ppi radically pragmatic

The Next Ten Million Jobs: Energizing the Physical Industries in the Heartland States

Michael Mandel

ppi

This paper is part of PPI's larger "The Next Ten Million Jobs" project. According to the Bureau of Labor Statistics, the American economy is projected to generate ten million new jobs over the next decade. We are looking at ways policy can improve the quality and pay of those jobs all across the United States, including rural areas.

The Next Ten Million Jobs: Energizing the Physical Industries in the Heartland States

OCTOBER 2017

Michael Mandel

INTRODUCTION

We start with a healthy dose of reality: Since 2000, healthcare and education have been the main sources of private-sector job growth, both nationally and in the heartland states.

From home health aides to technicians to physicians, from child care helpers to well-paid professors in private colleges, private-sector healthcare and education jobs have provided a welcome safety net for otherwise turbulent labor markets, since they receive substantial funding via government programs such as Medicare, Medicaid, and federal student loans, and are not easily subject to globalization or automation.

But we believe a prosperous future for Americans requires much more than healthcare and education. For one, the rapid expansion of the private-sector healthcare and education workforces is the major reason healthcare and education costs are rising so quickly. Getting the cost of healthcare under control will necessarily involve slowing the rate of healthcare hiring. Second, it's important to diversify the local economic base, and not rely on just two industries that are substantially supported by taxpayer money.

Instead, we believe progressives should try to build healthy local economies around growth in tech and digitally-enabled physical industries that can compete on a global scale. These digitally-enabled physical industries include ecommerce distribution, small-batch and custom manufacturing, precision agriculture, and digital construction.

Here there is good news: Employment in tech and tech-related industries is up by 51% in the heartland states, compared to 57% nationally. Increasingly, tech is diversifying out of the coastal tech hubs.

Perhaps more important, the next round of major job growth could come from the digitization of physical industries such as retail, manufacturing, mining, construction, and agriculture. Despite conventional wisdom that automation hurts jobs, we believe that, correctly applied, automation can create more well-paying jobs than it destroys.

> Employment in tech and tech-related industries is up by 51% in the heartland states, compared to 57% nationally. Increasingly, tech is diversifying out of the coastal tech hubs.

We've seen that in retail, as ecommerce has generated 400,000 decent-paying jobs nationally since 2007, propelled by a rapid expansion of fulfillment centers around the country. These fulfillment centers pay 31% more, on average, than brick-and-mortar retail.

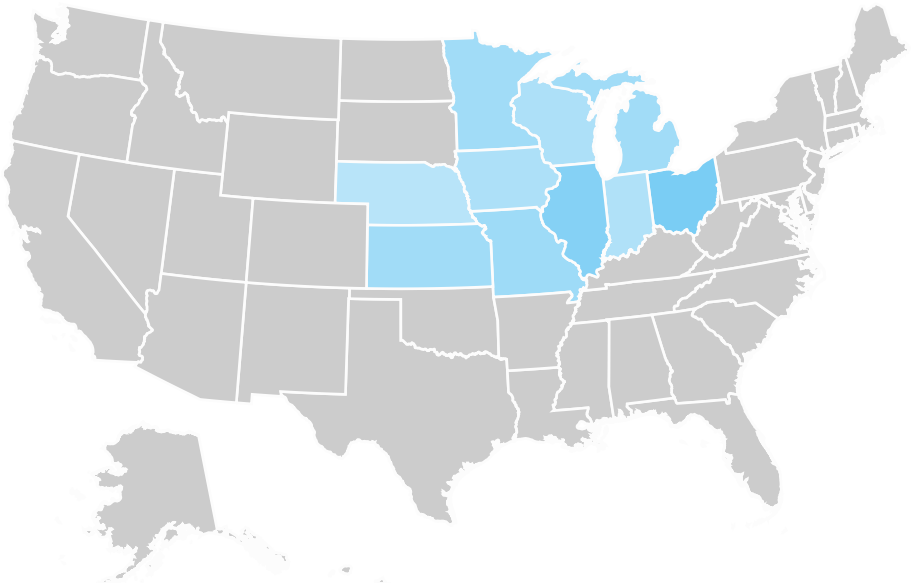
The place where policy can make a major difference is the digitization of manufacturing. We believe that, through additive manufacturing and other new technologies, combined with the new faster local distribution networks, there is the possibility of creating new business models for manufacturing. In particular, there is the potential for the revival of small-scale manufacturing operations, relatively close to customers, making small-batch and custom goods.

