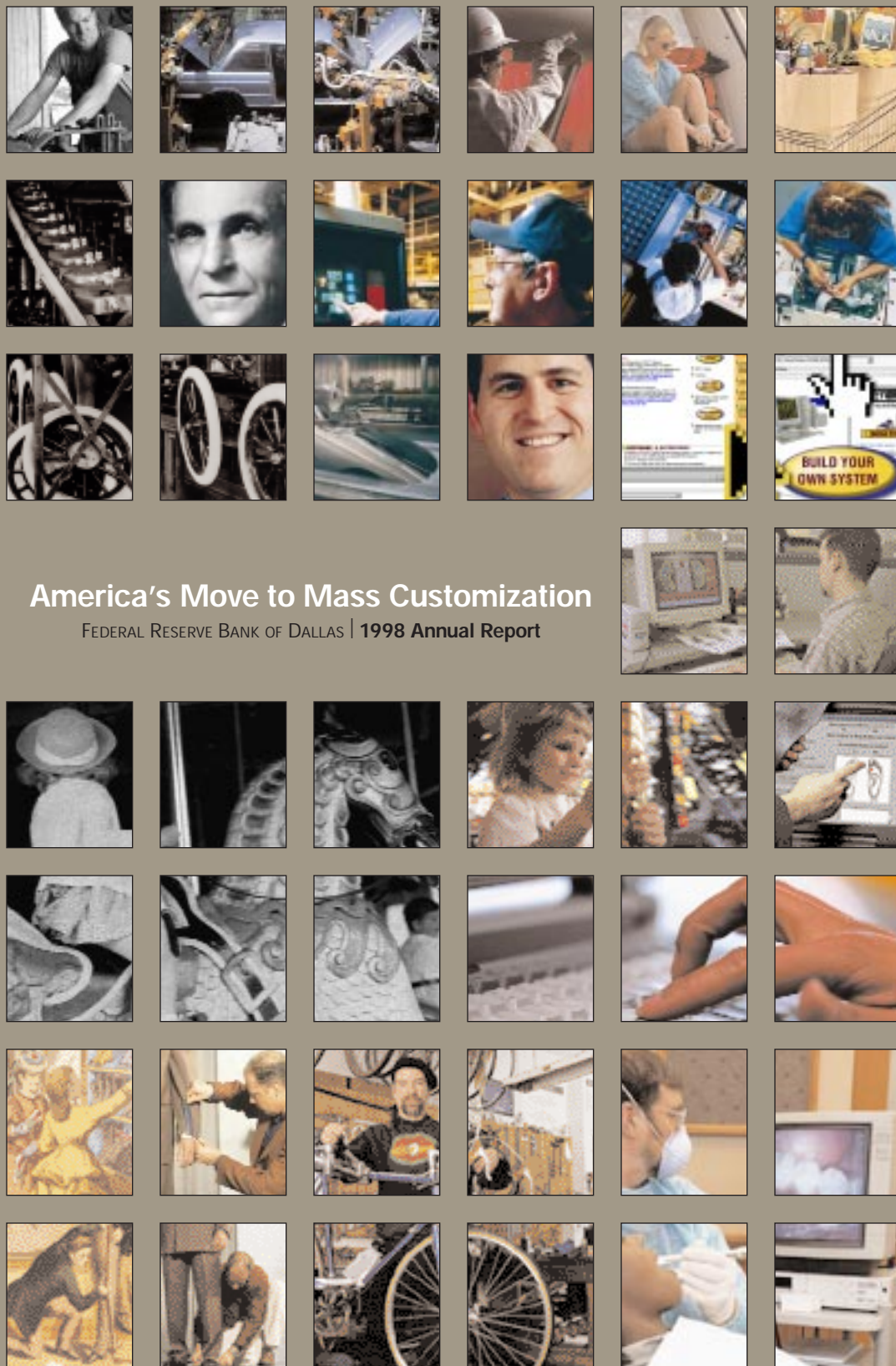


# The Right Stuff

America's Move to Mass Customization  
FEDERAL RESERVE BANK OF DALLAS | 1998 Annual Report



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In July 1947, on potato fields 20 miles from Manhattan, William Levitt pioneered the mass production of affordable homes. Variations in the 17,477 houses were minor; each had two bedrooms, a bath, living room and kitchen on a 750-square-foot concrete slab. By standardizing the units, Levitt eventually was able to put up more than two dozen a day, helping fill the enormous postwar demand. Over the years, innumerable changes to the homes have transformed the community. But even now, Levittown remains a kind of shorthand for the sameness of mass production that's starting to give way to mass customization.





## A LETTER FROM THE PRESIDENT

When I use my remote key to unlock Big Red, it automatically adjusts the seat and mirrors for me. When my wife, Suzanne, uses her remote, it does the same for her. Is this a great country or what?

Somehow we were able to get by before this convenience, but life is surely sweeter now. We may save only 10 or 15 seconds, but, hey, those seconds add up.

