



The Internet of Goods and a Revitalized Economy: Upstate New York as a Template

Michael Mandel
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INTRODUCTION

A revival in local manufacturing could provide a new source of jobs for areas of the country that have suffered disproportionate job losses in recent years. The key to this revitalization is integrating digital technology into every stage of the research, development, distribution and delivery of the goods produced. We call this integration the Internet of Goods and believe it is poised to revitalize physical industries such as manufacturing, agriculture and transportation.¹

Based on new business models, as well as new technology, digitally-driven manufacturing can provide an essential jumping-off point for growth. As we recently wrote in a policy report:²

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.

Digitally-driven manufacturers won't locate in dense urban areas where land prices are high and logistics for transporting the manufactured goods are complex, time consuming and expensive. Instead, they will gravitate to areas of the country that have sufficient, available land; have a strong base of workers comfortable with technology; and have access to a high-capacity broadband network infrastructure.

The question we consider here: How can public policy encourage this turnaround and catalyze the growth of Internet of Goods industries?

The conditions in upstate New York – particularly the region from Buffalo to Rochester to Syracuse – provide a real-world test bed to determine best practices for attracting and retaining Internet of Goods industries. With its world-class universities, access to interstate highways and shipping routes, educated workforce, and ample building space vacated by former manufacturing plants and other industries, this region possesses many essential qualities to forge a robust Internet of Goods economy. Buffalo, Rochester, and Syracuse are already seeing a rise in economic vibrancy and a growth in high-end tech jobs as a result of state policy.

Because new Internet of Goods industries incorporate real-time data and advanced analytics into their business practices, high-speed high-capacity mobile broadband is essential. Unfortunately, some upstate cities are imposing new and prohibitive costs on the installation of the equipment needed to bring high-speed mobile broadband to more upstate cities and towns. This impulse to collect high fees in the near term will likely come at the expense of revitalizing upstate New York with Internet of Goods industries and the new jobs that will produce.

Like many areas around the country, upstate New York is at a crucial juncture: Can the state make the policy decisions necessary to accelerate growth and help the most people? To add to all the good work that has been done so far, what's needed are policies that encourage broadband companies to bring high-speed broadband networks to these areas of the country that are ideally suited for digitally-driven manufacturing companies, while not taking actions that delay or depress the build-out of these networks by making it cost prohibitive to build them.

INGREDIENTS FOR SUCCESS: THE CASE OF UPSTATE NEW YORK

How can public policy spur momentum and bring back industries and jobs to upstate New York? Fortunately, many of the necessary ingredients are already in place throughout the region: a rich academic environment, ample space for the siting of new industrial facilities, good transportation, and a tech-savvy workforce.

First, upstate New York starts out with a wealth of topnotch universities. These include, among others, Cornell University, the University of Rochester, the Rochester Institute of Technology, Rensselaer Polytechnic Institute, Syracuse University, the University at Buffalo, Binghamton University, and the University at Albany. These higher education institutions give the region not only fertile research facilities, but a built-in pipeline for an educated workforce.

Ironically, because the region has experienced a heavy loss of mainstay manufacturers, it has a significant inventory of attractive and affordable locations in which new manufacturing industries can locate. Further, a well-connected highway system provides transportation routes that resolve logistics and distribution issues for new industries. Thanks to forward-looking state public policy, heavy investment in infrastructure and downtown placemaking has begun to attract young people and startups, making many of these cities more desirable places to live.

Indeed, thoughtful state policies – whether tax incentives, operational support, or opportunities to collaborate with public and private institutions – are already helping upstate New York attract

innovative businesses. For example, the Buffalo Manufacturing Works, which began as part of New York State Governor Andrew M. Cuomo's Buffalo Billion Investment Development Plan, is currently helping local manufacturers integrate the latest technologies into their businesses.³ The goal is to be a center of excellence for new manufacturing technologies such as additive manufacturing. Panasonic has been hiring several hundred workers to help build solar panels at Tesla's Solar City plant in Buffalo.⁴

Cuomo's "Upstate Revitalization initiative" has helped support Syracuse's revival as well.⁵ Cuomo prioritized drone research and development as a growth industry for the Rome-Syracuse corridor, and state investments have positioned the area as a hub of drone research, development and manufacturing.⁶ State policies are spurring new drone-related companies such as Rome-based SkyTube Live and Gryphon Sensors in Syracuse. In addition, the Northeast UAS Airspace Integration Research Alliance (NuAir Alliance) announced in September 2017 that the first phase of the 50-mile drone research corridor is operational, and based at Griffiss Air Force Base in Rome.⁷

Indeed, the 150-mile stretch from Buffalo to Rochester to Syracuse is poised to regain some of its economic luster. In part because of the New York State initiatives listed above, Erie, Monroe, and Onondaga Counties have been attracting tech jobs in software, ecommerce, and Internet-related businesses.⁸ The table below shows these gains, even as traditional manufacturing jobs have declined dramatically.

