

## ***BUILDING WEALTH***

### ***The new rules for individuals, companies, and nations***

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THE old foundations of success are gone. For all of human history the source of success has been controlling natural resources -- land, gold, oil. Suddenly the answer is "knowledge." The king of the knowledge economy, Bill Gates, owns no land, no gold or oil, no industrial processes. How does one use knowledge to build wealth? How do societies have to be reorganized to generate a wealth-enhancing knowledge environment? How do they incubate the entrepreneurs necessary to bring about change and create wealth? What skills are needed? The knowledge-based economy is asking new questions, giving new answers, and developing new rules for success.

#### **RULE #1: No one ever becomes very rich by saving money.**

THE rich see opportunities to work and invest in situations where great disequilibriums -- imbalances or openings in the economy created by new circumstances -- exist. Something, usually a new technology, has opened up opportunities to jump to new products with very different capabilities or to new processes with much higher levels of productivity. This was as true for John D. Rockefeller as it is for Bill Gates. For both of them lifetime savings constituted a small fraction of total wealth. Carefully saving money and investing in normal equilibrium situations can make one comfortable in old age but never really wealthy.

In what will come to be seen as the third industrial revolution, new technological opportunities are creating fortunes faster than ever before. The United States has created more billionaires in the past fifteen years than in its previous history -- even correcting for inflation and changes in average per capita gross domestic product. Bill Gates might spend close to \$100 million on his house and still have only the second most expensive house under construction in the United States. The thirteen billionaires of 1982 had by last fall been joined by 176 others. Together these 189 people have well over a trillion dollars in wealth. An additional two dozen people would have been on the list if the assessments had been made in July rather than October, and with the recovery in the stock market they were probably back on the list by the end of the year. To be among the fifty wealthiest Americans last year required a minimum of \$2.9 billion. The richest Americans don't hide their wealth; they actively seek to get their names on the list, and produce their financial records to prove that they belong there. They want to be seen as economic winners.

The slightly less wealthy exhibit their wealth in other ways. Conspicuous consumption is rising. Whereas since 1993 general consumption is up 29 percent, adventure travel is up 46 percent, sales of gourmet chocolates up 51 percent, pearls 73 percent, luxury cars 74 percent, and yachts 143 percent.

This wealth explosion isn't usual in America. In the 1950s, 1960s, and 1970s the economy was growing much faster (twice as fast from 1950 to 1970 as from 1970 to 1998), and average wealth was going up, but great wealth was not erupting. America did not suddenly give birth to a generation of super Americans. Americans in the fifties, sixties, and seventies were no less talented, no less inventive, no less ambitious. Our political and economic systems -- democracy and capitalism -- were not different. The opportunities to become wealthy simply weren't there.

What we are seeing in America today was last seen in the 1890s, during the second industrial revolution. Two innovations were changing the nature of economic advancement then and opening up opportunities to build great wealth.

The first was the birth of the corporate research laboratory. In creating its chemical industry Germany established the concept of systematic industrial research and development. Technological advances did not just randomly happen; they could be systematically invented. Previously the economy had advanced on the brilliance of what we might call great entrepreneurial tinkerers -- James Watt, Henry Bessemer, Richard Arkwright. Technological advances were not closely coupled to scientific advances. Bessemer, for example, never knew what chemistry made his blast furnace work. He just fiddled around until it worked.

Electricity was the other element behind the second industrial revolution. Electrification allowed a whole new set of industries to emerge (telephones, movies), and radically altered the production processes of every old industry. In the steam era a giant engine powered a central rotating shaft, and machine tools ran off pulleys in long linear factories. In the new electric model of production, small motors could be attached to each machine tool, and very different, more productive configurations of machinery could be arranged on the factory floor. It was an early industrial version of what is known today in the computer industry as distributive processing.

With the electric light bulb, night became day. The price-performance curve for the light bulb looked like the price-performance curve for today's computer. The lighting that can be had for thirty-three cents in a 100-watt bulb from Home Depot would have cost \$1,445 in 1883 (adjusted for lumens emitted, length of bulb life, inflation, and changes in per capita income).

Being able to do something after dark changed basic habits. People had slept an average of nine hours a night; now they slept slightly more than seven hours. With electricity came transportation systems -- underground and street railways -- that allowed the emergence of the modern metropolis. Electricity powered the telephone communication system that allowed small local markets to become big national markets.

