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The Impact of Globalization and Trade with China on New York State Companies and  
Communities

Co-Chairman Shea, Co-Chairman Mulloy, other panel members, commission staff, and other distinguished guests, good morning, and thank you for the invitation to speak with you this morning. I believe that you are addressing a very important topic, one that has had a significant impact on the region, and America as a whole.

I would like to begin with some background on myself. I began my professional career in the Hudson Valley, at IBM Corporation in Poughkeepsie, in downstate New York. I spent fourteen years at IBM, followed by another four years at two other computer companies, the Digital Equipment Corporation in Maynard, Massachusetts, followed by Silicon Graphics Computer Systems in Mountain View, California. In July 1997, I came to the Eastman Kodak Company here in Rochester, and several weeks later assumed the position of President of the Digital and Applied Imaging unit, which represented Kodak's nascent efforts in the consumer digital arena. The team that I was privileged to lead there was a great team, and I was with that business until the end of 2003. I then was President of the Display and Components business unit, and simultaneously led Kodak's Intellectual Property strategy until I left the company in February 2005. It was a period of great excitement, and of some real ups and downs. When I worked at Kodak my family and I lived in Pittsford, not far from here, and I am pleased to tell you that both of my daughters completed their high school education here.

I subsequently joined Thomson, a French company, and was based in Princeton, New Jersey but I also had offices in Burbank, California and Paris, France. Thomson, I should mention, owned what remained of the RCA Corporation, the pioneer in recorded music, radio, and of course color television, having received it as part of a famous "trade" with GE.

I joined the faculty at the Harvard Business School in January 2007, where I have been teaching in the second year of the MBA program as well as the Executive Education program. The focus of my research there has been on companies operating in Asia in technology sectors, and I just returned from my seventh trip to Asia this year, where we have major research studies going on in China and Taiwan.

Professor Gary Pisano and I recently published an article in the current issue of the *Harvard Business Review* entitled, "Restoring America's Competitiveness." In this article, we argue that as a consequence of not thinking about potential long term implications of some types of outsourcing, as well as faltering investment in research, the U.S. has lost or is on the verge of losing its ability to develop and manufacture many high-tech products. We talk about the idea of an "industrial commons" — the collective R&D, engineering, and manufacturing capabilities in a region that sustain innovation. Historically, the "commons" referred to the land where animals belonging to people in the community would graze. The commons did not belong to any one farmer, but all farmers were better off for having access to it. We describe an industrial commons in an analogous fashion, embodying the R&D know-how, advanced process development and engineering skills, and manufacturing competences related to specific technologies. One finds such resources embedded in companies, universities, often even the different intermediate customers and users in the value network. The capabilities in an industrial commons sustain all the companies that access it, and it is a foundation of capabilities upon which those companies can build.

It was during my years at Kodak, when I made many trips a year to Asia, that I started to think a lot about this topic. Let me give you some examples that illustrate the often unforeseen long term consequences of letting a commons erode.

When I came to Kodak, one of the efforts I was to lead was the establishment of a digital camera business. I think everyone in this region certainly remembers that George Eastman built the Eastman Kodak Company on his innovations in roll film. And for a century, Kodak made its profits on film – cameras were a "vehicle" for the film to be consumed. The company made low cost cameras for the mass market, but it let the mid and high end of the camera business shift to Japan in the 1960s and 1970s. It was very hard to make money in cameras, but the profits were in film anyways.

Digital cameras were different. There was no film, but now in a turnabout, the components of the camera became key generators of value. Consumers wanted zoom lenses, but the industrial cluster, or commons, for lenses was in Japan. Digital cameras used electronic image sensors, a technology invented in the United States that had migrated to Japan with the rest of the consumer electronics industry when Asian companies started to build camcorders. And the

coolest thing about a digital camera was the ability to view the picture immediately on a little electronic display. That was another technology invented in the United States that had moved to Asia. We talk about the loss of the display industry and the consequences in our article as well.

So there was no commons, no capabilities, in the United States, or specifically in Rochester, to develop and manufacture a product whose technological underpinnings all came from the United States, many of them from Kodak's own Research Labs, as a look at Kodak's patent portfolio will show.

Did I outsource digital cameras to Asia? Actually, we bought a company in Japan that was well connected to the commons in the greater Nagano region of Japan so that we could tap into that cluster of resources. That was where we did our camera design and manufacturing initially. Ultimately we moved camera manufacturing to China, where costs were lower. Because if we wanted the American consumer to purchase our products, and the United States was far and away our largest market, we had to be price competitive at retailers like Wal-Mart. Assembly labor costs were substantially less in China, and the cost differential would have made us woefully uncompetitive if we had assembled cameras in the United States. We did do much of our firmware and software in the United States, in Rochester and in Lowell, Massachusetts.