The old way met our needs, but the new way meets them better. That's what our annual report essay is about this year: the power of new technology to customize our products. Things used to be made to order and made to fit. But they were labor-intensive and expensive. Mass production came along and made things more affordable, but at a cost—the cost of sameness, the cost of one-size-fits-all.

Technology is beginning to let us have it both ways. Increasingly, we're getting more personalization at mass-production prices. We're moving toward mass customization. That's the message of our essay. I hope you enjoy it.

••



The economy just finished another remarkable year of rapid growth, falling unemployment and declining inflation. Don't say I didn't tell you so. Here's what I said in this space last year:

Our optimism about the American economy was well placed last year [1997]. Real GDP grew almost 4 percent, employment was up 3.2 million, unemployment fell to 4.7 percent and the Consumer Price Index increased only 1.7 percent. The best performance in years in both unemployment and inflation left many less optimistic souls scratching their heads. We, however, expect more of the same in 1998.

How close was I to the mark? Well, real GDP grew over 4 percent last year, employment was up 2.8 million, unemployment fell to 4.3 percent and the Consumer Price Index rose only 1.6 percent. Once again, a stellar performance. Less optimistic souls are still scratching their heads.

Dare I predict more of the same for 1999? Why not? As Tom Wolfe might have me say, let's let the red dog off the leash.

I expect real growth in 1999 to benefit again from technology-driven improvements in productivity, which rose more than 2 percent last year. I also expect the global deflationary environment to combine with strong growth in productivity and real output to hold down inflation. I'm not saying that inflation will remain low despite strong real growth; I'm saying it will remain low in part *because* of strong real growth. If inflation results from too



much money chasing too few goods, more goods will help as much as slower money growth. The bottom line will be real growth in the 3–4 percent range, with inflation remaining below 2 percent.

I don't believe in speed limits on the economy or a stable NAIRU (nonaccelerating inflation rate of unemployment). And I'm certainly not a Phillips curver who believes inflation and unemployment are on a seesaw where one goes down only when the other goes up. I can't support my optimism with sophisticated models, but I do offer as evidence the economy itself. As Yogi Berra has said, "You can observe a lot just by watching." I'm also reminded of an old Richard Pryor line: "Who are you going to believe? Me or your own lying eyes?" For the past three years the economy I've been watching has grown at what most models would consider unsustainable rates while inflation has declined rather than increased.

I think a fourth year like the last three is possible, but we do face some unpleasant employment arithmetic. The past three years have benefited from growth in both productivity (more output per hour worked) and the labor supply (more hours worked). Declining unemployment during those years means we were drawing down the available labor pool. With unemployment at 4.3 percent, with labor-force participation over 67 percent and discouraged workers (people who'd like a job if they thought it possible) at a record low, we may finally run out of slack in the labor market. If so, productivity will have to increase even faster for the recent growth rate to continue. Of course, productivity growth and the number of available workers are related, since much of the consolidation and downsizing undertaken to make companies more efficient frees up labor for other uses.

Congress could help make my optimistic scenario a reality by taking two easy steps to bolster our workforce. My first recommendation is to abolish the earnings test on Social Security benefits to make part-time work more attractive for experienced retirees. My other suggestion is to ease limits on immigration of foreign workers with the education and skills to be productive immediately. We need more good people. While we're at full employment is the time to do it.

•

The U.S. economy performed well last year despite the Asian financial crisis. In fact, until the Russian default in August, large parts of our economy benefited from the flight of capital to the United States. That changed after the Russian default, however, and our financial markets became unsettled in September and early October, prompting the Fed to ease policy in three small steps. Financial markets returned to near normal, and the overall U.S. economy not only remained robust but picked up strength in the fourth quarter.

Although the U.S. economy has done well for several years, the Eleventh District has done even better, as measured by employment growth. During 1998, however, District employment growth slowed to the national rate in the face of head winds spawned by low oil prices—which affected both producers and exports to Mexico—and by depressed computer chip prices. Agriculture also was hard hit. In recent years, an influx of workers helped keep regional employment growth above the national pace, but tight labor markets nationwide narrowed this advantage during 1998.

Banks in the District remain well capitalized, liquid and profitable. Loan demand has remained strong. Texas bankers were saddened at the loss of our friend Bob Harris, president of the Texas Bankers Association. We miss him very much.