FIGURE 1: Growth in Software, Ecommerce, and Internet-related Tech Jobs in Selected Upstate New York Regions

| | CHANGE IN SOFTWARE, ECOMMERCE, AND INTERNET-RELATED JOBS (2007-2016)* | CHANGE IN MANUFACTURING JOBS (2007-2016) |
|----------------------------|---|--|
| ERIE COUNTY (BUFFALO) | 2096 | -7062 |
| MONROE COUNTY (ROCHESTER) | 2591 | -15626 |
| ONONDAGA COUNTY (SYRACUSE) | 744 | -7862 |

* includes NAICS 4541, 5112, 518, 519, 5415, 5416 and the change in 493 since 2007. Data: BLS, PPI

The connection between deliberate public policy and tech growth in upstate New York goes back to the Pataki Administration, which gathered leaders in business and industry to develop a strategy to encourage next-generation industries in New York. One result of that effort was support for the state’s semiconductor industry.⁹ That industry, in turn, is a key platform for new nanomanufacturing companies across the region.

THE INTERNET OF GOODS

We believe that the next wave of digitally-driven manufacturing – what we call the Internet of Goods – has the potential to revitalize areas such as upstate New York. The Internet of Goods is the convergence of several trends that may lead to a revival of local manufacturing. These trends include robots and additive manufacturing, which enable companies to effortlessly shift between small-batch or custom production runs. The rise of ecommerce fulfillment centers gives manufacturers the ability – for the first time ever – to cheaply ship individual items directly to their customers. And cloud platforms will cheaply provide the essential advanced analytics and machine learning that tie the new technologies together.

Taken together, these new technologies have the potential to greatly boost the productivity of U.S. factory workers, which, surprisingly, has languished in recent years. In turn, as productivity rises, the cost of production and distribution will fall, enabling local manufacturers to greatly expand their regional sales and creating opportunities for hiring tech-enabled workers to complement automated production. And a new crop of manufacturing startups will arise to create new products and services we can’t even imagine now.

With abundant land, access to good transportation, a sufficiently large skilled workforce, leading-edge educational institutions, and support from the state government, upstate New York is well positioned to take advantage of the Internet of Goods. Imagine, if you would, a startup in the Buffalo area that uses production-quality additive manufacturing techniques to quickly make custom furniture on demand, and ship it out the next day to a local fulfillment center for rapid delivery across a 200-mile radius. That would provide a sustainable competitive advantage against foreign rivals that are limited to floating large containers of identical goods over 10,000 miles.

Now think about a thickening network of such local manufacturers, each of them growing and hiring.

Of course, it's not just manufacturing, but also healthcare, education, and the whole range of physical industries that will be transformed by access to high-speed broadband. Ultimately, the acceleration of productivity growth and job creation in the physical industries that the next generation of wireless broadband will help facilitate creates a lot more tax revenue than collection of near-term fees to site the equipment needed to build such networks. On a national level, Mandel and Swanson recently estimated that the application of the next generation of wireless and other new technologies to physical industries could add 0.7 percentage points to annual national GDP growth, which makes an enormous difference over time to the size of the economy and tax revenues.

By 2031, the higher growth rate pushes up U.S. GDP by 11 percent compared to its previous path, or \$2.7 trillion (in 2016 dollars). That's enough to significantly lift incomes and living standards, as wage and salary payments would rise by a cumulative \$8.6 trillion over the next 15 years, in 2016 dollars. In addition, the larger economy would yield around \$3.9 trillion in cumulative federal revenues and \$1.9 trillion in additional state and local revenues over the 15-year period, all without increasing the tax share of GDP.

AN ANALYSIS OF IMPEDIMENTS TO CONTINUED REVITALIZATION IN UPSTATE NEW YORK: SMALL CELL POLICY

The Internet of Goods requires access to high-capacity, high-speed broadband infrastructure – and, unfortunately, that's where Upstate New York is falling short. Today's wireless technology is typically powered by large towers, spread relatively far apart. But the next generation of wireless broadband networks, usually called 5G networks, are essential infrastructure for the Internet of Goods. They provide enough bandwidth to power driverless trucks, guide drones without interruption, and support digital manufacturing.