RECENT HISTORY

In some ways, the job market seems as strong today as it was in 2000. After two recessions, the national unemployment rate is only 4.4%. That's resiliency. Meanwhile, the unemployment rate for the ten "heartland" states—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin—has fallen from a high of 10.3% at the end of 2009 to only 4% today (Table 1).

TABLE 1: America's Heartland Unemployment Rate, July 2017

ILLINOIS	4.8%
INDIANA	3.1%
IOWA	3.2%
KANSAS	3.7%
MICHIGAN	3.7%
MINNESOTA	3.7%
MISSOURI	3.8%
NEBRASKA	2.8%
OHIO	5.2%
WISCONSIN	3.2%



Data: BLS

But something's wrong here. Despite the low unemployment rate, most Americans don't feel good, and real wages haven't been rising for many jobs. People are worried about their future and their children's. They look back and see the disruptions caused by globalization and automation. They look at today, and see the disruption caused by natural disasters and the lack of stability in Washington. And looking forward, they fear that robots will eat their jobs and that they can't compete against foreign workers.

Indeed, the apparently rosy topline numbers conceal underlying problems. The first problem: The labor market in the heartland states has been propped up since 2000 by a 37% expansion of the private-sector healthcare and education industries (Table 2). These gains in jobs far exceed the underlying demographic trends. For example, from 2010 to 2016, the population of the heartland states rose by 1.3% and the age-adjusted population rose by 4.9%, accounting for the extra healthcare spending on people as they get older.[1] But, over the same stretch, the number of private-sector healthcare and social assistance jobs rose by 11%.

1 The growth of different age groups was weighted according to relative healthcare spending in 2012, which is the last year reported by CMS.

TABLE 1: The Crucial Role of Health and Education Jobs

	CHANGE IN JOBS, 2000-2016 (THOUSANDS)	
	PRIVATE SECTOR	PRIVATE SECTOR EXCEPT PRIVATE-SECTOR HEALTH AND EDUCATION
ILLINOIS	-19	-255
INDIANA	56	-78
IOWA	77	31
KANSAS	53	5
MICHIGAN	-270	-432
MINNESOTA	196	-1
MISSOURI	85	-37
NEBRASKA	84	41
OHIO	-135	-379
WISCONSIN	85	-20
HEARTLAND	213	-1126
NATIONAL	11,103	3,820

The dominance of healthcare and education is reflected in the fact that, in many areas, hospitals and universities are the single largest private-sector employers. Take Milwaukee—long a manufacturing powerhouse where Allis-Chalmers reigned supreme. Today, Aurora Health Care is the biggest private-sector employer in Milwaukee, with more than 26,000 nurses, technicians, doctors and other personnel in the seven-county local area.[2] The second largest is Ascension Wisconsin, another healthcare organization, with 12,000 workers. And the third largest private-sector employer in Milwaukee is Froedtert Health, with almost 11,000 local workers. Over the past 20 years, the metro Milwaukee region has added 45,000 new private-sector jobs, almost entirely from the healthcare and social assistance sector. Without healthcare, there would have been no growth.

The same holds true if we look at the period since the financial crisis. From 2007 to 2016, the heartland states added roughly 660,000 private-

2 https://www.bizjournals.com/milwaukee/subscriber-only/2017/07/21/largest-milwaukee-area-private-sector.html

sector jobs. But, over that same stretch, the private health and education categories added 690,000 jobs, meaning the rest of the private sector in the heartland states is still below its 2007 employment.

