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HOW TO MAKE AN AMERICAN JOB BY ANDY GROVE

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**‘Startups
are
wonderful.**

**But they
don’t
create
employment.’**

**How to Make
an American Job.
By Andy Grove**

Photograph by Robyn Twomey



Recently an acquaintance at the next table in a Palo Alto (Calif.) restaurant introduced me to his companions, three young venture capitalists from China. They explained, with visible excitement, that they were touring promising companies in Silicon Valley. I've lived in the Valley a long time, and usually when I see how the region has become such a draw for global investments, I feel a little proud.

Not this time. I left the restaurant unsettled. Something did not add up. Bay Area unemployment is even higher than the 9.7 percent national average. Clearly, the great Silicon Valley innovation machine hasn't been creating many jobs of late—unless you're counting Asia, where American tech companies have been adding jobs like mad for years.

The underlying problem isn't simply lower Asian costs. It's our own misplaced faith in the power of startups to create U.S. jobs. Americans love the idea of the guys in the garage inventing something that changes the world. *New York Times* columnist Thomas L. Friedman recently encapsulated this view in a piece called "Start-Ups, Not Bailouts." His argument: Let tired old companies that do commodity manufacturing die if they have to. If Washington really wants to create jobs, he wrote, it should back startups.

Friedman is wrong. Startups are a wonderful thing, but they cannot by themselves increase tech employment. Equally important is what comes after that mythical moment of creation in the garage, as technology goes from prototype to mass production. This is the phase where companies scale up. They work out design details, figure out how to make things affordably, build factories, and hire people by the thousands. Scaling is hard work but necessary to make innovation matter.

The scaling process is no longer happening in the U.S. And as long as that's the case, plowing capital into young companies that build their factories elsewhere will continue to yield a bad return in terms of American jobs.

What Went Wrong?

financed further growth.

I am fortunate to have lived through one such example. In 1968 two well-known technologists and their investor friends anted up \$3 million to start Intel, making memory chips for the computer industry. From the beginning we had to figure out how to make our chips in volume. We had to build factories, hire, train, and retain employees, establish relationships with suppliers, and sort out a million other things before Intel could become a billion-dollar company. Three years later the company went public and grew to be one of the biggest technology companies in the world. By 1980, 10 years after

Andy Grove, senior adviser to Intel, was the company's chief executive officer or chairman from 1987 until 2005.

our IPO, about 13,000 people worked for Intel in the U.S.

Not far from Intel's headquarters in Santa Clara, Calif., other companies developed. Tandem Computers went through a similar process, then Sun Microsystems, Cisco, Netscape, and on and on. Some companies died along the way or were absorbed by others, but each survivor added to the complex technological ecosystem that came to be called Silicon Valley.

As time passed, wages and health-care costs rose in the U.S. China opened up. American companies discovered that they could have their manufacturing and even their engineering done more cheaply overseas. When they did so, margins improved. Management was happy, and so were stockholders. Growth continued, even more profitably. But the job machine began sputtering.

The 10X Factor

Today, manufacturing employment in the U.S. computer industry is about 166,000, lower than it was before the first PC, the MITS Altair 2800, was assembled in 1975 (figure B). Meanwhile, a very effective computer manufacturing industry has emerged in Asia, employing about 1.5 million workers—factory employees, engineers, and managers. The largest of these companies is Hon Hai Precision Industry, also known as Foxconn. The company has grown at an astounding rate, first in Taiwan and later in China. Its revenues last year were \$62 billion, larger than Apple, Microsoft, Dell, or Intel. Foxconn employs over 800,000 people, more than the combined worldwide head count of Apple, Dell, Microsoft, Hewlett-Packard, Intel, and Sony (figure C).

