

NAVIGATING ENERGY BOOMS AND BUSTS

The fracking revolution has created new job opportunities, but are workers prepared for the fluctuations of the energy economy?

By Tim Sablik



In 1956, Shell Oil Co. researcher M. King Hubbert predicted that U.S. oil and gas production would begin to decline after 1970. This theory of “peak oil” caught on quickly when it seemed that Hubbert was spot on. According to the U.S. Energy Information Administration, crude oil production grew to just shy of 10 million barrels per day in 1970 and then declined to roughly half that over the next three decades. Natural gas production kept growing a bit longer, until 1973, before declining as well.

Recently, however, oil and gas drilling have been making a comeback. Oil production is nearly back to its previous peak, and natural gas production has surpassed its 1973 high point. In 2017 and 2018, the United States extracted so much oil and gas that it became a net exporter for the first time in over half a century. The twin developments of hydraulic fracturing (“fracking”) and horizontal drilling are responsible for this boom. They have allowed firms to tap into previously difficult to reach deposits of oil and natural

gas in shale rock formations throughout the country. (See “The Once and Future Fuel,” *Region Focus*, Second/Third Quarter 2012.)

For states sitting on top of rich shale oil and gas reserves, such as North Dakota, Texas, Pennsylvania, Ohio, and West Virginia, the fracking boom has brought huge job opportunities. From 2007 through 2014, the oil and gas industry added roughly 60,000 jobs on net during a period when many industries were still reeling from the Great Recession.

Much of the boom in natural gas extraction has been driven by activity along the Marcellus shale formation underlying where Pennsylvania, Ohio, and West Virginia meet. From the beginning of 2007 to the end of 2018, the Marcellus shale region went from producing a million cubic feet of gas per day to over 21 billion cubic feet per day, a 21,000-fold increase. (See chart.) The shale revolution has resulted in huge economic opportunities in energy extraction, construction,

and related fields. But are some workers giving up their education, and future opportunities, to get in on the boom?

Energy Boom, Empty Classrooms?

To fuel the boom in the Marcellus region, firms have been willing to pay a premium for drillers and construction crews to build wells and lay pipelines. A 2017 study by the RAND Corporation found that in 2010-2014, wages for construction and extraction in the Ohio, Pennsylvania, and West Virginia counties affected by the shale boom were about \$10,000 higher on average than for the rest of the country. While this represents a good opportunity for workers in those areas, one concern is that this premium might draw students away from school, potentially harming their long-term employment prospects as well as the overall human capital of the region.

“In southwestern Pennsylvania, there was a surge in low-skill employment over a very short period when the fracking pads were being constructed,” says Jim Denova, vice president of the Claude Worthington Benedum Foundation, a nonprofit that promotes education in West Virginia and southwestern Pennsylvania. “I think those jobs tended to draw students out of community colleges.”

It’s a problem the region is all too familiar with. Coal mined in the Appalachians helped fuel the Industrial Revolution in America in the 18th and 19th centuries and production across two world wars, but since then, the industry has mostly been in decline. About nine out of 10 West Virginia coal mining jobs disappeared between 1940 and 2000. (See “The Future of Coal,” *Econ Focus*, Fourth Quarter 2013.) Coal did enjoy a bit of a comeback in the 1970s as oil and natural gas declined. This led to a sudden increase in demand for coal miners in West Virginia, Pennsylvania, Kentucky, and Ohio that lasted about a decade.

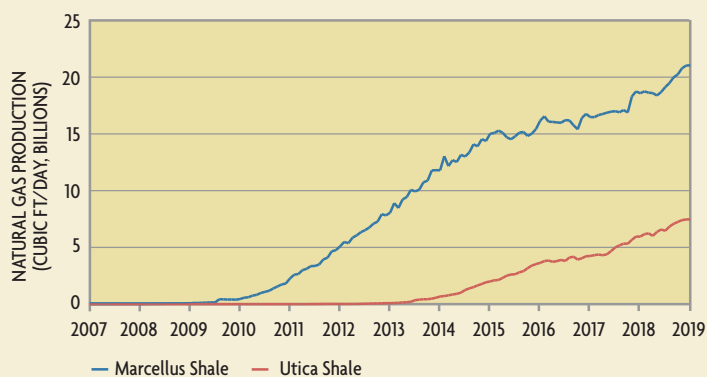
Dan Black of the University of Chicago, Terra McKinnish of the University of Colorado Boulder, and Seth Sanders of Duke University found that during this coal boom, the wage gap between high school graduates and non-graduates shrank. In economics, the potential loss associated with choosing one investment over another is known as the opportunity cost. In this case, the opportunity cost of staying in school went up as wages for miners increased. As this happened, Black, McKinnish, and Sanders found that high school enrollment rates declined.

A similar dynamic played out in Alberta, Canada, during the same period. There, rising oil prices driven by the OPEC embargoes increased oil production and demand for workers. J.C. Herbert Emery of the University of New Brunswick, Ana Ferrer of the University of Waterloo, and David Green of the University of British Columbia found that enrollment in postsecondary education fell in Alberta during the 1973-1981 oil boom.