This is a stronger version of the same phenomenon on the national level. Between 2007 and 2016, the health and education sector accounted for 66% of all private-sector job growth nationally.

These positions in healthcare and education are real jobs, of course. Many of them pay well. Moreover, demographic trends are running in their direction. The population is aging, and workers require more training to keep up with change.

But it's no coincidence that health and education are also the fields where costs are spiraling out of control, and have been for years. Worker pay makes up 44% of the cost of healthcare, and the rising number of healthcare workers is the single largest cause of rising healthcare bills.[3] To the extent we are and must get healthcare costs under control, that will immediately show up as a slowdown in healthcare job growth. The same is true for education.

> Worker pay makes up 44% of the cost of healthcare, and the rising number of healthcare workers is the single largest cause of rising healthcare bills.

THE ROLE OF TECH

What industries are a logical complement to health and education as job creators? Tech firms get a bad rap for not being big job creators, but the weight of the evidence has surely but steadily mounted in the other direction. Since 2007—which not coincidentally marks the beginning of the mobile revolution—tech and tech-related jobs are up by 1.6 million nationally, or a 57% increase.

> Since 2007—which not coincidentally marks the beginning of the mobile revolution—tech and tech-related jobs are up by 1.6 million nationally, or a 57% increase.

The heartland states are not far behind the national pace in terms of creating tech and tech-related jobs. Since 2007 they are up 51%, almost paralleling the national growth, as Figure 1 below shows. Iowa's tech and tech-related jobs are up by 83% (Figure 2).

The "tech and tech-related" category includes software publishing; Internet publishing and search; computer systems design; electronic shopping; management and technical consulting; and the increase in warehouse employment since 2007 (which mostly reflects the growth of fulfillment centers). Table 3 breaks down the gain by state.

> Iowa's tech and tech-related jobs are up by 83%

The key is that tech is beginning to transform physical industries such as manufacturing, healthcare, agriculture, and distribution (see, for example, Mandel and Swanson, "The Coming Productivity Boom"). For example, telemedicine is an essential new technology for rural areas, where medical specialists may be few and far

3 http://www.progressivepolicy.org/blog/pharmaceuticals-accounted-11-rising-health-care-costs-2016/. See also Michael Mandel, "The Folly of Targeting Big Pharma," Wall Street Journal, December 10, 2015.

between. Similarly, the Iowa Agritech Accelerator in Des Moines is focused on applications of technology to agriculture.

> The key is that tech is beginning to transform physical industries such as manufacturing, healthcare, agriculture, and distribution