The second industrial revolution created a sharp discontinuity in economic affairs and opened up opportunities to do things never done before. Old things could also be done in new ways. The smart and the lucky did not have to content themselves with highly competitive businesses producing commodities that earned bond-market "equilibrium" rates of return. In the jargon of economists, high "disequilibrium returns" replaced low "equilibrium returns." America's first set of billionaires (in inflation-corrected dollars) -- Rockefeller, Carnegie, Mellon, Morgan, Schwab -- emerged.

Disequilibrium conditions always disappear eventually. New industries with high returns and high growth rates become old industries with much lower returns and normal growth rates. As technologies mature, costs stop falling faster than selling prices. Competitors arise to drive down selling prices. The new products reach saturation levels. Growth markets become replacement markets. But "eventually" often means several decades. It takes time to attract enough capital and people into new industries to turn them into mature industries with normal growth rates and normal rates of return. In the meantime, there are great fortunes to be made.

Although billionaires and market wealth dominate the headlines, there is another way to look at wealth creation that could generate a very different set of headlines if anyone wanted to pay attention. Real wealth is the ability to produce more with less -- to generate a flow of goods and services without having to sacrifice something else of equal value. It is not created by taking time away from other activities and devoting it to money-making. Real wealth can be created by increases in what economists call labor productivity: the same time spent working generates more income (and hence wealth) than it did in the past.

But wealth can also be created by investing in plant and equipment. If one sacrifices consumption in order to save and invest, the sacrifice must be subtracted from the flow of income from that investment. Real wealth is ultimately not created by taking income away from consumption and devoting it to investment; it flows from increases in capital productivity -- getting more out of the same capital resources or using fewer capital resources to generate the same levels of market wealth.

**RULE #2: Sometimes successful businesses have to cannibalize themselves to save themselves.**

BUSINESSES must be willing to destroy the old while it is still successful if they wish to build the new that will become successful. If they don't destroy themselves, others will destroy them.

Disequilibrium means great threats as well as great opportunities. Only six of what had been the twenty-five biggest firms in 1960 were still on the list in 1997. Most had been merged into other companies, but two of the twenty-five had gone out of business. Of what were the twelve largest American companies at the beginning of the twentieth century, eleven will not be around to see the beginning of the twenty-first. Technological breakthroughs occur, the economic environment changes, and they could not adjust.

Old big firms understand, and often even invent, the new technologies that transform the world, but they have a structural problem that is almost impossible to solve. When breakthrough technologies come along, such firms must destroy the old to build the new. Four of the five makers of vacuum tubes, for example, never successfully made transistors after transistors emerged to replace the vacuum tube -- and the fifth is today not a player. When the microprocessor allowed the personal computer to replace the mainframe as the dominant growth market in the computer industry, the old industrial leader, IBM, fell off a cliff, and new leaders, Intel and Microsoft, emerged. IBM understood the new technology and wanted to compete but could not destroy its old (mainframe) business to build the new. In the 1980s IBM sold its 20 percent stake in Intel; if it still owned that stake today, IBM's total market value would be almost 30 percent greater than it is.

New firms have the great advantage of not having to destroy themselves to save themselves.

**RULE #3: Two routes other than radical technological change can lead to high-growth, high-rate-of-return opportunities: sociological disequilibriums and developmental disequilibriums.**

ENTREPRENEURS see sociological opportunities to change human habits. Starbucks persuaded Americans to replace their fifty-cent cup of coffee bought at a local restaurant with a \$2.50 cup of coffee bought at a coffee bar. They turned a competitive commodity with widely distributed points of sale out of which no one made much money into a noncompetitive differentiated product, and created a rapidly growing industry with high rates of return from which great fortunes could emerge.

The cruise industry took advantage of a shift in demographics: the relative purchasing power of the elderly had doubled in two decades. Seventy-year-olds twenty years earlier had cash incomes 40 percent below those of thirty-year-olds; suddenly seventy-year-olds had cash incomes 20 percent above those of thirty-year-olds. Cruises, known at least since the days of Cleopatra, became the perfect vacation for the elderly: We move you; you don't move. Some owners of cruise lines have become billionaires by exploiting sociological disequilibriums.