Could we have done manufacturing in Rochester? Actually, we tried. We had set up a highly automated assembly line at the former Elmgrove site. But it was not as flexible as manufacturing in Asia, nor was the cost competitive. And almost all of the components would have come from Asia in any case, because they simply were not made in the United States.

Was there a lesson in this? I think so. Thirty years ago, manufacturing sophisticated cameras was less important than the manufacture of film. So Kodak and others let the commons wither away. Was it a sensible decision at the time? In isolation, probably. A colleague of mine who was the president of a second tier Japanese camera company once told me, "In the film era, we camera manufacturers never made money. Kodak made all the money on film." He said that with a tone of residual bitterness, as his was one of the companies that had never made money on film cameras. But then a technological shift happened, and the decisions made thirty years ago suddenly had irreversible consequences.

Let me give you another example. In my last year at Kodak, I managed what was then called the Display and Components business. Ching Tang, a scientist at Kodak Research Labs, discovered the phenomena know as organic electroluminescence back in the late 1980s. This is the foundation for a technology called OLED, which stands for organic light emitting display. Some of you may have seen Sony's remarkable OLED television, and I was just talking to an Asian display manufacturer last week who said OLEDs would be the next big thing for them.

But here was the problem. Fashioning a display out of OLED materials required the capability to fabricate large thin film transistor arrays on thin sheets of glass, as is done in the LCD flat panel display industry. LCD flat panel displays were invented in the United States as well, but the capital costs and the skills for that type of manufacturing left these shores in the 1990s, for Japan, Korea, Taiwan and now China. For a while I considered the possibility of purchasing the manufacturing tools and setting up a line in the United States. But essentially every other such production line in the world was located in Japan, Korea, Taiwan, or China. If a tool went down and one needed a service call in Taiwan or Korea, a technician could come over in maybe 20 minutes. In the United States, it might take a week. We ended up setting up a joint venture production line in Japan, because you need access to a production line if you want to commercialize this type of technology. Much of the innovation and the obstacles to commercialization were in the manufacturing process. The commons did not exist in North America, a result of decisions made a decade earlier, by other companies.

Let me look at the subject of batteries. Kodak developed some pretty advanced battery technology too, but was not the U.S. market leader. Who would have thought that batteries, rechargeable batteries, would become so important an area? Certainly not the other large U.S. based battery manufacturers, who didn't really want to chase the rechargeables market. 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 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. And BYD is also an auto manufacturer. When I was in China over the last few weeks, we used quite extensively a little taxi company with two cars, one of which was a BYD, so we rode around in it quite a bit. It was not a bad little car – it reminded me of where Korea was 10 years ago, and of Japanese cars from the mid 1980s. BYD has announced their intention to produce electric cars, and I believe the Chinese government strategically is using the 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.

Why do managers make these seeming short-sighted decisions to outsource in the first place? More often than not, it is not driven by greed, but it is driven by cost pressure and the need to be competitive. If you spend any time analyzing retail sales, you find that American consumers are very cost conscious – price matters a great deal. A lot of manufacturing outsourcing is driven by pure labor cost arbitrage, the ability to reduce costs by taking advantage of lower factor costs in another geography. But when a major player in an industry outsources an

activity, cuts funding for long-term research, and gains a short-term cost advantage, competitive pressure often forces rivals to follow suit. Next potential employment opportunities shrink, experienced people change jobs or move out of the region, and students shy away from entering the field. Eventually, the commons loses the essential critical mass of work, skills, and scientific knowledge and can no longer support providers of upstream and downstream activities, which are, in their turn, forced to move away as well. Short term decisions, which might make sense in their own context, have the longer term potential to impact strategic control points for future technologies.

The problem I am describing has been years in the making. It is the consequence of what I sometimes call “logical incrementalism,” in which individual decisions made with a local context and shorter horizon, seem to make sense. But taken together, the long term consequences are not what we bargained for.

Having said this, I don’t think all outsourcing is bad. The global model of vertical specialization and sequential production that we live in today has brought dramatic improvements in the standard of living to many people, especially here in the United States. And there are many things that are outsourced from the United States that are jobs people here would not, or could not do. We as a country need to look forward, and think carefully and strategically about what we do want to keep, and what do we want to nurture for the future. We need to recognize areas that embody capabilities that will be the underpinnings of important technologies for the future, and we need to recognize that the capacity to undertake advanced process engineering and complex manufacturing is important to continued innovation.