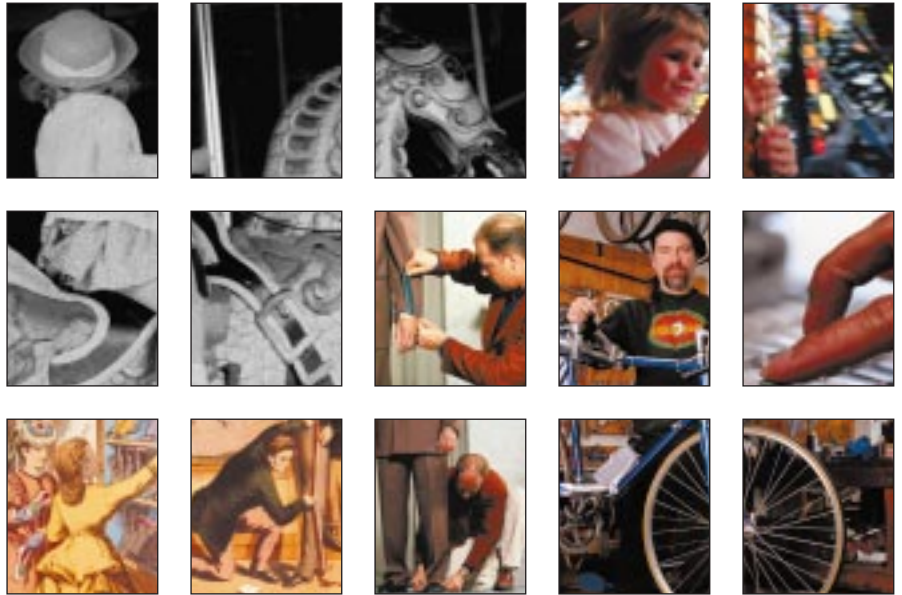
Demand for the Dallas Fed's financial services continues to be strong overall. 1998 saw increases in check and cash volume as well as automated clearinghouse and funds transfer volume. These gains helped us improve productivity and efficiency. We recovered the cost of our priced services during 1998.

The Dallas Fed devoted considerable attention to Y2K last year. By midyear the Fed's critical systems were Y2K compliant, and banks began testing their electronic interfaces with us. All milestones are being met. As testing continues in 1999, we will also finalize our contingency plans. In addition to our own systems and electronic connections to financial institutions, our examiners have been overseeing the Y2K preparations of the banks and holding companies under our jurisdiction. Virtually all are meeting their milestones and are on track. If there are significant problems with the century rollover, we don't expect them to originate in the banking system.

Robert D. McTeer, Jr.  
President and Chief Executive Officer

# The Right Stuff

## America's Move to Mass Customization



Henry Ford's first great contribution to America was the Model T, which rolled off the assembly lines at his Highland Park, Michigan, plant at the rate of one every 24 seconds. At the time, it was an amazing display of industrial efficiency. By streamlining automation in his factories, Ford advanced an era of mass production that built his fortune and brought the automobile within reach of an emerging middle class. But while the miracle of mass production delivered the goods, it didn't adapt easily, so all Model T's looked alike. Ford's approach can be summed up in what he said about the car's exterior: "The consumer can have any color he wants so long as it's black."

Ford's take-it-or-leave-it attitude wouldn't cut it in today's economy. Americans are blessed—some might say overwhelmed—by an ever-expanding variety of goods and services. (See *Exhibits 1 and 2*.) Just since the early 1970s, there's been an explosion of choice in the marketplace—the assortment of new vehicle models has risen from 140 to 260, soft

drinks from 20 to more than 87, TV channels from 5 to 185, over-the-counter pain relievers from 17 to 141. The U.S. market offers 7,563 prescription drugs, 3,000 beers, 1,174 amusement parks, 340 kinds of breakfast cereal, 50 brands of bottled water. Whole milk sits on the supermarket shelf beside skim milk, half-percent, 1 percent, 2 percent, lactose-reduced, hormone-free, chocolate, buttermilk and milk with a shelf life of six months. Today's consumers have access to more book titles, more movies and more magazines. Ford's company still makes black cars for buyers who want them, but it also offers a palette of 46 other colors—toreador red, jalapeño green, Atlantic blue, mocha frost, autumn orange, teal and more.

This proliferation of products, models and styles isn't capitalism run amok. Variety shouldn't be dismissed as a trivial extravagance. It's a wealthy, sophisticated society's way of improving the lot of consumers. The more choices, the better. A wide selection of goods and services increases the chance



**Exhibit 1: MORE CHOICES THAN EVER**

Americans' historical buying patterns show a growing penchant for variety. To market closer and closer to customers' individual tastes, business has increasingly eschewed the paradigm of mass production, in some cases virtually flooding the market with a profusion of choice. Today's athletes, for example, can choose from more than 285 models of running shoes (167 men's and 118 women's), up from just five (unisex) models in 1970. More than 3,000 assorted beers are available to enjoy while surfing 185 different TV channels. Historical data on product variety are surprisingly hard to find, but what's there tells an unambiguous tale: today's richer consumers seek to express themselves through more choice.

