firm's overall worker retention rates are "very good," and he describes the Scholars program — which focuses on targeted and effective recruitment starting at the high school level — as one way to reduce the need to constantly replenish its skilled workforce. It's one approach that addresses a common and growing concern among firms in the region that a shortage of skilled workers is serving as an impediment to further hiring.

Both in academic research and at the policy level, apprenticeships are getting more attention as one possible solution to what is often termed a "skills mismatch" in the U.S. labor market, namely, a perception among employers that skilled labor is in short supply. The makeup of the U.S. job market has shifted in the last decade to reflect higher demand for workers with college education. According to the Bureau of Labor Statistics, over the last decade the share of employment in occupations requiring only a high school degree has fallen while the share of those requiring college has risen. One challenge, however, is that only around 70 percent of high school graduates go to college, and only around 57 percent of college freshmen complete their degree within six years; among students seeking certificates and associate degrees, completion rates are even lower. And more broadly, the rise in U.S. college attainment has been much more sluggish in recent years compared with the 2000s, especially among men.

Apprenticeships, as some economists see them, have several features that could help address skill mismatch. They can "fast track" workers (often from high school) to full-time employment in less time than a college education, as well as teach applied skills that are career-specific. And even though participating firms in "apprenticeship countries" often bear some upfront costs by paying for the apprentices' education, they can use the experience to better gauge potential over time before deciding to hire.

Harry Holzer, a senior fellow at the Brookings Institution and former chief economist at the U.S. Labor Department, points to another potential benefit of apprenticeships: They can train workers for what he terms jobs in "the new middle," ones that used to require only a high school degree but now demand more advanced technical and cognitive skills (such as health technicians and paralegals). In a 2015 paper, he concluded that the share of such positions among total jobs rose by 0.8 percentage point from 2000 to 2013, while the share of what he calls "old middle" jobs fell by 3.3 percentage points.

"If you look at sectors where employers have difficulty filling jobs, it's in health care, advanced manufacturing, IT, and transportation logistics," he says. "You don't need a college degree, but you do need something beyond high school. The 'old middle' jobs in fields like traditional manufacturing and clerical work do not. And that's where jobs are disappearing and wages are shrinking."

Lessons From Abroad

Apprenticeships have long been established abroad, especially in Northern Europe. In those nations, upon high school completion, more young people — sometimes more than half of the total — choose apprenticeships over a university degree. While these programs vary from country to country, they typically require a young adult to apply to train with a firm upon graduation from high school. The apprentice then combines part-time work with part-time study at a local university and, over the course of three to four years, completes both the workplace training and the equivalent of an associate's degree; the combination of practical experience and coursework is known as the "dual system." The coursework relates directly to the job, and the trainee contributes to the firm's production and is paid, albeit at a low wage. The tuition is usually paid for by the state, the employer, or both.

When trainees in the dual system graduate, they become broadly employable because they secure a certification that is universally recognized in their field. These certifications encompass a wide range of middle-class jobs, often in technical or specialized professions. Many graduates are also offered a job at the firm, but the certification enables them to search beyond if they choose; in Germany, for example, about half take a job elsewhere.

Does this alternative to college make a difference in labor market outcomes? Economists who have studied the European job market note that youth employment rates are much higher in countries that have well-established apprenticeships — for example, Germany, Austria, and Switzerland — than in those that do not, mostly in the south. Those rates range between 40 percent and 60 percent of 15- to 24-year-olds in the former and between 15 percent and 30 percent in the latter, according to the Organisation for Economic Co-operation and Development (a gap that, to be sure, also reflects other differences among those economies). Young people in apprenticeship countries are also far less likely to be unattached under the OECD definition — that is, not working, studying, or training — than their counterparts elsewhere, often by a factor of two or more. In one recent study on the relationship between apprenticeships and youth employment in Germany, economists Regina Riphahn of the University of Erlangen-Nuremberg and Michael Zibrowius of the Cologne Institute for Economic Research found that apprentice graduates, by age 25, were more likely to be fully employed — by 30 percentage points — than those with neither training nor college with other factors held constant, including overall labor market conditions.