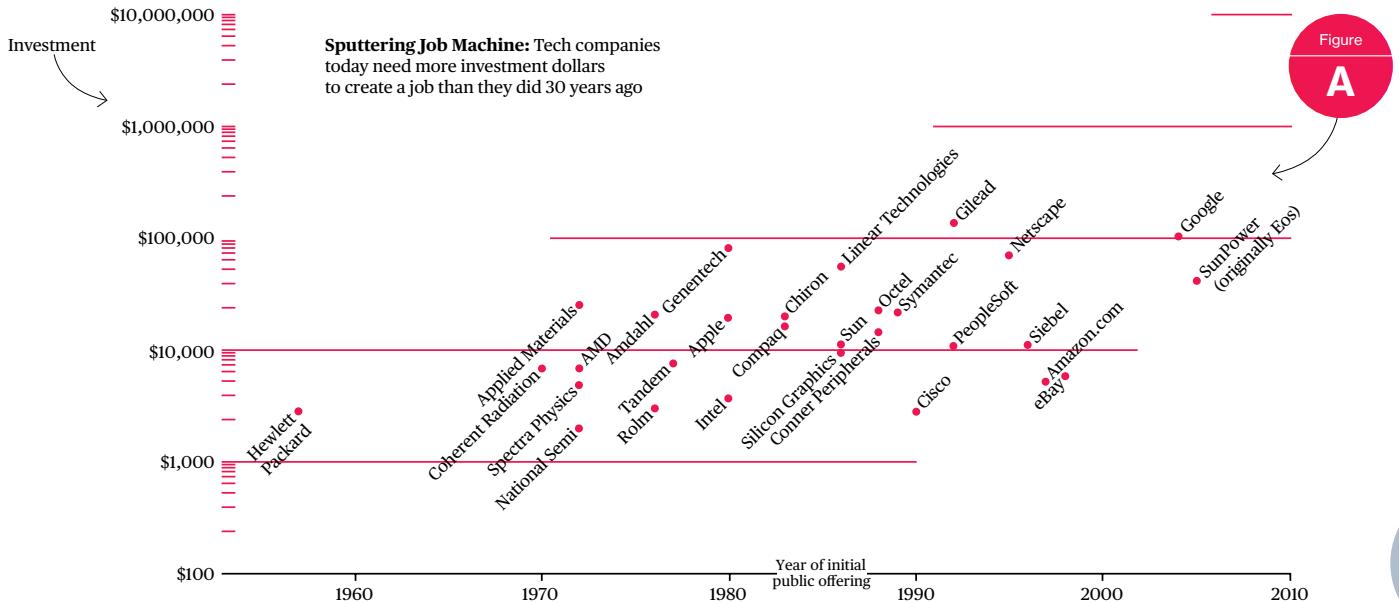
Until a recent spate of suicides at Foxconn's giant factory complex in Shenzhen, China, few Americans had heard of the company. But most know the products it makes: computers for Dell and HP, Nokia cell phones, Microsoft Xbox 360 consoles, Intel motherboards, and countless other familiar gadgets. Some 250,000 Foxconn employees in southern China produce Apple's products. Apple, meanwhile, has about 25,000 employees in the U.S. That means for every Apple worker in the U.S. there are 10 people in China working on iMacs, iPods, and iPhones. The same roughly 10-to-1 relationship holds for Dell, disk-drive maker Seagate Technology, and other U.S. tech companies.

You could say, as many do, that shipping jobs overseas is no big deal because the high-value work—and much of the profits—remain in the U.S. That may well be so. But what kind of a society are we going to have if it consists of highly paid people doing high-value-added work—and masses of unemployed?

Since the early days of Silicon Valley, the money invested in companies has increased dramatically, only to produce fewer jobs. Simply put, the U.S. has become wildly inefficient at creating American tech jobs. We may be less aware of this growing inefficiency, however, because our history of creating jobs over the past few decades has been spectacular—masking our greater and greater spending to create each position. Should we wait and not act on the basis of early indicators? I think that would be a tragic mistake, because the only chance we have to reverse the deterioration is if we act early and decisively.

Already the decline has been marked. It may be measured by way of a simple calculation—an estimate of the employment cost-effectiveness of a company. First, take the initial investment plus the investment during a company's IPO. Then divide that

'The cost of creating jobs grew from a few thousand dollars per position to a hundred thousand today'



*Investment restated in 2010 dollars. Dollars invested before and in the IPO, divided by worldwide employment 10 years after the IPO. Data: Andy Grove

by the number of employees working in that company 10 years later. For Intel this worked out to be about \$650 per job—\$3,600 adjusted for inflation. National Semiconductor, another chip company, was even more efficient at \$2,000 per job. Making the same calculations for a number of Silicon Valley companies shows that the cost of creating U.S. jobs grew from a few thousand dollars per position in the early years to a hundred thousand dollars today (figure A). The obvious reason: Companies simply hire fewer employees as more work is done by outside contractors, usually in Asia.

The job machine breakdown isn't just in computers. Consider alternative energy, an emerging industry where there's plenty of innovation. Photovoltaics, for example, are a U.S. invention. Their use in home energy applications was also pioneered by the U.S. Last year, I decided to do my bit for energy conservation and set out to equip my house with solar power. My wife and I talked with four local solar firms. As part of our due diligence, I checked where they get their photovoltaic panels—the key part of the system. All the panels they use come from China. A Silicon Valley company sells equipment used to manufacture photo-active films. They ship close to 10 times more machines to China than to manufacturers in the U.S., and this gap is growing (figure D). Not surprisingly, U.S. employment in the making of photovoltaic films and panels is perhaps 10,000—just a few percent of estimated worldwide employment.

There's more at stake than exported jobs. With some technologies, both scaling and innovation take place overseas.