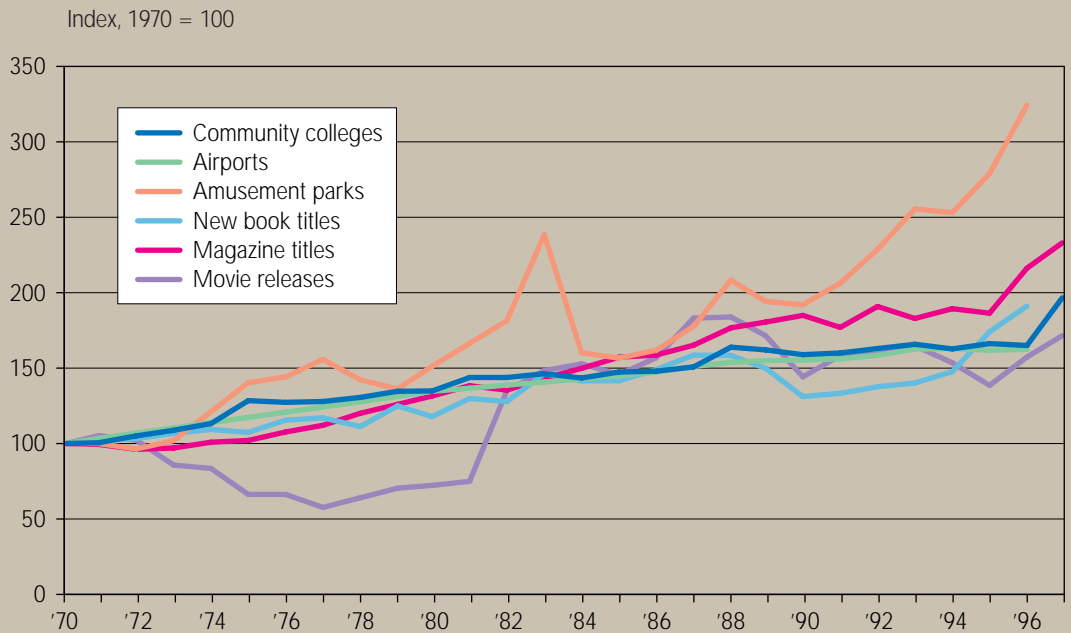


Item	Early 70s	Late 90s
Vehicle models	140	260
Vehicle styles	654	1,212
SUV models	8	38
SUV styles	18	192
Personal computer models	0	400
Software titles	0	250,000
Web sites	0	4,757,394
Movie releases	267	458
Airports	11,261	18,292
Magazine titles	339	790
New book titles	40,530	77,446
Community colleges	886	1,742
Amusement parks	362	1,174
TV screen sizes	5	15
Houston TV channels	5	185
Radio broadcast stations	7,038	12,458
McDonald's menu items	13	43
KFC menu items	7	14
Frito-Lay chip varieties	10	78
Breakfast cereals	160	340
Pop-Tarts	3	29
National soft drink brands	20	87
Bottled water brands	16	50
Milk types	4	19
Colgate toothpastes	2	17
Mouthwashes	15	66
Dental flosses	12	64
Prescription drugs	6,131	7,563
Over-the-counter pain relievers	17	141
Levi's jean styles	41	70
Running shoe styles	5	285
Women's hosiery styles	5	90
Contact lens types	1	36
Bicycle types	8	31

## Exhibit 2:

**VARIETY ON THE RISE**

Statisticians collect reams of data on the quantity of goods and services in the economy but little on product variety. The few statistics that can be found generally proclaim a common theme: America cares about choice. We want—and we're getting—more choices of movies, amusement parks, educational institutions, books, magazines and airports, to name just a few.



each of us will find, somewhere among all the shelves and showrooms, products that meet our requirements. (See Exhibits 3, 4 and 5.)

Over time, the American economy has been giving us more of what we want. Just look at what's happened in automobile design since Ford made his declaration about the color of cars. Until 1914, Model T's were available in red, blue, green, gray and black. The move to all black was a concession to mass production that made the car a commodity of sorts, but standardization wasn't a winning strategy in the long run. By 1927, competition forced Ford to rethink variety. The Model A came in several body styles and an array of colors. With each decade, Ford gave consumers more choices, so that by 1955 the company offered five model series: mainline, customline, Fairlane, station wagon and the two-passenger Thunderbird convertible. Buyers could select upholstery and optional equipment.

The possibilities for doing a better job of meeting consumers' wants still weren't exhausted. Ford and


other automakers started designing products for market niches. In 1964, Ford introduced the Mustang, an inexpensive, sporty vehicle for young drivers. The 1980s brought the Taurus and Sable, cars for middle- and upper-middle-income families. As Ford prepares for the next millennium, it's introducing custom ordering, which allows buyers to specify what they want. Ford's Internet site offers six models of the Explorer—each with choices for power train, exterior, interior, audio, wheels, tires and other options. All told, there are more than 2.5 million possible combinations for the vehicle.

The trend toward customization isn't confined to the automobile industry. From clothing to computers, businesses are working to become more consumer friendly. They do it to gain new sales and stay competitive. They do it because pleasing the customer isn't just about producing more stuff. It's about producing *the right stuff*.