But the outlook appears much more mixed in the long run, according to economist Eric Hanushek of Stanford University. He warns that while apprenticeships can help boost youth employment by imparting specific vocational skills, they might not be useful in building general skills that involve cognitive reasoning, which can make workers more flexible when retraining is needed in the later years.



Trainees in the BMW Scholars program at work in a robot training cell.

In particular, he notes, this can be an issue when a worker has to adjust to new technologies. In terms of employment and earnings over a lifetime, he says, economists need to consider these factors rather than just look at the short run.

“It’s one thing to train young workers who can find initial jobs more easily, but my concern is with older people,” says Hanushek, whose research has found that labor market withdrawal among older men in Europe is more widespread among those who pursued apprenticeships or vocational tracks rather than the equivalent of American bachelor’s degrees. “We have yet to learn how we can provide incentives for workers to develop the general skills that make them resilient as the workplace changes.”

In a 2015 paper that Hanushek co-authored with economists Guido Schwerdt, Ludger Woessmann, and Lei Zhang, the authors noted that vocational- and apprentice-trained men had an employment and earnings advantage over those with university degrees until their mid-30s. But this declined and leveled off until about age 50 — at which point the college-educated group did better. In terms of the differences in lifetime earnings, however, the results varied across those countries, perhaps due to different long-run economic growth rates, the researchers wrote.

Moving On Up

In the United States, large-scale apprenticeship programs are still rare enough that researchers don’t have much data to look at their long-run effects. According to a 2013 World Bank and International Labour Office study, only about 0.3 percent of the total U.S. workforce is in registered apprenticeships — about a 12th of the share in Germany. But some states, including South Carolina, have expanded “dual system” apprenticeships in recent years by building partnerships between colleges and firms and, in some cases, offering tax credits. Through the state’s “Apprenticeship Carolina” program, about 27,000 workers have been trained since 2007, including many at foreign-owned firms. Nationwide, there were about 505,000 registered apprentices in

2016, according to the U.S. Labor Department.

For its part, BMW has found ways to adapt the traditional model to the U.S. educational system. Although it’s had training programs in place since the plant opened, it formalized apprenticeships in 2011 with its BMW Scholars program, which it runs in coordination with four local community colleges. Students may apply as long as they have a high school diploma and have enrolled in one of those community colleges. They also need at least a 2.8 GPA and a major in particular applied fields, such as mechanical or electrical engineering, machine tool operations, or business. After they apply, they’re required to complete an interview and resume workshop to be formally considered. Many trainees are 25 or younger, but there’s no age limit, and older adults and veterans are also well-represented, according to BMW’s Childers. Overall, about 80 percent complete the program (those who drop out usually do so due to grades), and, as noted, virtually all find full-time work at BMW afterward, he says.

Since the Scholars program is relatively new, its long-run effect on earnings and employment among those who opted to participate won’t be seen for years. But as it stands now, it offers its trainees a financial head start compared to other young workers. During their training, trainees not only have their tuition covered, but are also paid between \$13 and \$15 an hour for part-time work; after they start full employment, their hourly wages can go up to \$30 an hour over five years. In contrast, the median hourly wage for South Carolina production occupations, including manufacturing, is about \$16. (BMW also provides tuition assistance to those who want to study further, as well as a benefits package that includes lease discounts on BMWs, including those made at the plant.) Childers notes that the firm has yet to apply for the state’s tax credit — \$1,000 per apprentice per year — but it might reconsider as the program expands.

A Risky Investment?

The popularity of apprenticeships abroad poses a puzzle: Why do employers in apprenticeship-intensive countries offer and pay for training if these young workers might take what they learn and leave for another job? The late University of Chicago economist Gary Becker, among others, famously argued that firms have less incentive to invest in human capital if they know they risk losing that investment as a result of the employee departing. Yet in many countries with these programs, apprenticeships are as popular as ever, both among high school graduates and firms, even though many trainees ultimately take up full-time jobs with other firms.