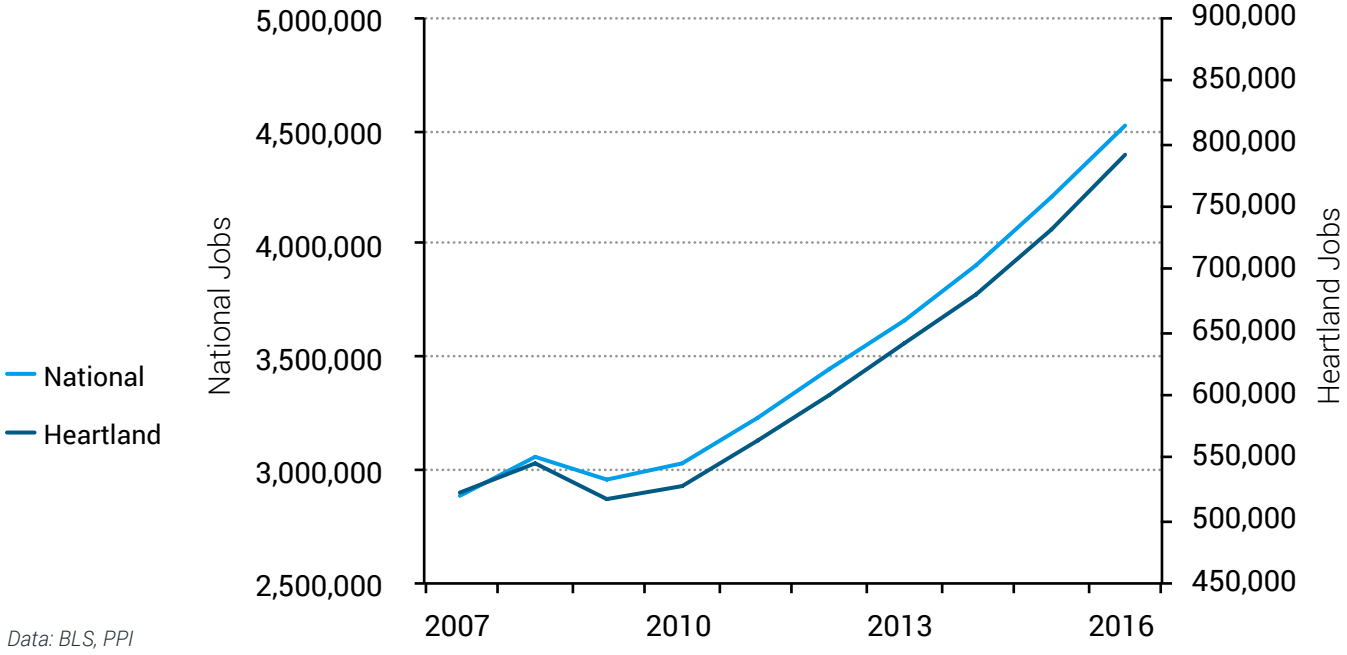
As of August 2017, farming equipment manufacturer John Deere was hiring a Mobile App Developer in Urbandale to work on projects digitizing the farming industry. Also in August 2017, UI Community Medical Services, Inc., was hiring a Software Engineer with mobile app development experience to work on mobile health and e-health interventions designed to improve patient care in Coralville.

Certainly companies are hiring for tech-related jobs that bridge the physical industries as well. As of September 2017, InfraDrone—which provides inspection, monitoring and testing solutions for the agriculture, construction and transportation infrastructure industries—was hiring a Software Developer with mobile app development experience in Des Moines.

Note also that the growth of tech and tech-enabled jobs is being supported by the expansion of fixed and mobile broadband networks in these states. However, there's a lot more to be done to get fast broadband—either fixed or mobile—to rural areas. That includes putting more federal money into supporting rural buildout, plus utilizing technologies such as fixed wireless to improve local service quickly ("Fixed wireless" is the use of cellular to provide a wireless broadband connection from a tower to a Wi-Fi router in your home, without laying cables.)

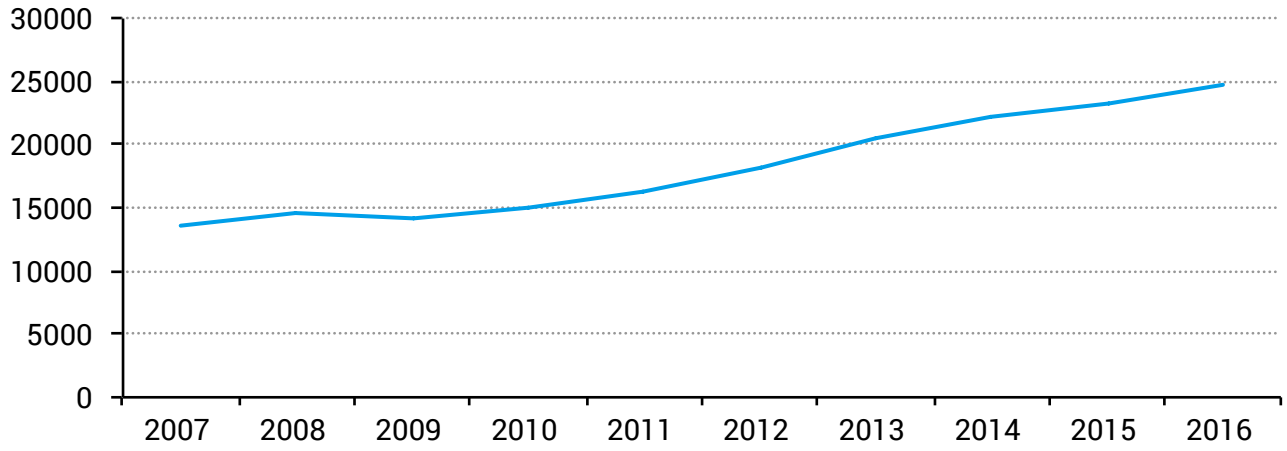
> The growth of tech and tech-enabled jobs is being supported by the expansion of fixed and mobile broadband networks in these states.