The problem with wealth generated this way is that sociological disequilibriums usually reflect a transfer of existing wealth rather than the generation of new wealth. Those who were selling conventional cups of coffee now sell fewer of them, and thousands of mom-and-pop restaurants make less money. The extra two dollars a cup that goes to Starbucks is two dollars that isn't spent somewhere else.



What might be called developmental disequilibrium exists whenever countries or entrepreneurs can replicate the activities of the developed world in the underdeveloped world.

A year or so before the hand-over of Hong Kong from Britain to China, I was sitting in the lounge at the Hong Kong airport eavesdropping on a conversation between two rich Chinese businessmen on their way to spend six months in Vancouver in order to get Canadian passports -- their insurance policy in case things went wrong in Hong Kong. They were complaining about having to stay so long in Vancouver, because they could see no way of using their time there to make money. To hear them

describe it, Vancouver was an economic desert. Why? Vancouver, after all, is richer than Hong Kong.

The answer is to be found in the absence of developmental disequilibriums in Canada. In Hong Kong these businessmen had become rich by exploiting the differences between the developed world and poor, but now open, mainland China. They simply copied what was done in the developed world and replicated it in China. What were commodity operations with low rates of return and few growth prospects in the developed world were high-return, high-growth opportunities in China. These businessmen were skilled at replication and at knowing the exact time when mainland-Chinese conditions were ripe for any particular activity.

Vancouver held no replication opportunities. All the normal First World activities already existed there. To get rich in Vancouver one needed breakthrough technologies or new sociological concepts. The businessmen had neither. For them Vancouver truly was an economic desert.

**RULE #4: Making capitalism work in a deflationary environment is much harder than making it work in an inflationary environment.**

SYSTEMATIC deflation is not a certainty, but the third industrial revolution has made it likely enough that there's good reason to think about how standard economic operating procedures change when prices start to fall.

Globalization is forcing prices down. Production is being moved from high-cost to low-cost locations, and prices are falling as a result. Name any major product, calculate how much the world could produce if every factory were operating at capacity, subtract what the world is going to buy, and you'll find that the world's production potential exceeds expected consumption by at least a third. Cars, semiconductor chips, and oil are but three of many examples. With such an excess of production capacity, falling prices are no mystery. Firms have an enormous incentive to lower prices in an attempt to keep their facilities operating closer to capacity.

Globalization also brings pressure to bear to change work practices, to raise productivity, and to lower wages. BMW used its ability to set up a manufacturing plant in the United States as leverage with its unions to change work practices in Germany. Flexible shifts were introduced in Germany so that when demand was high, the plants could operate on weekends. This allowed capital costs to be cut by a quarter. BMW workers essentially have bank accounts in which their hours of work on weekends or after a normal shift can be deposited. When demand is low, workers who aren't needed can draw pay for the hours of work accumulated in their bank accounts. Overtime is not paid unless it is clear that total hours of work in a year will exceed the standard. The company is now spreading these practices to its Rover plants, in Britain. The British workers have been told that they must cut the productivity gap, of 30 percent, between themselves and the Germans. BMW does not have to threaten that if they don't, production will be moved elsewhere. Everyone knows that. With labor costs and wages down (the same pressures have been forcing down real weekly U.S. wages for the bottom two thirds of the work

force at the rate of about a percentage point a year for the past twenty-five years), prices must eventually start to fall.

The Asian meltdown substantially increases the downward pressures on prices. Indonesia and Thailand have to export more, and can do so only by lowering prices. If their global competitors, mostly in the Third World, do not want to lose market share, they have no choice but to match the lower prices. In the developed world similar pressure comes from Korea and Japan. New technologies, especially those affecting energy, minerals, and agricultural products, are also driving prices down very rapidly. Oil prices were at an all-time low early this year. Gold, that bellwether commodity, is also down dramatically from where it was just a few years ago. In every case new processes are dramatically cutting the costs of extracting value from nature.

Downsizing and outsourcing have also played a role in reducing prices. It is common in America for companies to have contracts with their suppliers that require annual price reductions. Auto-parts manufacturers, for example, have signed contracts with the major auto producers calling for price reductions of three percent a year. Outsourcing is largely responsible for these tough contracts, because it is easier to get tough with an outside supplier than it is with an inside supplier. If an outside supplier makes no money with the lower prices, that is his problem. But if an inside supplier makes no money, the corporation loses in one of its selling divisions what it gains in one of its buying divisions. It sees no gain in aggregate profits. Such practices led to a fall in new-car prices in the United States last year for the first time since the early 1970s.

