

## SECTION 4: CHINA'S INDUSTRIAL POLICY AND ITS IMPACT ON UPSTATE NEW YORK

“The Commission shall investigate and report exclusively on—

...

“ECONOMIC TRANSFERS—The qualitative and quantitative nature of the transfer of United States production activities to the People’s Republic of China, including the relocation of high technology, manufacturing, and research and development facilities, the impact of such transfers on United States national security, the adequacy of United States export control laws, and the effect of such transfers on United States economic security and employment.

“WORLD TRADE ORGANIZATION COMPLIANCE—The compliance of the People’s Republic of China with its accession agreement to the World Trade Organization (WTO). . . .”

### Introduction

In March 2009, the Commission held a hearing in Washington, DC, on China’s industrial policy, receiving testimony from experts on China’s efforts to promote its information technology, telecommunications, and other advanced technology industries such as optoelectronics. Following up on that hearing, the Commission traveled to Rochester, New York, in July 2009 to assess the impact of China’s industrial policy on some of the industries of the region. Of particular interest to the Commission was evaluating the growing concern that research and development, essential to high-technology innovation, is following manufacturing abroad.

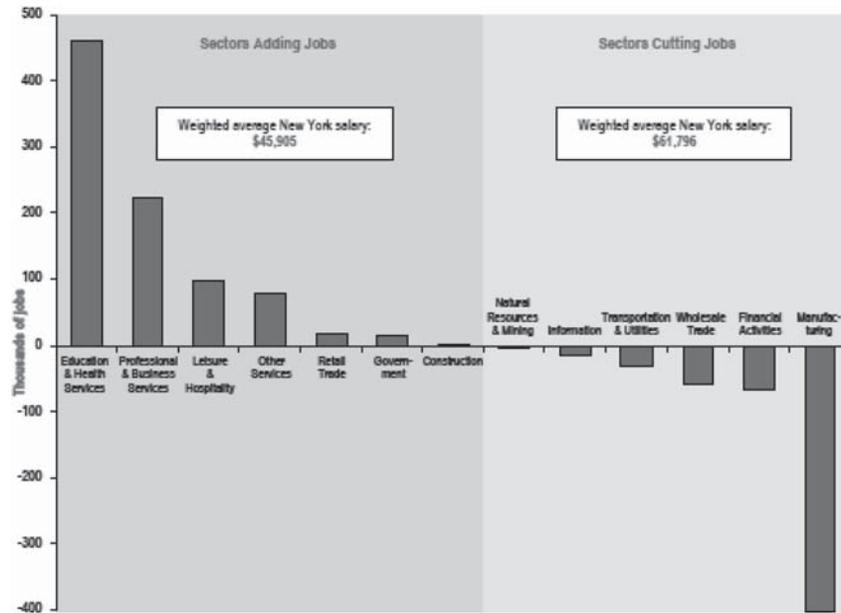
Currently, upstate New York is home to numerous small- and medium-sized companies ranging from auto parts and solar panel suppliers to biotech and optoelectronics producers. Although the region is rich in technical talent and has advanced research universities with curricula oriented to science and technology, it has not yet been able to replicate the success of the industrial clusters in Silicon Valley or along Boston’s Route 128.<sup>355</sup> The New York State government is trying to invest in the clean energy sector and other sunrise technologies and industries, but funding is fragmented and difficult to obtain, and small entrepreneurs and parts suppliers remain almost entirely dependent upon the individual decisions of larger producers and assemblers who outsource much of their operations overseas.

### Loss of Industries Impacts Communities

The three main cities in central and western New York State—Buffalo, Syracuse, and Rochester—have developed different industrial bases. Buffalo and Syracuse were home to major industries such as appliance, dinnerware, furniture, and air conditioner manufacturers, as well as many auto parts and machine tool companies that were suppliers to bigger companies. The outsourcing of manufacturing from Buffalo and Syracuse has left big employment gaps that the growing services industries at universities and hospitals have partially filled, but at significantly lower wages. Meanwhile, the national trend by major manufacturers to outsource their production has compounded job losses by the many auto parts and machine tool suppliers in the region.