Other countries have for years thought strategically about the industries that they want to foster and grow. I am not speaking just of China. Japan in the 1970s, Taiwan in the 1970s and 1980s, Singapore, Korea, all have exhibited visionary thinking and planned for the long term. One of my good friends and colleagues was one of the fathers of the semiconductor industry in Taiwan. As a government researcher, he was part of the original team that travelled to RCA in New Jersey, to transfer its CMOS process to Taiwan. He then spent the next thirty years of his life trying to foster the development of the right types of capabilities within local industry. They put a lot of energy and government funding into the growth of a commons, through its Industrial Technology Research Institute, which he ultimately headed. Today Taiwan has 70% of the world’s semiconductor foundry capacity, and they are recognized as world leaders not only in semiconductors, but in LEDs, PC design, and information displays.

China’s “863” program framed its long term technology development goals in 1986. Subject areas included information technology, biotechnology and advanced agricultural technology, advanced materials, energy technology, and resource and environmental technology. It

targeted specific product categories and know-how that the country needed to develop. This program was not about currency manipulation or trade barriers, it was about what capabilities the country wanted to establish, what strategic industries they wanted to foster. China as well as other nations were only too happy to see the American companies abandon area after area in pursuit of short term profits. Should we fault them for capitalizing on our myopia?

So what do we do? I think Washington and companies operating in America need to work together to reinvigorate the industrial commons. A few of the things that we suggest in our article include:

Reverse the slide in the funding of basic and applied science. Government funding for basic research has been flat to declining over the last six years, and funding for applied research has dropped sharply. Historically, government programs like the DARPA VLSI program in the early 1980s or National Science Foundation funding of the NSFNet have had led to groundbreaking innovation and growth of entire new industries.

Focus resources on solving “grand challenge problems.” Programs like the sequencing of the human genome, big complex problems like climate change, such problems require tremendous resources and coordination. We rally to such challenges in this country. And the benefits in generating new capabilities in universities, companies and the commons are lasting and profound. But that also means that we have to look at the granting process, and move it beyond the safe and incremental to the higher risk, higher return cross discipline challenges that the U.S. is supremely good at tackling.

We suggest that companies need to make capabilities the main pillar of their strategies. Capabilities are the foundation on which innovative products are built. There are some exemplary upstate companies in this regard – Corning and IBM Research.

Companies need to stop blaming Wall Street for short-term behavior. I understand why it happens, the pressure for short term earnings can be huge. But I think this is a matter of choice for executives. Again, to cite Corning, there stock has had its ups and downs. But when you talk to people responsible for the long term strategy of the company, they think about the next 150 years and invest for the long term. And they end up having the stockholders they deserve.

Company managers need to recognize the limits of financial tools. I have worked in a company where every key R&D project was evaluated by a tool called net present value or NPV. I suspect one reason they did this was it relieved top executives of the need to understand the

details of the projects, including their longer term strategic implications. The problem with a lot of these tools is that you need data in order to use them. And data is only available on the past, and good data is really only available on the distant past. Informed judgment is a better guide to making such decisions than analytical models loaded with arbitrary assumptions.

We all need to reinvigorate basic and applied research. I've cited Corning and IBM as great New York State examples. Locally the University of Rochester, R.I.T., Kodak's Research Labs, Xerox, U. of R.'s Laser Energetics Lab, there are rich resources and capabilities in the area.

There are many things we as a country can do to set ourselves on a better course for the future. The Federal government, and to a lesser extent state governments have long played a role in supporting technological innovation. As we discuss in our article, programs like DARPA's VLSI Program, the National Science Foundation Network, the sequencing of the human genome – these programs produced tremendous benefits by creating capabilities in universities and companies – and in the commons. And the Albany Nanotech initiative is making the Hudson Valley a key development area in the future of microelectronics and nanotech. The recent groundbreaking of the new GlobalFoundries fab in Luther Forest is a testimony to this, and it complements the ongoing investment by IBM in microelectronics at East Fishkill. These are all steps that hold great promise for upstate New York, as long as we train people for the new types of jobs that they will create.

I hope we can turn our recognition of the challenges we face into concrete steps that will start to address this problem. Only by rejuvenating our high-tech sector can we hope to return to the path of sustained growth needed to pay down our enormous deficits and raise our citizens' standard of living.

Thank you very much for your attention.