This question often centers on the distinction between employer-specific skills — which the firm needs only for its production — and more portable general skills that a worker can leverage in other jobs. If an apprentice is gaining primarily employer-specific skills, there’s a greater chance that he or she will remain rather than taking those

skills elsewhere; that, in turn, increases the employer's incentive to invest in the apprenticeship. But studies suggest that most apprenticeships offer a mix of both, and in surveys, most apprenticeship graduates say that a fair amount of the learning can be transferred across jobs over their careers. This finding seemingly runs counter to the theory that firms have little reason to teach general skills if they know they might not recoup that investment.

Some economists contend that the typically low apprentice wages in these countries — which effectively price this risk of lost investment — might be one part of the answer to the apprenticeship puzzle. One 1998 study on German apprenticeships by MIT's Daron Acemoglu and Jörn-Steffen Pischke of the London School of Economics looked at what kind of information a firm gathers on a trainee and how it relates to pay. They noted that, at first, a new trainee is an unknown quantity to the firm, since he or she has no prior experience. But over time, that firm will gather specialized information about that worker that other firms don't have. That includes the firm's estimate of that trainee's marginal product of labor — the change in output that he or she provides — which in turn helps inform the firm what that trainee's wage should be. To test this proposition, the researchers compared the wages of trainees who stayed on with their firm with those of trainees who took a break (in this case, for military service) and reapplied to jobs upon their return. They found the latter group commanded higher wages, suggesting that they had more accurate information about the value of their skills once they were free to search for work; by contrast, firms discounted wages for trainees as long as they stayed on.

Other studies have looked at what separates firms that offer training from those that don't. Research on the Swiss experience suggests that features inherent to each firm can play a role in how that company decides whether training is worth it. A 2007 paper by Swiss economists noted that firms with a mix of tasks that apprentices can complete, as well as employees on hand who can train, were more likely to offer apprenticeships than firms that didn't fit that profile. Both features were more common in larger firms, and the study found that these firms in fact were more likely to choose to train. Because these factors are specific to each firm, public incentives such as subsidies might not have major effects on the decision to train, the study concluded.

The American Exception

In the United States, the apprenticeship model is getting attention as one way to address problems such as the

skilled labor shortage and youth unemployment. But even its advocates agree that the U.S. labor market has features that make it relatively resistant to such an approach. One is higher labor mobility, which can make firms wary of making a long-term training investment; over the first 10 years in the labor force, an American will hold an average of six jobs, compared with two for a German (although, to be sure, Germany's dual system could explain part of this difference). Another difference is labor flexibility: In many countries, it's more expensive and difficult to fire workers than in the United States, so firms use apprenticeships as a relatively low-risk testing phase before deciding on a full-time hire. Finally, the overall cost of training is likely to be higher for U.S. firms, assuming they cover tuition, whereas higher education abroad tends to get a bigger public subsidy.

A bigger factor than finances, however, might be culture. In other countries, it's more likely that college is seen as one option among many, and apprenticeships are considered a worthwhile route to middle-class employment. In the United States, parents are more likely to see college as a vital investment without considering other alternatives, including vocational training or apprenticeships, to place their children on a viable career track — a view that's likely due in part to the persistent labor market advantages of a college degree. But for high school students who might not finish college for academic, financial, or other reasons — and who might drop out with debt but not the benefits of the degree — the apprentice route could be another alternative toward gainful employment. BMW's Childers agrees and says he sees this play out frequently when he meets with Scholar applicants and their families.

"To sell the Scholars program, you have to convince the parents," he says. "They come with the mindset that their kid has to go to college, and it's on us to show them that our program can also lead their kids into a lucrative and high-tech career — and can do so without debt."

Meanwhile, economic forces are at work that could push U.S. firms to be more creative in how they approach training, whether through apprenticeships or something else, says Hanushek of Stanford. As long as the labor market continues to tighten and baby boomers keep on retiring, he argues, firms will have to compete for a shrinking pool of skilled workers. In time, they might have to rethink their own role in growing human capital.

"American firms are having a hard time dealing with the need to compete more for labor," he says. "They're fighting for the same pool of workers, and they see this as zero sum. At some point, they might be forced to find solutions that are positive sum." **EF**

READINGS

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