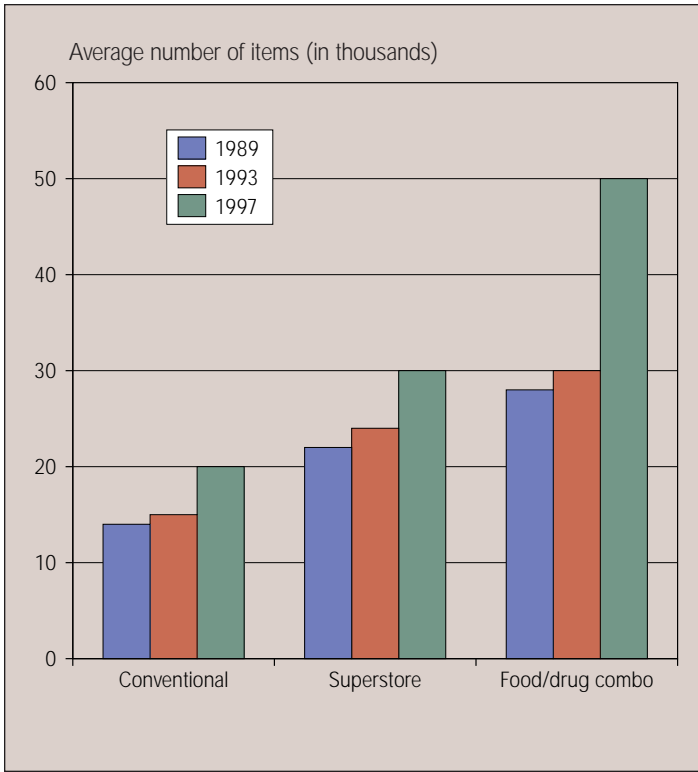
Just what is the right stuff? It's more of what we do want and less of what we don't want. The economy

**Exhibit 3: THE MORE THE MERRIER: New product introductions of consumer packaged goods: 1980 vs. 1998**

The customer is always right, even when he changes his mind. Businesses refresh their shelves with thousands of new products annually to keep pace with consumers' changing tastes. Whether it's a bottle of aspirin or ibuprofen, a six-pack of Pepsi or a 48-ounce bottle, a bag of barbecue-flavored chips or ruffled ones, retailers code and track them as shelf-keeping units (SKUs). And with each new variation, businesses hope to bring products closer to what consumers want. In consumer packaged goods alone, the number of SKUs introduced in 1998 reached nearly 25,000, up from just 4,414 in 1980. Many new products undoubtedly fail, but many remain—as long as consumers want them. Paradoxically, the nation's accounts of economic activity tally only the quantity of goods produced and give no credit for how adept business is at following America's shifting tastes.

	1980	1998		1980	1998
<b>Food products</b>	<b>2,112</b>	<b>10,803</b>			
	<i>Examples</i>				
	Meals, entrées	159	671		
	Meat	42	234		
	Fish	32	118		
	Poultry	13	168		
	Vegetables, vegetable side dishes	68	329		
	Rice, rice side dishes	17	94		
	Pasta, pasta side dishes	79	561		
	Sauces—pizza, pasta	26	156		
	Salads and salad kits	3	124		
	Salad dressings	79	260		
	Soup	119	291		
	Bread products	95	324		
	Cereals	34	192		
	Cheese	65	300		
	Chips	46	166		
	Cookies	127	396		
	Ice cream, novelties, frozen yogurt	57	556		
	Candies	159	1,648		
	Chewing gum	47	167		
	Snack bars	41	162		
	Oil, shortening, cooking sprays	20	161		
	Spices, extracts, seasonings	61	403		
				<b>400</b>	<b>1,001</b>
	<i>Examples</i>				
	Laundry soaps, detergents	12	48		
	Paper towels, napkins	11	126		
	Deodorizers, air fresheners	53	372		
	Glues, adhesives, tapes	8	18		
				<b>393</b>	<b>2,944</b>
	<i>Examples</i>				
	Milk, nondairy milk, yogurt drinks	26	255		
	Fruit, fruit-flavored drinks	118	483		
	Health drinks	4	70		
	Soft drinks	26	252		
	Bottled waters	12	125		
	Coffee	11	384		
	Tea	25	461		
	Beer, ale	25	187		
	Wine, wine coolers	22	252		
				<b>1,294</b>	<b>9,509</b>
	<i>Examples</i>				
	Pain relief	29	79		
	Cough, congestion relief	35	134		
	Vitamins, supplements	88	1,289		
	Toothpaste	22	38		
	Other dental care products	20	119		
	Mouthwash, breath fresheners	19	55		
	Skin care	198	1,202		
	Shampoos, conditioners	218	346		
	Hair colorings, other hair products	36	321		
	Lipsticks, lip products	68	1,112		
	Eye makeup, accessories	36	541		
	Nail products	39	1,063		
	Fragrances	62	502		
	Baby products	21	137		
				<b>138</b>	<b>439</b>
	<i>Example</i>				
	Dog food	58	180		
				<b>77</b>	<b>269</b>
	<b>GRAND TOTAL</b>			<b>4,414</b>	<b>24,965</b>