Rochester, on the other hand, was a city of engineers and scientists. Rochester was home to Eastman Kodak, Xerox, and Bausch & Lomb, companies that were technology innovators throughout the 20th century. With the downsizing of Eastman Kodak and Xerox in the 1980s and 1990s, many former employees took their expertise and started niche companies, some of which are doing well.<sup>356</sup> Former employees of Eastman Kodak, in particular, purchased its equipment, labs, or entire divisions and started their own companies.

**Figure 1: Change in Numbers of Jobs in New York State, by Sector, 1990–2005**



Note: "Sector" refers to Bureau of Labor Statistics "super-sectors." All super-sectors are included in the analysis above, collectively accounting for the entire New York State economy.

Source: A.T. Kearney analysis of Bureau of Labor Statistics. A.T. Kearney, "Delivering on the Promise of New York State: A Strategy for Economic Growth & Revitalization," prepared for Empire State Development Agency (New York, NY: July 2007), p. 7.

Employment has shifted during the past 20 years from higher-paying manufacturing jobs to lower-paying service jobs in industries such as education and health care.<sup>357</sup> From 1990 to 2005, manufacturing in the region declined by almost 400,000 jobs, while education and health services gained 450,000 jobs. The average salary in the state of New York for manufacturing jobs was \$62,000 in 2008, while the average for jobs in education and health services was only \$46,000.<sup>358</sup>

This shift from manufacturing to services has been particularly pronounced in upstate New York. William Johnson, former mayor of Rochester and current distinguished professor of public and urban studies at the Rochester Institute of Technology, testified at the Commission's hearing on this shift and on the impact of downsizing on the local communities. He testified that in 1981, Kodak was the top employer in Rochester, with 59,582 employees. By 2007, Kodak's employment had dropped to 12,500 jobs; the University of Rochester/Strong Health was the top employer (17,802), with Wegmans grocery stores in second place (13,642). Universities are the top employers in Buffalo and Syracuse as well. In 1983, Kodak accounted for 11.63 percent of the property tax valuation in Rochester. By 2008, Kodak accounted for only 1.95 percent.<sup>359</sup> In his written testimony to the Commission, Mr. Johnson said,

*When a company like Kodak shrinks its presence in its hometown, there are significant side effects: the loss of jobs leads to a decline in the quality of life for the families who were dependent on that income. Many people are unable to maintain their middle-class lifestyles, and neighborhoods suffer as these families either move on or cut back. Kodak was recognized for its civic leadership. Not only were its top managers involved in a host of important community initiatives, but it encouraged its workforce to also be good citizens through volunteerism and generous financial support. Kodak's philanthropic activities supported a host of worthwhile community endeavors.*<sup>360</sup>

### **Key Industries in Upstate New York**

The following industries are examples of the past, present, and potential future of industrial activity in upstate New York. In the past, machine tools companies were vital suppliers to original equipment manufacturers. At present, optoelectronics companies have been evolving and now comprise many of the small- and medium-sized employers in the region. In addition, healthcare and education providers make up the top employers in Rochester, Buffalo, and Syracuse. Clean energy companies could represent the future for innovation and development in the region.

#### ***Machine Tools***

Machine tools are metalworking machines that have sophisticated, computer-based motion control systems, which allow the machine to perform a range of tasks with high productivity while achieving high precision. Machine tools are the engine of manufacturing, and advances in machine tool technology have been a vital part of the remarkable strides made in manufacturing productivity

in past decades.<sup>361</sup> As recently as the 1980s, the United States was the global leader in technological innovation and the production of machine tools. Today, with the general decline of domestic manufacturing, the United States barely makes the top 10 list of countries producing machine tools.<sup>362</sup> Historically, the United States had been the largest global consumer of machine tools, because the United States was a far larger manufacturer.<sup>363</sup> However, after Japan's industrial policy targeted manufacturing, the U.S. machine tools sector lost this advantage. Now China seeks to dominate manufacturing through its own industrial policy.