In a deflationary world debt is to be avoided at all costs. Real interest rates (nominal money rates plus the rate of deflation) are very high and debts have to be repaid in dollars of greater value than the dollars that were borrowed. Those with debts want to repay them as quickly as possible, because debt burdens automatically grow larger in real terms over time. If prices fall by 10 percent, a \$100 debt effectively becomes a \$110 debt. And if debt reduction becomes the No. 1 priority, no one will invest in the things that cause growth.

**RULE #5: There are no institutional substitutes for individual entrepreneurial change agents.**

CAPITALISM is a process of creative destruction. The new destroys the old. Both the creation and the destruction are essential to driving the economy forward. Entrepreneurs are central to the process of creative destruction; they bring the new technologies and the new concepts into active commercial use. They are the change agents of capitalism.

The old patterns of powerful vested interests must be broken if the new is to exist, but those vested interests fight back. They are not willing to fade quietly into the pages of history. Entrepreneurs built the national companies that destroyed local companies at the end of the nineteenth century, and they are building the global companies that are destroying national companies at the end of the twentieth century.

History teaches us that it is only too easy to stamp out entrepreneurship. It is a fundamental human characteristic but, despite its creative and destructive powers, an extremely fragile one. Among most peoples in most times and most places entrepreneurs do not exist. The economic possibilities exist, but they are not seen, the energy to realize them is lacking, or the risks they involve seem too great.

When societies aren't organized so that the old vested interests can be brushed aside, entrepreneurs cannot emerge. Social systems have to be built in which entrepreneurs have the freedom to destroy the old. Yet destroying the old can too easily be seen as a step into chaos. Societies that aren't ready to break with the past aren't willing to let entrepreneurs come into existence.

Europe provides a good example of the importance of entrepreneurship. Europe saves and invests more than the United States, has a better-educated populace, and has a basic understanding of

science that is just as good as that in the United States, yet it has created none of the new brainpower industries of the twenty-first century. Last year the production arm of the last indigenous European computer manufacturer, Siemens Nixdorf, was sold to Acer, of Taiwan. How can a region be a leader in the twenty-first century and be completely out of the computer business? The European entrepreneurs that should exist don't.

Sociology almost always dominates technology. Ideas often lie unused because people do not want to use them. The fact that something is possible does not mean that it will happen. Great persistence is needed to bring a truly new idea into the market. Steam toys have been unearthed in the archaeological exploration of ancient Greece, and the ancient Egyptians had steam-powered temple doors -- yet the steam engine did not emerge as a source of power for economic production until the eighteenth century. The right sociology had to be in place for revolutionary new products to emerge.

**RULE #6: No society that values order above all else will be creative; but without some degree of order creativity disappears.**

CONSIDER China at the outset of the fifteenth century. Its curiosity, its instinct for exploration, and its drive to build had created all the technologies necessary to launch the Industrial Revolution -- something that would not actually occur for another 400 years. It had the blast furnace and piston bellows for making steel (the amount of pig iron that China produced annually in the late eleventh century would not be matched anywhere in the world for 700 years); gunpowder and the cannon for military conquest; the compass and the rudder for exploration; paper and movable type for printing; the iron plough, the horse collar, rotary threshing machines, and mechanical seeders to generate agricultural surpluses; the ability to drill for natural gas; and in mathematics the decimal system, negative numbers, and the concept of zero, which put the Chinese far ahead of the Europeans. Large Chinese armadas -- carrying as many as 28,000 men -- were exploring Africa's east coast at about the same time that Portugal and Spain were sending much smaller expeditions down the west coast of Africa. Seven major Chinese expeditions explored the Indian Ocean with ships four times as large as those of Columbus.



But the geographic conquests and the industrial revolution that were possible did not happen. The Chinese rejected and ultimately forgot the technologies that could have given them world dominance. New technologies were perceived as threats rather than opportunities. Innovation was forbidden. Imperial edicts prohibited the building of new oceangoing ships and sailing away from the Chinese coastline. By the end of the fifteenth century the demand for order had overridden intrinsic human curiosity, the desire to explore, and the drive to build.