Early evidence suggests that the shale boom may be having a similar effect on students’ decisions about staying in school. Elizabeth Cascio of Dartmouth College and Ayushi Narayan, a Ph.D. candidate in economics at

Shale Gas Production Takes Off in Appalachia

The Marcellus and Utica Shale Formations Lie Under PA, OH, and WV



SOURCE: U.S. Energy Information Administration, “Natural Gas Weekly Update”

Harvard University, found that fracking increased high school dropout rates, particularly for young men. And another study by Dan Rickman and Hongbo Wang of Oklahoma State University and John Winters of Iowa State University found that the shale boom reduced high school and college attainment among residents of Montana, North Dakota, and West Virginia. And declining student attendance isn’t the only way energy booms could hurt education outcomes. Even students who remain in school may be affected.

“In the case of Texas, we saw no effect on completion rates and some small decline in student attendance,” says Jeremy Weber, an economist at the University of Pittsburgh. “But changes in the labor market brought about by the shale boom influenced whether teachers stayed in the classroom.”

In a recent paper with Joseph Marchand of the University of Alberta, Weber found that the average experience of teachers fell during the boom as teacher turnover went up. Some teachers may have been drawn to other private sector opportunities made more attractive by the boom, while others may have been able to retire thanks to royalties on property connected to drilling. Indeed, in another paper with Jason Brown of the Kansas City Fed and Timothy Fitzgerald of Texas Tech University, Weber found that the largest shale oil and gas regions generated \$39 billion in private royalties in 2014. Whatever the cause, as the turnover of experienced teachers went up, standardized test performance at Texas schools went down.

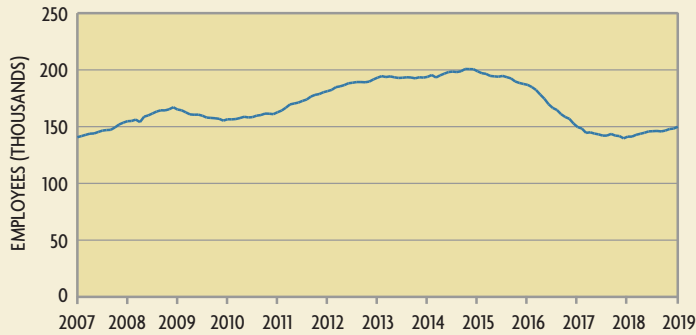
This evidence seems to suggest that energy booms reduce educational attainment, at least in the short run. But in the case of the shale revolution, there may also be other factors pushing in the opposite direction.

A Different Kind of Boom

Early on, fracking companies needed a lot of labor to transport materials and build the wells and pipelines. But Denova says that in Pennsylvania those jobs were short lived. Dropping out of school to work may be less

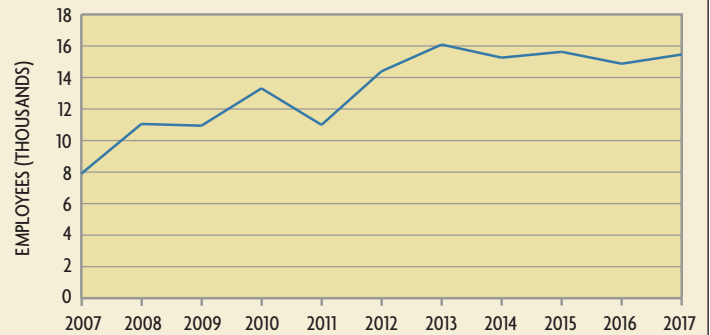
Boom and Bust

National employment in oil and gas extraction



SOURCE: Bureau of Labor Statistics

West Virginia employment in oil and gas extraction



SOURCE: Bureau of Economic Analysis

attractive if the job is expected to only last about a year rather than a decade, as in the case of the coal and oil booms of the 1970s.

Additionally, many of the shale well construction jobs don't always go to locals, says Jen Giovannitti, president of the Benedum Foundation and a former community development manager at the Richmond Fed. "The companies doing the initial drilling and exploration are often out-of-town companies that have the ability to move their workforce from site to site."

A study by Riley Wilson of Brigham Young University confirmed that the surge in demand for fracking workers generated a "sizable migration response" across shale regions. These effects may have muted some of the incentives for local students to drop out and work. Once the wells were constructed, shale firms needed workers to operate them, but those positions are not low skill.

"The technicians who run the wells all need at least two years of training to operate the complex systems," says Paul Schreffler. From 2011 to 2016, he served as dean of the School of Workforce Education at Pierpont Community and Technical College in Fairmont, W. Va. "Companies couldn't find enough of those workers, no matter how much they were willing to pay."

Firms began turning to local community colleges and technical schools, like Pierpont, to train workers for those jobs. Pierpont was an early participant in ShaleNET, an effort to develop those training and certification programs across shale oil and gas regions. The program received initial federal funding from the U.S. Department of Labor in 2010. Energy companies helped to develop curricula and also provided funding, instructors, and apprenticeship opportunities for students. Although Schreffler says firms were committed to student development, some students were still lured away from their studies by the opportunities in the industry.