In Japan and Germany, the machine tools sector is considered vital to the countries' long-term economic prosperity; accordingly, both countries have emerged as the technology leaders in this field. China and Taiwan are also top producers of machine tools, but their products are typically less technologically advanced.<sup>364</sup>

China considers machine tools to be a strategic industry and is making vigorous efforts to advance the growth of the industry domestically. In the past two years, China has purchased 25 percent of all the machine tools produced in the world, more than two times the amount of machine tools purchased by the next highest consuming country, Germany.<sup>365</sup> Nabil Nasr, director of the Center for Integrated Manufacturing Studies at the Rochester Institute of Technology, testified to the Commission that Chinese officials and companies have bought state-of-the-art machine-tool manufacturing companies in Germany that are in financial trouble. After acquiring the companies, China sent all the companies' equipment, as well as their German experts, to China to facilitate the transfer of this technology.

There are some machine tool success stories for upstate New York. The Gleason Corp., a local machine tool manufacturer with production facilities both in New York and overseas, exports 70 percent of its Rochester-made products to China.<sup>366</sup> John Perrotti, chief executive officer of the Gleason Corp., testified at the Commission's hearing about competing with China's machine tool industry. According to Mr. Perrotti, Chinese machine tool companies that are state owned have access to capital and subsidies that are not available in the United States.<sup>367</sup> As a result of Chinese government policies, many of the basic expenses of doing business, including healthcare, energy, and acquisition of certain raw materials and regulatory costs, are subsidized.<sup>368</sup> Said Mr. Perrotti: "Certain of these companies would not survive based on their own financial performance."

### ***Optoelectronics***

Optoelectronics or photonics applies the science of using light to a number of products such as light-emitting diodes (LEDs), sensors, infrared remote controls, liquid crystal display TVs, and laser printers. According to the Washington, DC-based Optoelectronics Industry Development Association, the global optoelectronics market in 2008 amounted to \$356 billion. Edward Patton, director of sales and marketing for Rochester Precision Optics, who testified at the Commission's Rochester hearing, noted that "if it were not for the progress in ultraviolet lasers and optics, the dramatic, exponential growth of the digital chip could not have occurred."<sup>369</sup>

The New York optoelectronics cluster is among the largest and most active photonics clusters in the country and, according to Mr. Patton, it is a vital resource for the economic growth of the region.<sup>370</sup> There are more than 60 leading optoelectronics companies in Rochester alone, many of which are spin-offs of former Eastman Kodak divisions. One such example is Rochester Precision Optics, which acquired the assets of one Eastman Kodak precision glass manufacturing operation, Kodak Optical Imaging Systems. In addition to the 60 companies, there are outstanding university centers conducting optoelectronic research, such as the Rochester Institute of Technology and the University of Rochester's Institute of Optics. Since its creation in 1929, the Rochester Institute of Optics has awarded approximately half of all the degrees in optics in the United States.<sup>371</sup>

However, as noted in section 3 of this chapter, the optoelectronics industry has moved much of its manufacturing operations to Asia over the past 10 years. For the optoelectronics industry in particular, the main reason for relocating to China is the proximity to the customers and the supply chain, rather than China's low labor costs, which, in the optoelectronics industry, account for only 10 to 15 percent of the production cost.<sup>372</sup>

Mr. Patton noted that if it were not for the defense industry, there would be very little of the optoelectronics industry left in the United States. To accelerate the development of its own domestic optoelectronics industry, China has successfully attracted foreign investment in manufacturing and research and development. The outsourcing of optoelectronics manufacturing by U.S. firms is a national security concern for the United States, according to Mr. Patton: "There are a lot of today's weapons systems that have optics on them, that are driven by developments in optics, and as more of the jobs in the optics industry get displaced to China, and more of the businesses go away, the U.S. defense industry could be seriously disadvantaged."<sup>373</sup>

One of the success stories in optoelectronics is Corning Incorporated, a leader in high-technology applications, primarily due to its investment in research and development. Corning's management has focused on a long-term strategy of innovation and investment, and the company has accordingly invested for the long term.<sup>374</sup> Corning, once best known for its line of tableware and cookware, has transformed itself over the years into a high-technology company, allocating a significant amount of its resources to research and development. Corning employs more than 23,000 people worldwide, 4,900 of whom work in upstate New York. Corning's revenues for 2008 were \$5.9 billion. Annually, 10 percent of Corning's total revenues go to research and development, which has allowed Corning to retain its competitive edge.<sup>375</sup> Moreover, in 2000, Corning consolidated its labs in New York State to better coordinate its research, development, and innovation needs.