Consider the opposite case of Russia in the seventy-five years before the Russian Revolution. Creativity flourished in the chaos of a dying empire. Think of all the great authors: Tolstoy, Dostoevski, Chekhov, Turgenev, Gogol -- the list goes on and on. Likewise in the world of music and the arts. Stravinsky, Tchaikovsky, Kandinsky, Kasimir, and many others are still played in our concert halls or admired in our museums. In science Russia was a leader. Wilhelm Ostwald was one of the first Nobel Prize winners in chemistry, for his work on the speed of chemical reactions. Ivan Pavlov, also a Nobel Prize winner, is perhaps the most famous physiologist ever. Dmitri Mendeleev devised the periodic table of chemical elements. Markov chains -- named for the mathematician Andrei Markov -- have found a wide variety of applications in physics, biology, linguistics, and economics. Nikolai Lobachevski developed non-Euclidean geometry. Being skeptical and refusing to accept authority are the secrets of scientific

advancement. Living in chaos, Russians could be skeptical. Compared with the dangers of political revolt against the Czar, the risks of scientific revolt against perceived wisdom were small.

Creativity flourished in the chaos, yes, but without some degree of order it was impossible for the Russians to use that creativity to develop a successful economy. Chaos led to more chaos, and ultimately to the Russian Revolution. Order was reimposed. Creativity died.

To advance and use knowledge a society needs the right combination of chaos and order. Too much order (China) does not work. Too much chaos (Russia) does not work. Although not as extreme, America and Japan are in many ways similar to Russia and China. America has more than enough chaos to be creative, but too little order to use its ideas in the most efficient ways. Japan has more than enough order to be efficient but too little chaos to be creative. Both could gain if each moved a little in the direction of the other. Successful societies create and manage a tension between order and chaos without letting either of them get out of hand. New ideas are easily frustrated if societies are not receptive to the chaos that comes from change, yet societies have to maintain an appropriate degree of order to take advantage of creative breakthroughs.

At the individual level these same forces show up as a tension between tradition and rebellion. Einstein dropped out of high school at the age of fifteen; renounced his citizenship a year later; lived on the margins socially, economically, and morally; and called himself a gypsy and was viewed as a bohemian. His life was in some sense a search for order in disorder, both scientifically and socially. Great creativity requires hard facts, wild imagination, and nonlogical jumps forward that are then proved to be right by working backward to known principles. Only the rebellious can do it.

Entrepreneurial and organizational skills, curiosity, the desire to explore, and the drive to build can be enhanced. Useful curiosity is a characteristic of individuals who have mastered the existing body of knowledge but are not paralyzed by it.

**RULE #7: A successful knowledge-based economy requires large public investments in education, infrastructure, and research and development.**

IT is not just a matter of brilliant individuals and aggressive entrepreneurs. The new economic game is simultaneously a team game and an individual sport. Without the support of the team the individual fails. Without individual initiative the team fails. Both are necessary.

Some countries are willing to invest in research and development; others are not. The right amount to invest is not obvious. The industrial world's four biggest economies spend very similar percentages of GDP on R&D: France and Germany spend 2.3 percent, Japan 2.8 percent, and the United States 2.5 percent. But the similarity derives more from a desire in each not to let the other three get ahead than from any proof that they are spending the right amount.

Most private American R&D, about four fifths, is done by big firms. Even among these big spenders, however, spending levels vary greatly: Boeing spends four percent of sales, Intel nine percent, Lucent 12 percent, and Microsoft 17 percent. Expenditure levels depend on the industry under consideration and on whether firms in that industry believe that the basic science is in place to make real progress in developing new goods or services. Virtually 100 percent of Intel's sales and profits come from products developed within the past three years, but only about 30 to 40 percent of IBM's profits come from recently developed products.

For countries or companies technological leadership is not the same thing as R&D spending. Europe spends its share on research, but if one looks at technological leadership, that spending does not seem to be paying off. To pay off, obviously, research has to be followed by the activities necessary to embed the newly developed technologies in the economy. Where America outclasses Europe is not so much in R&D spending on information technology, for example, as in investments in information hardware and

software. As a fraction of GDP, U.S. investments were twice those of Germany or France in 1996. What has been learned isn't very different, but what is being done with the learning is quite different.