#### Exhibit 4: PRODUCT VARIETY AT U.S. GROCERY STORES

One of capitalism's greatest creations is the grocery store. Where else can you find, within just a few steps, so many products at such affordable prices? Bananas from Ecuador, kiwi fruit from New Zealand, potatoes from Idaho, wine from France, paprika from Hungary, coffee from Colombia, oranges from Florida, film from Japan and much more. It's not public decree that lets us tap the world's markets in a single shopping trip. It's the profit motive of American business. "You want it. You got it!" is the dictate of competition, which has put upwards of 22,000 more items on grocers' shelves in just the past eight years. The average product selection at conventional grocery stores (those with a full line of groceries, meat and produce) increased from 14,000 in 1989 to 20,000 in 1997; the selection at superstores (they add nonfood items and are 40,000 square feet or more) was up from 22,000 to 30,000. At food/drug combos (those with a pharmacy under the same roof), a staggering 50,000 different items are now within reach of the discerning shopper.








provides more of what we do want by customizing products to our particular tastes. It eliminates what we don't want through preventive products. Vaccines, childproof caps, safety gear on cars and antipollution devices are valuable for the misfortunes they avert. Preventive goods and services are often taken for granted—until they're needed. They raise living standards by replacing treatment with immunity, repair with safer design, helping protect consumers from some of life's tragedies.

The rich have always enjoyed the luxury of custom-made products. Now, though, personalized goods and services are increasingly within the budgets of middle-class consumers. Computers, the Internet, DNA research and other technologies are forging a whole new paradigm that makes possible the delivery of custom-designed products to the masses—at ever lower prices. The descriptive phrase for the phenomenon is *mass customization*. "Once you know exactly what you want, you'll be able to get it just that way," says Bill Gates, founder of software giant Microsoft.

"Computers will enable goods that today are mass produced to be both mass produced and custom-made for particular customers."

The economy's progression to customization isn't a fad. It arises from the free market's relentless drive to bring what we buy closer to what we want. What we buy yields a lot more utility when it exactly matches our needs, and Americans are reaping enormous benefits as new tools help business cater to markets of one. We're getting more for less, helping keep inflation in check.

There's just one glitch in this otherwise serendipitous story: traditional measures of the economy may not reflect how much our living standards are improving. Conceived in an era of mass production, the nation's GDP and productivity statistics may ably count more stuff, but they give little credit for right stuff. Mass customization and prevention—just like variety—deliver their gains in important but subtle ways, so gross domestic product and productivity statistics fail to capture the extent of our progress.

	Cuisine	Restaurant	Price
	1 American	Dave & Buster's	\$6.75
	2 Brazilian	Rodizio Grill	\$9.95
	3 Cajun	Crescent City Cafe	\$6.95
	4 Caribbean	Cafe Gecko	\$5.95
	5 Chinese	Dragon Pearl	\$5.25
	6 Colombian	Casa Vieja	\$5.75
	7 Egyptian	Mediterranean Oasis	\$6.50

	Cuisine	Restaurant	Price
	8 English	The Londoner	\$5.95
	9 Ethiopian	Queen of Sheba	\$5.99
	10 Filipino	Palayok	\$4.95
	11 French	La Madeleine	\$7.99
	12 German	Kuby's	\$5.95
	13 Greek	Kostas Cafe	\$7.99
	14 Hungarian	Franki's Lil Europe	\$7.99

**Exhibit 5: FOOD FOR THOUGHT**

**28 days, 28 burgers with fries: \$189.00**

**28 days, 28 different cuisines: \$187.37**

We all must eat to survive. But while a poor nation struggles to find rice, corn or bread, a rich one offers myriad ways to partake in the pleasures of the palate.

When it comes to eating out, variety is enormous, and it spices up our dining experience. Some of us like Thai cuisine. Some of us prefer Italian. A consumer who craves Thai won't enjoy dining as much if his choice comes down to pizza or pasta. The Dallas-Fort Worth area's Yellow Pages lists thousands of restaurants—a cornucopia of cuisines, ambiances, prices and locations.

Wealthy societies don't just take progress in the form of more goods and services. They want quality, convenience and variety. Yet national GDP and productivity statistics don't generally recognize the gains. Twenty-eight days spent eating cuisines from around the world counts the same as 28 days spent eating just burgers and fries.

**FOR THE FUTURE,  
THE BEST OF THE PAST**

Just as mass production was the hallmark of yesterday's Industrial Age, mass customization promises to dominate the modern stage of America's economic evolution—the Information Age. New eras, of course, don't arrive overnight. They emerge slowly and incrementally as they overlap with the old, taking years and even decades to transform the economy. Even so, we're already seeing noteworthy moves to mass customization.