FIGURE 1: Heartland vs National: Tech, Ecommerce, and Consulting Jobs



Data: BLS, PPI

FIGURE 2: Tech and Tech-related Jobs in Iowa



Includes NAICS 4541 (electronic shopping), 5112 (software publishing), 51913 (Internet companies), 5415 (computer systems design), 5416 (consulting), and change in 493 since 2007 (picking up growth in fulfillment centers).
Data: BLS, PPI

TABLE 3: Tech Jobs in the Heartland

	CHANGE IN TECH, ECOMMERCE, AND CONSULTING JOBS* 2007-2016	
	PERCENT CHANGE	INCREASE IN JOBS
ILLINOIS	46%	62,576
INDIANA	130%	39,813
IOWA	83%	11,241
KANSAS	69%	14,898
MICHIGAN	36%	24,783
MINNESOTA	48%	26,392
MISSOURI	66%	27,092
NEBRASKA	20%	3,672
OHIO	39%	35,647
WISCONSIN	48%	22,881

**NAICS 5112, 51913, 5415, 5416, and the increase in 493 after 2007*
Data: BLS QCEW, PPI

ENERGIZING THE PHYSICAL INDUSTRIES

The new factor in the labor market—and one to which every policymaker must pay attention—is the digitization of physical industries. And we don't mean in the sense of "robots will eat all of our jobs." Rather, digitization of physical industries such as manufacturing, agriculture, and distribution could create new opportunities for entrepreneurs and job growth. That would be especially helpful for the heartland states, which traditionally lean more towards physical industries.

First, a bit of history. The past 20 years have been about information technology transforming the "digital" industries—entertainment, communications, advertising, finance, and professional services. These industries, because their output is bits and bytes, are easy to digitize. So roughly 70% of spending on information technology equipment and software goes into these digital industries, which make up about 30% of the private sector.[4]

TABLE 4: Which Industries Have Digitized?

SELECTED INDUSTRIES	TECH AND TELECOM SPENDING PER WORKER (THOUSANDS OF $)*
TELECOM AND BROADCASTING	189.4
TECH	49.0
FINANCE AND INSURANCE	21.6
OIL AND GAS EXTRACTION	20.5
PROFESSIONAL SERVICES**	12.8
MANUFACTURING EX COMPUTER AND ELECTRONICS	6.3
WHOLESALE/RETAIL/TRANSPORTATION	5.1
HEALTHCARE AND SOCIAL ASSISTANCE	2.9
ARTS, ENTERTAINMENT, RECREATION, ACCOMMODATIONS, FOOD SERVICES AND OTHER SERVICES	1.9
CONSTRUCTION	1.9
AGRICULTURE	1.6

**Spending includes investment in computers, peripherals and communications equipment; investment in software; and spending on tech and telecom services, including cloud services. Workers measured as fulltime equivalents.*
***Includes portion of tech.*
Data: PPI calculations based on BEA data.

4 Michael Mandel and Bret Swanson, "The Coming Productivity Boom," Progressive Policy Institute and Tech CEO Council, March 2017.