Private rates of return on R&D spending (the financial benefits that accrue to the firm doing the spending) average about 24 percent. But social rates of return on R&D spending (the economic benefits that accrue to the entire society) are about 66 percent (as computed by averaging eight different studies), with a range from 50 to 105 percent -- almost three times as high as private rates. Two out of three dollars in net benefits generated do not accrue to those paying for the R&D. This result, never contradicted in the economic literature, provides powerful evidence that there are huge positive social spillovers from research and development. Left to themselves, private firms will spend too little, because they cannot capture all the benefits that flow from their activities.

Because the government doesn't care exactly which Americans reap the benefits, it has a very important role to play in R&D. Rates of return on R&D spending are far above those found elsewhere in the economy. Government now pays for about 30 percent of total R&D, but with a 66 percent rate of return it should be spending much more. Americans as a whole are investing too little in R&D. Put simply, the payoff from social investment in basic research is as clear as anything is ever going to be in economics.

Private returns are apt to be much more certain if one is looking for an extension of existing knowledge rather than for a major breakthrough; thus private firms tend to concentrate their money on the developmental end of the R&D process. Time lags are also shorter, and in the business world speed is everything.

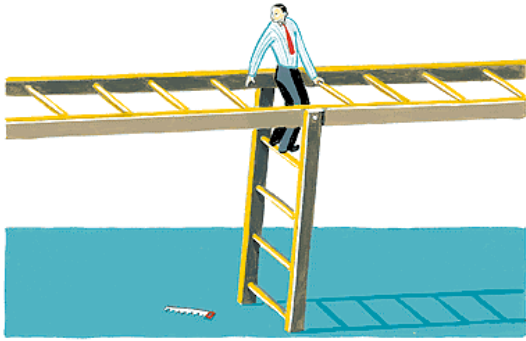
Because of this proclivity in the private sector, government should focus its spending on long-tailed projects for advancing basic knowledge. This is where private firms won't invest, but it is also precisely where the breakthroughs that generate private business opportunities are made. That is why biotechnology had to be supported by the government. Where it did not receive government support -- everywhere except the United States -- it did not develop. No private company would have made the investments that the National Institutes of Health did, even if the company had known that success was certain, because money went in for more than twenty-five years before any salable products came out.

**RULE #8: The biggest unknown for the individual in a knowledge-based economy is how to have a career in a system where there are no careers.**

EDUCATION has always been a high-risk investment for the individual. More than 20 percent of all college graduates will end up making less than the average high school graduate. They invested and it did not pay off. But recently it has become even riskier. How does one plan the investments necessary to have a career in the face of corporate downsizings at profitable firms?

For my generation of high school graduates the concept of a career had meaning. During the 1950s in Montana, where I went to high school, many high school graduates started as laborers in the copper mines. Starting wages were good, and one could count on annual raises of two or three percent. There was a skill ladder. Laborers moved up to operating underground trains or other kinds of heavy equipment, learning the necessary skills by working as assistants to the operators. Someone who demonstrated intelligence and judgment could be given responsibility for setting off underground explosions. Each promotion meant higher hourly wages. When a worker reached his mid-thirties, he could expect to take the last step on the earnings ladder and become a contract miner, who was paid for each foot of tunnel dug rather than by the hour. He was no longer a wage slave. On this career ladder high school graduates could match college graduates in earnings.





But that's all gone now. Those mines were shut down. The thousands of people who worked there were laid off.

What used to be true only in declining industries -- that skills suddenly become valueless -- is now true everywhere. Downsizing is a way of life even in good times. In a global economy, if skills are cheaper somewhere else in the world, companies will move there to lower production costs. They aren't tied to any particular set of workers. When new knowledge makes old skills obsolete, firms want to employ workers who already have that knowledge. They don't want

to pay for retraining. In the second half of this decade profitable American companies have laid off more than half a million workers each year despite the economic boom. The old career ladders are gone. The old lifetime employees are gone.

Explicitly or implicitly, today's high school graduate is given a message: "You are unlikely to have a lifetime career in any one company. You are going to have to learn to take responsibility for and manage your own career. Regular annual wage increases are a thing of the past. Paternalism is gone." If they are honest, employers themselves deliver the message. But how does anyone follow this advice?