### ***Life Sciences and Education***

During the past 20 years, as manufacturing has declined in upstate New York, the service sector, in particular hospitals and universities, has grown and absorbed some of the former factory workers. New York has the second-largest public university system in

the United States. The state has more than 250 colleges and universities in total and one of the highest densities of institutions of higher learning in the world. With 138,000 students, the Rochester region has the highest concentration of undergraduate and graduate students in the nation.<sup>376</sup>

Education and healthcare are fields that can create opportunities for the development of a thriving, innovation-based economy. To this end, the New York State government has established Centers of Excellence throughout the state to better facilitate innovation and assist in the cooperation between academia and the private sector, and the commercialization of new technologies. At present, about \$2 billion in annual research and development activity is underway at research institutions in the region.<sup>377</sup>

The New York State Foundation for Science, Technology and Innovation is one of the economic development agencies that provide funding for research and development projects. It has established 15 programs across the state to help startup companies take advantage of technological developments. During the Commission's hearing in Rochester, Marnie LaVigne, the director of Business Development for the University of Buffalo's Center for Advanced Biomedical and Bioengineering Technology, testified on the center's mission in bioinformatics and life sciences. Created from a \$200 million public-private sponsorship, the Buffalo Life Sciences Complex is the type of center where a combination of business development talent and investment capital for companies, supported at least in part with public dollars, may accelerate high-tech industry growth.<sup>378</sup> A dozen private sector firms are currently benefiting from transnational research, startup company activity, and support resources offered at the Buffalo Complex.<sup>379</sup>

### ***Clean Energy***

Both the Obama Administration and the current New York State government have placed a priority on developing a strong, domestic, clean energy industry as a key element of America's economic future.<sup>380</sup> Many view the development of a vibrant clean energy industry that promotes investments in batteries, fuel cells, and renewable energy as a job-creating alternative to the industrial sectors that have been lost to outsourcing and overseas competition.<sup>381</sup>

New York has achieved some modest success in nurturing its own clean energy industry. For example, in upstate New York, the growth in clean energy jobs in 2008 was double that of the traditional manufacturing sectors: 9.1 percent, versus 3.7 percent in overall job market growth.<sup>382</sup> Opportunities for growth exist in upstate New York, where there are several business incubators focused primarily on clean technology.<sup>383</sup>

### ***Fuel Cells and Batteries***

In the area of alternative fuels, Dr. Nasr sees significant growth potential as compared to other traditional job opportunities. Upstate New York also has significant infrastructure and capabilities in fuel cell technology, led by such companies as General Motors, General Electric, and the Delphi Corporation. The Delphi Corporation, for example, in cooperation with the Rochester Institute of Technology, has fuel cell technology in the advanced phase of devel-

opment that should be ready for production locally by 2012.<sup>384</sup> China currently enjoys an innovation advantage in a very important renewable energy technology: batteries.<sup>385</sup> The lithium-ion battery is the highest-value component of the Chevy Volt and is sourced from China and South Korea.<sup>386</sup> According to testimony provided at the hearing by Willy Shih, professor of management practice at the Harvard Business School,

*Most innovation in batteries in recent decades has been driven by the demands of consumer electronics products for portable power in small packages. So when U.S. companies largely abandoned the 'mature' consumer electronics business, the locus of R&D [research and development] and manufacturing—not just for the laptops, cell phones, and such but also for the batteries that power them—shifted to Asia. The Chinese company BYD is now the second largest manufacturer of lithium ion batteries in the world.*

Electric cars depend on the same battery technology used in laptops and cell phones. BYD, which is also an automobile manufacturer, has announced its intention to produce electric cars and market them in the United States by 2010.<sup>387</sup> Dr. Shih believes that the Chinese government is strategically using the global transition to hybrid and electric vehicles as an opportunity to assert global leadership in the next generation of automobiles, unburdened by a gasoline-powered vehicle manufacturing infrastructure.<sup>388</sup>