In general, the industries that have embraced digitization have tended to enjoy big gains in productivity and wages. For example, no matter what your position is on fossil fuels and climate change, the heavy use of information technology in oil and gas exploration and drilling has clearly transformed the industry and boosted real weekly earnings for oil and gas workers by 31% since 2006.

> The industries that have embraced digitization have tended to enjoy big gains in productivity and wages.

At the other end of the spectrum, many industries that are lagging in digitization have seen very little wage growth compared to the rest of the economy. That's notably true for manufacturing, where real weekly wages for factory workers has stagnated even as employment has plummeted.

One key example is the rise of ecommerce. Today, retail sales workers in most brick-and-mortar stores do exactly the same thing their predecessors did 30 years ago—reshelve inventory by hand, watch for pilferage, and assist customers. And their real wages reflect this lack of change. The average brick-and-mortar retail worker earned a stunningly low $448 per week in 2016, down from the $462 per week they earned in 1986, in inflation-adjusted 2016 dollars. As a result, the income gap between retail workers and the economy average widened substantially over this period.

By contrast, the men and women who go to work each day in ecommerce fulfillment centers are equipped with far more information technology—including robots—and are far more productive and better paid as a result. Our research shows that fulfillment center weekly wages are 31% higher, on average, than brick-and-mortar retail in the same area. Indeed, there are increasingly reports of labor shortages driving up wages for fulfillment center workers—a welcome turn of events.

Note that fulfillment centers are not hiring college-educated coders. Instead, these tech-enabled fulfillment center jobs use a mixture of physical and cognitive skills. Better yet, they pay decent wages and require only a high-school education—precisely what everyone has been asking for to narrow the income gap.

> Fulfillment center weekly wages are 31% higher, on average, than brick-and-mortar retail in the same area.

Of course, there are two looming questions. First, is ecommerce destroying more brick-and-mortar jobs than it is creating? At least so far, the answer seems to be no. According to our analysis of Bureau of Labor Statistics data, brick-and-mortar retail jobs have fallen by roughly 140,000 from the fourth quarter of 2007 to he second quarter of 2017. That's based on fulltime equivalent (FTE) jobs. Over the same stretch, the ecommerce industry has added some 400,000 jobs in fulfillment centers and electronic shopping firms.

What about over the past year? Using the latest period for which full data is available, brick-and-mortar retail jobs have fallen by some 22,000 FTE jobs in the year ending July. However, the ecommerce industry has added some 54,000 jobs—and another 60,000 jobs have been added in the trucking and courier industries. At least some of these are clearly propelled by ecommerce deliveries. And we haven't even counted the U.S. Postal Service workers, who have a contract to deliver Amazon packages.

The expansion of ecommerce adds to net paid employment because it shifts unpaid household hours shopping to the market sector. Americans spend 1.2 billion hours per week driving to the mall, finding a parking space, wandering around the aisles, checking out, and driving home. Since 2007, roughly 64 million hours per week of those unpaid hours have been shifted to fulfillment center workers (who do the "picking and packing" for customers) and truck drivers (who do the driving).

The other question is whether fulfillment centers are likely to be further automated in the future, reducing the number of workers needed. That's a speculative but important topic. In the short run, ecommerce employment is likely to keep soaring, as big brick-and-mortar retailers like Walmart and Target build out their ecommerce capabilities.

Looking a bit further out, automation of fulfillment centers, if it happens, will bring down the cost of distribution, which now amounts to 50% or more of the final purchase price of many consumer goods, including electronics, clothing, and furniture. Obviously that will drive down prices, helping the average consumers.

But, more importantly, the ability to inexpensively sort and deliver individual items will dramatically change the economics of manufacturing. Until now, it's been far cheaper to produce, ship and distribute goods in bulk. At the downstream end of the supply chain, that simple fact has propelled the growth of the big box store. At the upstream end, bulk shipping and distribution have given an advantage to manufacturing in large quantities at the lowest cost possible —that is, China.