If career ladders don't exist within any one company, maybe they exist across different companies. This would mean that a good initial performance at Company A would lead to training opportunities, a better job, and higher wages at Company B. But the world doesn't work that way for most employees. Companies don't tell other companies who their good employees are -- even if they have no promotion opportunities to offer those employees. They don't want to lose them. And even if they did tell other companies, they wouldn't be believed. They would be suspected of trying to get rid of their bad workers. Similarly, they don't tell other companies about their bad employees. They don't want to open themselves up to lawsuits. If asked, and they seldom are, companies are willing to tell other companies just one thing about a worker seeking a new job: Yes, that person did work for us.

In this context a good performance at Company A doesn't matter, because it does not lead to opportunities for training and promotion at Company B. When workers move from one company to another, they simply start over at another entry-level job; there is no progress up a career ladder. The rational strategy is to keep moving until one finds a company that still has internal career ladders. But as such companies become fewer, the number of high school graduates with real career opportunities ahead of them declines to the vanishing point.

A cross-company career ladder runs into other problems. After age forty-five cross-company career moves are difficult, and after age fifty-five they are impossible. (Those tracking downsized workers find that after age fifty-five they seldom find good jobs with good companies.) Age-discrimination laws can protect older employees against being unfairly dismissed from their old firms, but they cannot get them a good job at a new company. Employers have the right to hire the best workers available. In a fast-changing world older employees too often bring obsolete experience and out-of-date skills. There are always a lot of young potential employees who look more promising.

The lack of career opportunities is dramatically visible in earnings data. The gains in real annual earnings of high school graduates aged twenty to forty are much smaller than they used to be. There are lots of jobs, and unemployment is low, but opportunities to acquire skills and the higher wages that go with them don't exist. As a result, earnings profiles are flatter. The lack of on-the-job opportunities to acquire new skills is another reason that the wage gap between high school graduates and college graduates has gotten much bigger in recent years.

Real wages have also been falling for most of the male labor force. Graduating from American high schools, these men don't initially have the same level of skills as their counterparts in the rest of the industrialized world, nor do they get the post-secondary skills training (apprenticeships, for example) that most of the rest of the world gives its non-college-bound labor force. At the same time, wage gains for those in the top 20 percent of the work force have never been larger. The widening disparity in earnings and wealth doesn't create problems for the economy (it simply produces more luxury goods and fewer middle-class goods), but it probably does create long-run political problems in a democracy. How does one preach political equality in an economy of ever-growing inequality?

The issue is not jobs. It is high wages and careers. If wages fall to be commensurate with skills, jobs are always available. That is what the American experience proves. Jobs have never been more plentiful than they are in the 1990s, yet wages have been falling for more than half of the work force. In contrast with jobs, careers are in very short supply in America.

With career ladders in place, the ambitious worker of the 1950s or the 1960s could figure out what skills were needed for advancement. He or she knew what to take in night school. But without career ladders, how does anyone rationally plan an educational investment? What skills will pay off? No one wants to waste investment funds on skills that will go unused.

Historically, on-the-job training has been central to skills acquisition for much of the population. But with downsizing, the days of extensive on-the-job training have ended. What replaces it? In economics textbooks workers start to pay employers for the training they used to get free, when they were expected to be lifetime employees, by working for wages below what they could get from an employer who was not providing training. This has not happened. Judging what skills to buy from one's employer is no simpler than judging what skills to buy from an outside institution.

Also missing from a downsizing environment is a sense of economic security. If workers are asked what factors are most important in a job, economic security always comes out ahead of maximum wages. This is not the answer that is supposed to be given by Homo economicus. He or she is supposed to be interested in lifetime income maximization, and not to be worried about the risks and uncertainties of economic life. But real live human beings like the feeling of a solid economic floor under them. Homo economicus does not worry about starving between jobs.

Paradoxically, just when one would think that firms would be building closer relationships with their key knowledge workers, in order to keep them committed to the firm, they are smashing the implicit social contract with these workers. Knowledge workers, like other workers, are now fired when not needed or when their skills become obsolete. They, too, see a reduction in their real wages when cheaper alternatives are found elsewhere in the world. Firms invest less in on-the-job training for knowledge workers even when they want them to stay around, because they know that in the future fewer of them will stay around. If workers are laid off when not needed, the smart ones know that they should leave whenever an even marginally better job opportunity presents itself.