Such is the case with advanced batteries. It has taken years and many false starts, but finally we are about to witness mass-produced electric cars and trucks. They all rely on lithium-ion batteries. What microprocessors are to computing, batteries are to electric vehicles. Unlike with microprocessors, the U.S. share of lithium-ion battery production is tiny (figure E).

That's a problem. A new industry needs an effective ecosystem in which technology knowhow accumulates, experience builds on experience, and close relationships develop between supplier and customer. The U.S. lost its lead in batteries 30 years ago when it stopped making consumer electronics devices. Whoever made batteries then gained the exposure and relationships needed to learn to supply batteries for the more demanding laptop PC market, and after that, for the even more demanding automobile market. U.S. companies did not participate in the first phase and consequently were not in the running for all that followed. I doubt they will ever catch up.

The Key to Job Creation

Scaling isn't easy. The investments required are much higher than in the invention phase. And funds need to be committed early, when not much is known about the potential market. Another example from Intel: The investment to build a silicon manufacturing plant in the '70s was a few million dollars. By the early '90s the cost of the factories that would be able to

produce the new Pentium chips in volume rose to several billion dollars. The decision to build these plants needed to be made years before we knew whether the Pentium chip would work or whether the market would be interested in it.

Lessons we learned from previous missteps helped us. Some years earlier, when Intel's business consisted of making memory chips, we hesitated to add manufacturing capacity, not being all that sure about the market demand in years to come. Our Japanese competitors didn't hesitate: They built the plants. When the demand for memory chips exploded, the Japanese roared into the U.S. market and Intel began its descent as a memory chip supplier. Despite being steeled by that experience, I still remember how afraid I was as I asked the Intel directors for authorization to spend billions of dollars for factories to produce a product that did not exist at the time for a market we could not size. Fortunately, they gave their O.K. even as they gulped. The bet paid off.

My point isn't that Intel was brilliant. The company was founded at a time when it was easier to scale domestically. For one thing, China wasn't yet open for business. More importantly, the U.S. had not yet forgotten that scaling was crucial to its economic future.

How could the U.S. have forgotten? I believe the answer has to do with a general undervaluing of manufacturing—the idea that as long as “knowledge work” stays in the U.S., it doesn't matter what happens to factory jobs. It's not just newspaper commentators who spread this idea. Consider this passage by Princeton University economist Alan S. Blinder: “The TV manufacturing industry really started here, and at one point employed many workers. But as TV sets became ‘just a commodity,’ their production moved offshore to locations with much lower wages. And nowadays the number of television sets manufactured in the U.S. is zero. A failure? No, a success.”

I disagree. Not only did we lose an untold number of jobs,

we broke the chain of experience that is so important in technological evolution. As happened with batteries, abandoning today's “commodity” manufacturing can lock you out of tomorrow's emerging industry.

**Wanted:
Job-Centric
Economics**

Our fundamental economic beliefs, which we have elevated from a conviction based on observation to an unquestioned truism, is that the free market is the best of all economic systems—the freer the better. Our generation has seen the decisive victory of free-market principles over planned economies. So we stick with this belief, largely oblivious to emerging evidence that while free markets beat planned economies, there may be room for a modification that is even better.

Such evidence stares at us from the performance of several Asian countries in the past few decades. These countries seem to understand that job creation must be the No. 1 objective of state economic policy. The government plays a strategic role in setting the priorities and arraying the forces and organization necessary to achieve this goal. The rapid development of the Asian economies provides numerous illustrations. In a thorough study of the industrial development of East Asia, Robert Wade of the London School of Economics found that these economies turned in precedent-shattering economic performances over the '70s and '80s in large part because of the effective involvement of the government in targeting the growth of manufacturing industries.

Consider the “Golden Projects,” a series of digital initiatives driven by the Chinese government in the late 1980s and 1990s. Beijing was convinced of the importance of electronic networks—used for transactions, communications, and coordination—in enabling job creation, particularly in the less developed parts of the country. Consequently, the Golden Proj-

‘Foxconn employs more than ... Apple, Dell, Microsoft, HP, Intel, and Sony combined’

Figure
B

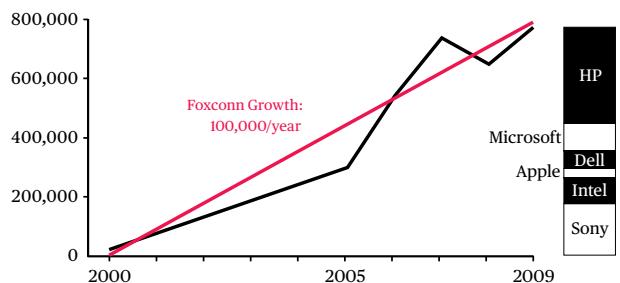
Computer manufacturing jobs in the U.S. have been on the decline since 1984*