Once it becomes possible to sort and deliver individual items cheaply, the economics of small-batch or custom manufacturing will become more attractive. Moreover, since people want their purchases quickly, these small-batch and custom manufacturers will be located much closer to the ultimate consumer, rather than 10,000 miles away.

> Since people want their purchases quickly, these small-batch and custom manufacturers will be located much closer to the ultimate consumer, rather than 10,000 miles away.

In this sense, the growth of ecommerce fulfillment centers is like the shift from the original circuit-switched telephone network to the packet-switched Internet. The Internet requires a lot more processing power than the telephone network did, but it's far more flexible and cheaper, and allows the creation of new applications and services that didn't exist before. Hence, we are seeing the beginning of the "Internet of Goods"—a packet-switched physical network.

So, just as the Internet generated many good jobs in the digital industries that didn't exist before, we expect the growth of the Internet of Goods to lower prices and open up new possibilities in physical industries such as manufacturing, distribution, construction, and agriculture. We can already see the growth in demand by small firms looking for workers with skills in additive manufacturing (3D printing). For example, Midwest Prototyping in Blue Mounds, Wisconsin—an additive manufacturing firm located about 25 miles outside of Madison—has been named repeatedly to *Inc*'s list of the fastest growing small firms in the United States.

HOW POLICY CAN SPEED PROGRESS

We see technology as fostering a revival and transformation of the physical industries, creating more good paying jobs for people who work with both their minds and their hands. We're already seeing this in distribution, where the rise of ecommerce has generated a whole new class of fulfillment center jobs that did not exist a few years ago. With the right policies, this shift will help the heartland states that historically are more focused on physical industries such as manufacturing and agriculture.

Broadly speaking, there are three key areas in which smart policies can accelerate a tech-enabled reinvigoration of physical industries in both the heartland states and the whole country:

1. **Extending broadband availability:** Obviously, it's crucial to continue extending broadband availability to rural areas. The FCC already has programs to help support this effort, such as the Connect America Fund. We support expanding this effort and making it more attractive for providers in order to stimulate rural deployment.

2. **Helping digital manufacturing:** Our vision is a network of small-scale digital manufacturing operations that can take advantage of new production technologies, new distribution capabilities, and new business models. They will be nimble enough to shift products as tastes change, close enough to their customers to understand what they want, and able to produce custom items on short notice and at a reasonable price. All three are necessary for success.

   How can state and local policymakers help jumpstart the new business models? The first step is to make sure budding entrepreneurs have physical access to the latest technologies. That may mean setting up centers that buy new production-scale 3D printers—which can cost hundreds of thousands of dollars—and rent or grant time on the printers to entrepreneurs.

3. **Supporting precision agriculture—which uses digital technology to boost yields and reduce inputs—and new business models for delivering food to consumers:** According to government data, gross margins for supermarkets have widened by 85% since 2000 (gross margins are the difference between the selling price and the acquisition price). At the consumer level, food prices have risen faster than the overall rate of inflation. The development of advanced distribution networks may offer new options for how to deliver and sell fresh and processed foods at lower prices, while providing higher incomes to farmers.

ppi

The Progressive Policy Institute is a catalyst for policy innovation and political reform based in Washington, D.C. Its mission is to create radically pragmatic ideas for moving America beyond ideological and partisan deadlock.

Founded in 1989, PPI started as the intellectual home of the New Democrats and earned a reputation as President Bill Clinton's "idea mill." Many of its mold-breaking ideas have been translated into public policy and law and have influenced international efforts to modernize progressive politics.

Today, PPI is developing fresh proposals for stimulating U.S. economic innovation and growth; equipping all Americans with the skills and assets that social mobility in the knowledge economy requires; modernizing an overly bureaucratic and centralized public sector; and defending liberal democracy in a dangerous world.

Progressive Policy Institute
1200 New Hampshire Ave NW,
Suite 575
Washington, DC 20036

Tel 202.525.3926
Fax 202.525.3941

info@ppionline.org
progressivepolicy.org