As job uncertainty rises, the numbers of those with a strong interest in the success of their current employers dwindle. Surveys show that although attachment to their occupations has remained constant for American workers over the past two decades, the number of those with a strong attachment to their employers has gone down by a fifth. The system is evolving toward less commitment and less investment in skills just as it should be moving in the opposite direction.

The basic problem in the United States is that every employer wants a free ride in the training system. "You train, I'll hire" is the American way. Whenever unemployment is low, employers who themselves do no training bitterly complain about the shortage of trained workers. They see nothing strange about their complaints. As for the employees, without career ladders they cannot intelligently acquire the right skills on their own. Since they will be switching employers frequently, they don't know what skills they

will need or how long those skills will be relevant to their earning opportunities. As a result -- rationally -- they don't invest in skills.

When it is clear that something must be done but rational individuals and companies won't do it, society has to reorganize itself to make what is individually irrational into something that is individually rational. There is a simple solution. For example, France levies a training tax of 1.5 percent of payroll. The purpose is not to collect taxes but to make it rational for every employer to train. Employers can deduct their expenditures for training from that 1.5 percent tax. Thus if they spend 1.5 percent of their sales on training their work force, they pay no tax. Since the money will be taken away from them if they don't train, training becomes a free good as far as the firm is concerned. No one tells employers what skills to teach their workers, but they are effectively being told that they must teach some skills. Such a system aids everyone. It makes employers invest as if there were career ladders even when these have been abolished. If all employers have to invest, no one gets a free ride.

### **Major Unresolved Problems**

THE biggest problem of the third industrial revolution is as easy to enunciate as it is difficult to solve. Technology is creating a global economy that is rapidly supplanting our old national economies. National governments cannot control this new economy, yet no one, least of all Americans, wants to create the forms of global government that might be able to control it. As a result we are going to be living in a fundamentally unmanaged economic system. The difficulties of containing the 1997 Asian economic meltdown are just the first of many such difficulties we can expect.

National governments, which used to worry about managing and maintaining their economic systems, are slowly being pushed out of business. Changes in global finance overwhelm all but the largest governments. Governments have lost much of their influence over the movement of information and capital. They cannot control who crosses their borders either physically or culturally. They still have their armies, but they are afraid to use them when wars are also fought on television.

Conversely, the power -- or perhaps we should say the freedom from government supervision -- of global businesses is growing with companies' ability to move to the most advantageous locations and to play countries off against one another in bidding for attractive investment projects.

As national governments shrink and global corporations expand, a second major problem emerges. Almost everywhere we look we see rising economic inequalities among countries, among firms, among individuals. Returns to capital are up; returns to labor are down. Returns to skills are up; returns to unskilled labor are down. Firms will be global players or they will be niche players. The mid-sized national firm is a species in danger of extinction. Traditionally, national governments have acted to keep such inequalities under control. But having lost their ability to manage the system, they have also lost their ability to restrain economic inequalities. For at least a while we are simply going to live in a world with greater inequalities on a broad scale.

THE third industrial revolution is making obsolete old institutions and old modes of operation, requiring the individual, the firm, and the nation to change.

For individuals here are three words of advice: skills, skills, skills. The economic prospects of those without skills are bleak. What we now see -- falling real wages for those without skills -- is going to continue. In education the needs of the bottom two thirds of the labor force are particularly acute. In an age when brawn earns little and brains much, this part of the labor force simply has to be much better educated. Something is fundamentally wrong when the bottom quarter of South Korean eighth-grade students score, on average, higher than their American counterparts.

Entrepreneurial opportunities were few in the 1950s and 1960s. Today they are many. But for every success we read about in the paper, every new billionaire made, dozens of entrepreneurs will go broke unnoticed and unmourned. The downside risks are real.

Cannibalization is the challenge for old business firms. Can they aggressively seize the opportunities opened up by the third industrial revolution, even when that means deliberately destroying existing profitable activities? History is clear: few can, and those that don't are likely to die. For new firms the economic opportunities have never been better. The world is full of openings for businesses to grow in environments without established competitors.

Nations that are heavy investors in education, infrastructure, and R&D are going to tend to win. We need a national capital investment budget to remind ourselves of how we are spending our resources. The negative savings rates that we now have are not the route to success.

For those with skills and a fondness for risks, however, who are willing to cannibalize their old activities and are living in high-investment societies, the times have never been more favorable.

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