* Before 1990; includes office equipment Data: Bureau of Labor Statistics

Figure
C

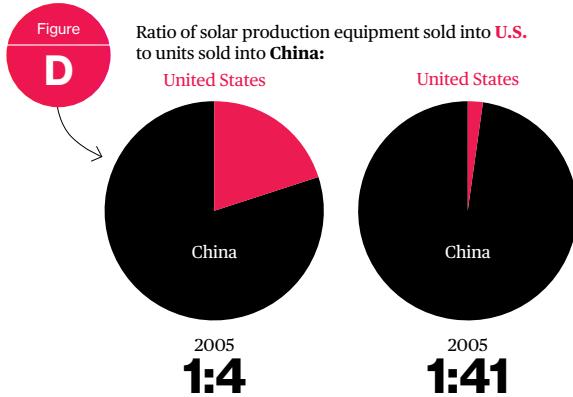
Hon Hai (Foxconn) head count



Data: Thompson Financial Extel Company Reports

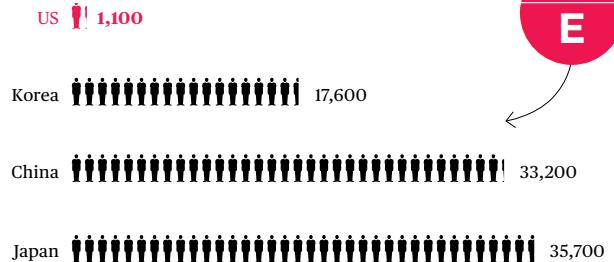


‘What chips are to computing, batteries are to electric vehicles. The U.S. share of the battery market is tiny’



Data: Applied Materials

86,500 people work in lithium-ion battery production:



Data: Intel

ects enjoyed priority funding. In time they contributed to the rapid development of China’s information infrastructure and the country’s economic growth.

How do we turn such Asian experience into intelligent action here and now? Long term, we need a job-centric economic theory—and job-centric political leadership—to guide our plans and actions. In the meantime, consider some basic thoughts from a onetime factory guy.

Silicon Valley is a community with a strong tradition of engineering, and engineers are a peculiar breed. They are eager to solve whatever problems they encounter. If profit margins are the problem, we go to work on margins, with exquisite focus. Each company, ruggedly individualistic, does its best to expand efficiently and improve its own profitability. However, our pursuit of our individual businesses, which often involves transferring manufacturing and a great deal of engineering out of the country, has hindered our ability to bring innovations to scale at home. Without scaling, we don’t just lose jobs—we lose our hold on new technologies. Losing the ability to scale will ultimately damage our capacity to innovate.

The story comes to mind of an engineer who was to be executed by guillotine. The guillotine was stuck, and custom required that if the blade didn’t drop, the condemned man was set free. Before this could happen, the engineer pointed with excitement to a rusty pulley, and told the executioner to apply some oil there. Off went his head.

We got to our current state as a consequence of many of us taking actions focused on our own companies’ next milestones. An example: Five years ago a friend joined a large VC firm as a partner. His responsibility was to make sure that all the startups they funded had a “China strategy,” meaning a plan to move what jobs they could to China. He was going around with an oil can, applying drops to the guillotine in case it was stuck. We should put away our oil cans. VCs should have a partner in charge of every startup’s “U.S. strategy.”

The first task is to rebuild our industrial commons. We should develop a system of financial incentives: Levy an extra tax on the product of offshored labor. (If the result is a trade war, treat it like other wars—fight to win.) Keep that money separate. Deposit it in the coffers of what we might call the Scaling Bank of the U.S. and make these sums available to companies that will scale their American operations. Such a system would be a daily reminder that while pursuing our company goals, all of us in business have a responsibility to maintain the industrial base on which we depend and the society whose adaptability—and stability—we may have taken for granted.

I fled Hungary as a young man in 1956 to come to the U.S. Growing up in the Soviet bloc, I witnessed first-hand the perils of both government overreach and a stratified population. Most Americans probably aren’t aware that there was a time in this country when tanks and cavalry were massed on Pennsylvania Avenue to chase away the unemployed. It was 1932; thousands of jobless veterans were demonstrating outside the White House. Soldiers with fixed bayonets and live ammunition moved in on them, and herded them away from the White House. In America! Unemployment is corrosive. If what I’m suggesting sounds protectionist, so be it.

Every day, that Palo Alto restaurant where I met the Chinese venture capitalists is full of technology executives and entrepreneurs. Many of them are my friends. I understand the technological challenges they face, along with the financial pressure they’re under from directors and shareholders. Can we expect them to take on yet another assignment, to work on behalf of a loosely defined community of companies, employees, and employees yet to be hired? To do so is undoubtedly naïve. Yet the imperative for change is real and the choice is simple. If we want to remain a leading economy, we change on our own, or change will continue to be forced upon us. **B**