**Computers.** Dell Computer of Round Rock, Texas, has proven that complex manufactured products can be made to order. Using the telephone or the Internet, customers describe the computer they want, the shape of the cabinet and size of the monitor screen, the speed of the microprocessor, the capacity of the

	Cuisine	Restaurant	Price
	15 Indian	Bombay Cricket Club	\$7.50
	16 Iranian	Sahara	\$5.99
	17 Italian	Momo's	\$5.75
	18 Japanese	Fuji-ya	\$5.95
	19 Korean	Po Jang Ma Cha	\$5.99
	20 Lebanese	Al-Amir	\$7.95
	21 Mexican	La Valentina de Mexico	\$7.50

	Cuisine	Restaurant	Price
	22 Romanian	Café Athenee	\$6.95
	23 Russian	Liza's Russian Cuisine	\$9.95
	24 Salvadoran	Izalco	\$4.50
	25 Spanish	De Tapas	\$4.99
	26 Thai	Chow Thai	\$9.99
	27 Turkish	Cafe Istanbul	\$5.95
	28 Vietnamese	Pho Que Huong	\$4.50
	<i>Total bill</i>		\$187.37

hard drive. Other choices involve keyboards, mouses, video cards, modems, speakers, data-storage systems and software. The number of possible combinations is staggering—almost 16 million for desktop models alone. Dell begins assembling a computer only after it receives an order and then ships the finished product directly to the customer's home or business within a few days. Gateway 2000, Micron Technology and Compaq Computer also make computers to customers' exact specifications.

**Clothing.** Off-the-rack apparel has always come in many sizes, styles and colors, but mass customization promises a perfect match for each buyer's fit and taste. Connecticut's InterActive Custom Clothes sells jeans over the Internet, allowing customers to specify hip size, leg and seat room, fabric, color, thread accents, leg silhouette, fly design, pocket style, but-

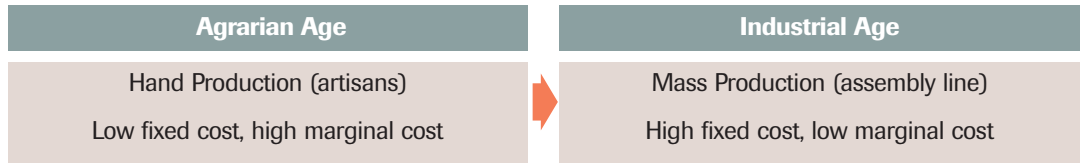
tons, rivets and even label. The pants are produced to exact specifications at a New York factory. Digitoe, a Washington company, uses a scanner to measure every millimeter of customers' feet for custom-made shoes. Using his computerized mobile fitting unit, Alan Zerobnick digitizes each foot's dimensions—no matter the size or shape—and builds a three-dimensional shoe last around which any style can be molded for a perfect fit. Orders are shipped in three to four weeks. Reorders require only a phone call.

**Entertainment and information.** Music buffs who wanted to hear their favorite songs once had to buy dozens of compact discs. Now, CDuctive, a New York company, maintains an Internet site with sound bites from about 10,000 titles. Customers select a dozen cuts to be burned onto a CD and shipped to their door.



**Exhibit 6: PROVIDING WHAT CONSUMERS WANT**

The evolution of auto production illustrates America's move from the Agrarian Age to the present. Local craft shops designed and handcrafted the earliest cars. Vehicles such as the 1911 Springfield were custom-made but exorbitantly priced. In mass producing automobiles, Ford sacrificed individualism but was able to slash prices. Consumers got identical models, but productivity soared. Today's production methods give buyers the best of both worlds—low prices and custom design. Customers choose from numerous options on Ford's web site, then the automaker's computer-based technology builds the vehicle to order at little cost over standard models.



In the age of mass media, the goal was to create newspapers and television stations that reached a broad audience. The Internet changes all that. NewsEdge Corp. gathers a profile of each customer's interests, then scans almost 700 news sources to deliver regular reports on current events, sports, weather and finance, all geared to the individual reader. Broadcast.com, a 5-year-old Dallas company, operates a web site that transforms computers into the most powerful radio receivers ever, allowing listeners to pick up stations from Turkey, Argentina, South Africa, Sweden or anywhere else in the world.

**Health care.** Advances in biotechnology—most important, the ongoing process of cracking the DNA code—now allow doctors to individualize drugs and other treatments. Affymetrix, a Santa Clara, California, company, has produced the first biochip, a dense grid of molecular tweezers that extracts individuals' DNA. The biochip can analyze thousands of genes at once—in effect, speed-reading the cells' DNA codes. Although the Human Genome Project has been

mapping genes since 1990, biochips make the process personal. They give doctors information on each patient's medical condition.

Philadelphia's Acumin sells capsules customized with specific vitamins and dosages for each customer, cutting the number of pills some people swallow in a day. Advances in cloning technology are allowing doctors to take a skin sample and reproduce a patient's own collagen cells. Injections of the cells can smooth wrinkles and scars without risk of allergic reaction.