#### *Solar Panels*

Ed Kowalewski, director of International Trade and Development for the Empire State Development Agency, and Sam Natapoff, senior advisor to the governor of New York for International Trade, maintain that upstate New York has a natural resource that gives it an advantage in the development of a green economy: the Niagara Falls hydroelectric generators that supply relatively inexpensive electricity. Silicon, the major raw material used in the manufacture of solar panels, requires an energy-intensive process to turn it into solar-grade silicon. Because global demand for silicon is growing, silicon could become more expensive.<sup>389</sup> The New York government is counting on Niagara Falls to provide the area with a comparative advantage in competing with foreign producers.<sup>390</sup> Recently, Global Specialty Metals reopened old silicon plants in the Niagara Falls region that it acquired in 2006 and is expanding production of metallurgical-grade silicon meant for solar panels.<sup>391</sup> These two developments give upstate New York potential for growth in the solar power sectors. There are more than 400 small solar power firms in the region, providing more than 10,000 jobs in the solar power sector. The growth rate for this industry is 50 percent higher than for other comparable sectors.<sup>392</sup> Currently, however, no large-scale production facilities for solar panels exist in upstate New York.

Paul Vargovich, president of National Solar Technologies, a small producer of solar technology products in the Rochester region, testified that merely being able to meet domestic demand should be enough to facilitate growth and the creation of many high-paying

jobs in upstate New York and nationally as well. Upstate New York companies and government agencies are already facing tough competition from China, a leader in the development of the clean energy sector. China is home to a burgeoning solar industry, due to generous government subsidies for electricity, export incentives, and tariff protections from foreign competition.<sup>393</sup> Recently, China has been using local content rules to help build its clean energy sector.

However, China already has the world's largest solar panel manufacturing industry and exports more than 95 percent of its output to the United States and Europe. In contrast, Linda Dickerson Hartsock, director of the Syracuse Center for Clean Tech Entrepreneurship, who worked with some of the largest solar and wind equipment manufacturers, said that U.S. companies first look for planned government projects rather than to state subsidies when determining where to build manufacturing capacity.<sup>394</sup> In part because of China's actions, the United States ran a \$9.6 billion trade deficit for 2008 in green economy products with the whole of Asia.<sup>395</sup>

### **Erosion of Capacity to Innovate**

Dr. Shih suggests that an "industrial commons"—the collective research and development, engineering, and manufacturing capabilities in a region—is required to sustain innovation. Such resources exist in the clusters of companies, universities, and suppliers in the value network. The capabilities in an industrial commons sustain all the companies that access it, and they form the foundation of capabilities upon which those companies can build.<sup>396</sup> However, if the specialized resources or customers that originally attracted firms to a region decline or shift their focus away from those firms, the result can be disastrous for the region.

New York's competitive advantage historically has included research, development, and innovation combined with manufacturing. As manufacturing was outsourced, there is strong evidence that research, development, and innovation are following.<sup>397</sup> "Innovation and manufacturing are inextricably linked," said Ron Hira, associate professor of public policy at the Rochester Institute of Technology. "Lose manufacturing and you're going to lose innovation," he added.<sup>398</sup> Examples include Eastman Kodak, which established a Product Development Center in Shanghai in 1998 to develop software for local and worldwide markets and which is now part of Kodak's Engineering and Design Center; Dow Corning, which operates a China Application Center in Shanghai that doubled in size in 2003;<sup>399</sup> General Electric, whose 1,000-person technology center in Shanghai conducts research on clean coal and advanced environmental technologies;<sup>400</sup> and IBM, which opened a new research and development center in Shanghai in October 2008 to complement its China Research Laboratory in Beijing.<sup>401</sup>

By relocating their research, development, and innovation functions overseas, New York manufacturers have retained fewer talented employees and have reduced high-paying jobs in New York.<sup>402</sup> In the short term, this may increase profits. While on an individual basis these decisions may be rational and entirely appro-

appropriate ways to maximize profits and enhance shareholder value, the cumulative effect of these individual decisions has been to diminish considerably the industrial commons in upstate New York, thereby making this region a less attractive place for future investment. Large original equipment manufacturers such as Eastman Kodak, the Carrier Corporation, Corning Incorporated, IBM, and General Electric have restructured their upstate New York operations and shifted manufacturing abroad. The flow of revenues, world-class technology, and best practices has diminished considerably in these formerly original equipment manufacturing-centered communities. This trend has exacerbated a steady and troubling erosion of financial and technical resources among smaller regional manufacturers.<sup>403</sup>