"The companies right now are so eager for workers that they are hiring students right out of programs," says Elizabeth McIntyre, director of the Tristate Energy and

Advanced Manufacturing (TEAM) Consortium that connects schools and employers across western Pennsylvania, eastern Ohio, and northern West Virginia.

In the case of both technicians and lower-skilled positions, though, students who left school to work in the shale industry may not be out for good. The study by Emery, Ferrer, and Green that looked at the oil boom in Alberta during the 1970s found that while postsecondary education attainment fell initially, it later recovered after the boom ended. The authors hypothesized that individuals who went to work in the oil fields instead of going to school were able to save enough money to make it easier to go back to school once the boom ended. In contrast, they found that the cohorts of students who came of age after the oil boom had gone bust were less likely to go to college, perhaps because they did not have the same opportunity to earn the premium wages in the energy sector that would have helped them cover the costs of higher education.

"Are people worse off for having not pursued college because of an energy boom?" asks University of Pittsburgh's Weber. "Suppose I graduate from high school and instead of going to college, I go to work in a shale-related industry. When the boom goes bust, maybe I get a two-year degree in a field I'm interested in and see a demand for, or maybe I go to college with a clearer focus and more money so I don't need to borrow as much. It's not clear to me that that scenario is so problematic."

Of course, that partly depends on the drive and circumstances of each individual and may also depend on his or her age when the boom ends. Kerwin Charles and Erik Hurst of the University of Chicago and Matthew Notowidigdo of Northwestern University studied the educational effects of the U.S. housing boom and bust that lasted from the late 1990s to the late 2000s. They found that the boom in housing demand drew many young people into related sectors, including construction and real estate. But unlike the case of the Alberta oil workers, after the housing market collapsed, educational attainment for

individuals who had deferred school remained low, suggesting that many did not return to their studies.

“Once you start working and start a family, it can become very difficult to go back to college,” says Weber. “So I could see different scenarios playing out.”

Preparing for the Future

Fulfilling the boom demand for workers is important but so is having a plan for the bust.

“I think everyone knows that the energy sector is very volatile when it comes to employment,” says Gabriella Gonzalez, a researcher at the RAND Corporation who studies the energy sector in Pennsylvania, Ohio, and West Virginia. She has also been involved in promoting education and industry partnerships in that region.

At the national level, signs of a slowdown are already here. Employment in shale oil and gas extraction peaked in 2014 and has now declined to pre-boom levels. In places like West Virginia, where the shale boom started a bit later, employment has held steady so far, but growth has largely plateaued. (See charts.) Both signs point to one truth that experienced workers in the energy sector know well: Booms don’t last forever.

The Appalachian region has been through slumps before. Past declines in coal mining and manufacturing displaced workers who came from long lines of coal miners or steel workers and strongly identified with that work. Despite efforts to retrain those workers for new advanced manufacturing or shale-related energy jobs, some reports suggest that the take-up rate of those programs has been low.

“Many people are still looking to find that one company where they can get hired and work until retirement,” says John Goberish, the dean of workforce and continuing education at the Community College of Beaver County (CCBC) in Pennsylvania, where TEAM is headquartered. “But that’s just not as likely as it was 30 or 40 years ago.”

To that end, programs developed under ShaleNET and TEAM aim to give students a foundation of basic skills such as problem solving and teamwork while also teaching them the technical skills to meet a variety of industry needs. For example, a degree in mechatronics combines skills from mechanical and electrical engineering that apply to jobs in advanced manufacturing as well as natural gas extraction and processing.

“Those basic skills are critical across industries,” says Schreffler. “I would tell my students all the time that once they understand the basic properties of mechanical or electronic systems, it’s very easy to jump from one sector to another.”

And to encourage students to stick with their training until they graduate, schools like CCBC and Pierpont offer flexible programs that allow students to take classes piecemeal and build toward certifications and a degree over time.

“We are trying to give students a lot of options, including an ‘earn and learn’ approach that includes internships, apprenticeships, and other on-the-job training where they don’t have to choose between going to school and going to work. They can do both,” says TEAM’s McIntyre.

Companies have also expressed their support. “Firms want our students to have that associate’s degree,” says Goberish. “Many of our instructors are from industry and they know it will be beneficial to everyone if students finish their training.”

Firms and schools are also looking ahead to the jobs to come and finding ways to ensure that the activity surrounding the shale boom doesn’t just disappear once the wells are in place and the gas is flowing. Shell is building an ethane cracker plant in Beaver County to turn the ethane gas extracted from the shale there into plastics that can be used in a variety of products. Construction of the plant has employed thousands of workers, and once the plant is in place, it will represent hundreds of advanced manufacturing jobs for graduates of CCBC’s programs. There have been discussions about building additional cracker plants along the Ohio River Valley, including in West Virginia.

By collaborating with industry, educators are trying to provide relevant and flexible programs to prepare workers for the next jobs. That constant change requires both students and teachers to be nimble.

“No one really knows what’s coming down the pipeline next,” says Gonzalez. “There’s continuous innovation in technology, and it makes it hard for educators to keep pace with those changes. Likewise, employers may not know how many people they will need next year because the economy or the price of oil and gas could change. So everyone is just trying to do the best they can.” **EF**

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