5G networks will be built on millions of small cells throughout the country. 5G networks will use laptop-sized antennae cells that can be placed in buildings or outdoors on utility poles, light poles, traffic lights, or exterior walls of buildings. These cells can transmit a lot of data, but over a short range, so that a robust broadband network needs to have many cells.

In terms of attractiveness for small cell buildout, upstate New York's cities start out with a handicap relative to comparable cities. Figure 2 calculates GDP density for selected urban industrial MSAs in the Northeast and Midwest. We note that Rochester and Syracuse MSAs have a lower GDP density and a much slower growth rate than either Pittsburgh or Worcester. That suggests the local governments in Rochester and Syracuse may want to avoid hindering the deployment of small cells for 5G networks.

FIGURE 2: GDP Density and Growth for Selected MSAs

| MSA | GDP DENSITY (GDP PER SQUARE MILE, MILLIONS) | REAL GDP GROWTH, 2007-2016 |
|------------------|--|-------------------------------|
| BOSTON | 120.6 | 16% |
| CHICAGO | 90.3 | 3% |
| CLEVELAND | 64.6 | 1% |
| DETROIT | 64.6 | 1% |
| BUFFALO | 37.1 | 8% |
| INDIANAPOLIS | 35.1 | 8% |
| COLUMBUS | 32.8 | 18% |
| AUSTIN | 32.0 | 52% |
| WORCESTER | 27.9 | 10% |
| PITTSBURGH | 26.2 | 17% |
| ROCHESTER | 18.9 | -1% |
| SYRACUSE | 13.7 | 0% |

Data: Census, BEA, PPI

Buffalo is somewhat better positioned, but issues still remain. Buffalo is way behind Cleveland and Detroit in terms of GDP density, but ahead in terms of growth. Columbus and Austin have the same GDP density, but much faster growth rates. Buffalo should not enact policies that further handicap itself.

At least nine states have passed legislation to encourage the deployment of small cells, including Minnesota, Iowa, Kansas, Virginia, Florida, Indiana, Arizona, and Colorado. The laws these states adopted establish a uniform process for installing small cells and limit the fees localities can charge to reasonable amounts. For example, earlier this year Virginia passed S. 1282, establishing guidelines and timelines for permitting decisions, limiting application fees to \$100 per cell and prohibiting right-of-way fees.¹⁰

Similarly, Iowa passed legislation providing a series of uniform rules for the permit application process for and deployment of small wireless facilities.¹¹ The legislation also prohibits local governments from charging an annual recurring rate for small cell attachment to municipal poles in excess of federal laws. Florida also passed legislation earlier this year, pre-empting local government control of rights-of-way for installation of wireless antennas and equipment.¹² The legislation also prohibits permit and pole attachment fees.

By contrast, some upstate New York localities are considering ways to impose significant fees on small cell installations. Slic Network Solutions, a company that has been expanding high-speed access throughout rural northern New York using fiber optics, recently said that gaining access to poles could account for up to

40 percent of their expansion costs, sometimes at a price between \$10,000 and \$14,000 per mile.¹³ The city of Buffalo's 2017-2018 adopted budget includes an annual fee of \$2,000 per pole, as well as application and processing fees in the upcoming fiscal year, for telecom operators to install and maintain small cells.¹⁴ Syracuse is considering legislation that would charge carriers an annual fee of \$1,000 to \$2,000 per installation depending on the type of pole.¹⁵

And, unfortunately, the New York State Senate is considering a bill that would direct the public service commission to prohibit the attachment of wireless equipment to utility poles unless existing easements are amended or new easements are written.¹⁶ Legislation such as this – that codifies barriers to small cell installation – will slow the small cell installment, hurting the growth of Internet of Goods businesses in New York.

CONCLUSION

As a result of thoughtful New York state policies, new industries are putting communities in upstate New York on the path to economic revitalization; however, a robust, evolving network that will support 5G technologies is an essential element for the continued success of new companies and additional future-oriented industries in the region. Unfortunately, some local governments have unwittingly undermined this goal by setting fees to install small cell equipment that discourage investment by broadband companies. As a result, broadband companies will find alternative sites for building out their networks, jeopardizing not only the future of new industries that have located upstate, but also closing the door to future industries and revenues they would generate. Upstate New York should complement its universities, workforce, transportation and affordable land advantages by encouraging the essential high-speed, high-capacity broadband network to power future industries and create jobs.

About the Authors

Dr. Michael Mandel is the chief economic strategist at the Progressive Policy Institute and a senior fellow at Wharton's Mack Institute for Innovation Management.

Elliott Long is Economic Policy Analyst for the Progressive Policy Institute. Elliott holds a BA in Political Science from Florida Gulf Coast University and an MPA from George Washington University.

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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