Despite the advantages that upstate New York has to offer, with its many universities and highly educated workforce, it has one of the highest-cost environments for doing business. This fact, according to many of the Commission's witnesses, is a major contributor to the decline of manufacturing in the region. According to a study by the Center for Integrated Manufacturing, healthcare, energy, and taxes have significantly contributed to New York's high-cost business environment. Another factor complicating efforts to improve the business environment in upstate New York is that the economic development strategies in New York State are generally set independently at the municipal, county, regional, and state levels, with only limited coordination. This often leads to duplicating or conflicting investments that reduce return rates.<sup>404</sup>

### **Adopt a National Strategy for the Future**

Witnesses testifying at the Commission's Rochester hearing made a number of suggestions about how to improve the local economy.\* Many witnesses highlighted the need for a national strategy to deal with the effects of competition with and outsourcing to China. Although representatives from the various industry sectors that testified differed on the direction of this national strategy, they were all unanimous on one subject: China already has a national strategy to advance its industries and to become a leading technology and innovation economy. They insisted that U.S. policymakers should be aware of China's industrial strategy when formulating national policies and of the difficulties that state governments face in countering China's policies and activities.

Some of the witnesses at the Commission's Rochester hearing recommended a national strategy to focus industrial activity and to provide downstream opportunities.<sup>405</sup> Dr. Nasr argued that the state of New York does try to fill in the gaps where it can, but only a national effort by the federal government can make a difference. Although several federal agencies provide grants and money for local projects, Dr. Nasr believes that "we need to tie all the research and development money to some tangible economic goal that advances our competitiveness."<sup>406</sup> Ms. Hartsock testified that "this is only going to happen if there is a true public policy infrastructure plan that provides regulatory policy and incentives to really

\* For a full transcript of the hearing, visit the Commission's Web site, at [http://www.uscc.gov/hearings/2009hearings/transcripts/09\\_06\\_11\\_trans/09\\_06\\_11\\_trans.pdf](http://www.uscc.gov/hearings/2009hearings/transcripts/09_06_11_trans/09_06_11_trans.pdf).

jump-start at a large, national scale the kind of innovation effort that put a man on the moon 40 years ago.”<sup>407</sup>

Innovation requires critical mass, lab support, the right equipment and instrumentation, and peer review. It takes open communication among peers and other subtle, but critical, cultural factors. It takes a tolerance for risk and a tolerance for failure as well as a willingness to think and apply innovation laterally, as many of the big breakthroughs were originally aimed at other targets.<sup>408</sup> And it takes a culture that attracts, encourages, and rewards the best minds.<sup>409</sup> Although China is developing quickly, both commercially and technologically, witnesses testifying at the Commission’s hearings in Washington and in Rochester identified innovation as America’s main competitive advantage over China. Upstate New York could be, but is not yet, a market that attracts the level of investment that Silicon Valley or Boston’s high-tech corridor do, and therefore there is far less early-stage technology development in the greater Rochester area than might be expected, given the area’s history and technological strengths.<sup>410</sup>

### **Conclusions**

- China’s industrial policy targets and supports strategic industries identified as important to its economy in the 11th Five-Year Plan. This industrial policy promotes and subsidizes many of the same industries that comprise the industrial cluster of upstate New York. These industries include auto parts, machine tools, information technology, optics, photonics, and, more recently, clean renewable energy.
- China’s industrial policy has contributed to the loss of manufacturing in the region and presents a challenge to New York as it seeks to become a global leader in the renewable energy field.
- The relocation of manufacturing from upstate New York has weakened the industrial cluster, which in turn has greatly impacted the ability of remaining firms to be innovative. Advanced technology companies in the region that have been moving their manufacturing operations to China are now relocating their research, development, and innovation operations there as well.