In one industry after another, companies are customizing for the mass market. They're doing it because new technologies make it practical and competition makes it imperative. Futurist Alvin Toffler, who predicted the coming of mass customization in the 1970s, recently issued a stern warning to producers who aren't yet on board: "I'd say if you have a company and you're not moving toward automation on demand, you'll have a competitor one day soon who will put you out of business."



### Information Age

Mass Customization (computer, etc.)  
Low fixed cost, low marginal cost



Whether companies are seeking to expand sales or just stay in business, mass customization enables producers to snare buyers by offering extra value. It's no surprise that consumer satisfaction lies at the core of this phenomenon; what consumers want always shapes market economies. Econ 101 professors have taught this straightforward notion since Adam Smith published *The Wealth of Nations* in 1776. Markets serve as complex information machines that collect and communicate buyers' needs, tastes, desires and whims. Producers that do the best job of catering to consumers gain market share and make greater profits. Burger King got it right in its advertising slogan: *Have it your way!*

Companies prosper by delivering what customers want. This conventional view of consumer sovereignty is correct—as far as it goes. What's missing is a description of how meeting buyers' needs and wants evolves over time. (See *Exhibit 6.*) Americans have always preferred customized products, but they couldn't always afford them. Now, companies are

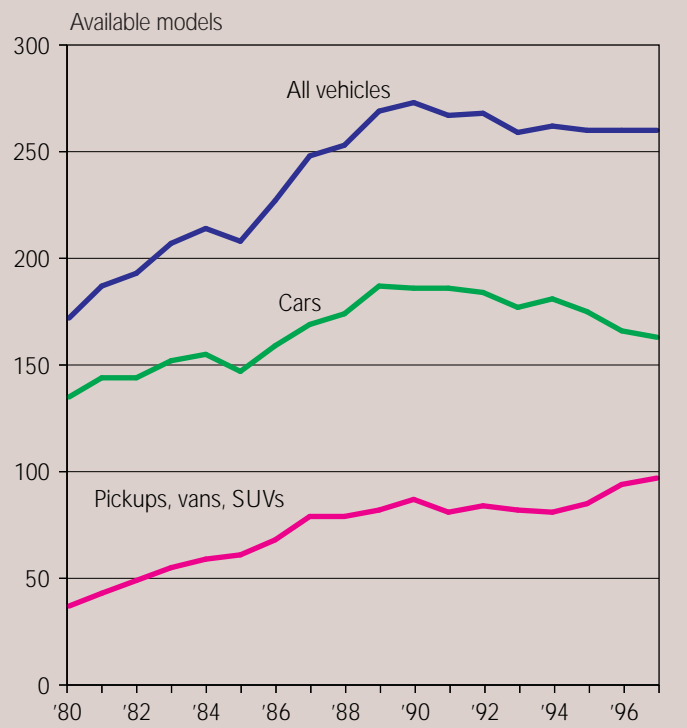
finding ways to deliver exactly what we want at prices competitive with those of mass production.

Until the Industrial Revolution, producers catered to consumers one at a time. Sophisticated machine tools hadn't been invented, so every product had to be handmade. A tailor, for example, would measure each customer and ask about style, fabric and fit, then stitch a suit or dress to the exact pattern. When shoes, furniture and all other goods were made to order, customers could always buy just what they wanted—if they could afford it. The drawback of production by artisans was high cost. The typical American was lucky to possess one suit of clothes and one pair of shoes.

Industrialization changed that. Machines began to make our clothes, shoes, furniture, kitchen utensils and an array of new products, sweeping America into an era of mass production. Producer and consumer rarely came into contact. Goods were made in factories, shipped over great distances and sold in department stores. Mass production dictated large runs of

**Exhibit 7: VEHICLE MODELS,  
1980–97**

In 1970 U.S. consumers had access to 140 different models of vehicles—110 cars plus 30 pickups, vans and sport utility vehicles (SUVs). By 1980 the variety of models had risen to 172—135 cars and 37 other vehicles. Today's economy offers consumers 260 different vehicle models from which to choose. The most notable shift in consumer taste has been toward SUVs, whose models rose from 8 in 1970 to just 12 in 1980 but to 38 by 1997. Today's median new car buyer drives away in a model unique among 104 buyers, compared with 1 in 84 in 1980.



identical products. Consumers sacrificed the luxury of personal attention for affordability. Taking what came off the shelf, though it might not be a perfect fit, was the best choice because it was cheap. The Industrial Age brought lower prices. Just as important, each worker produced more, justifying a bigger paycheck. Today, just about all U.S. households possess cars, television sets, telephones and plenty of other everyday conveniences—all made possible by mass production.

What's increasingly shaping today's economy isn't the raw power of machines but the subtle power of knowledge. Information Age technology—primarily the computer—has erased yesterday's edict that customization must carry a high price. Mass customization offers consumers the best of both worlds. It embodies the good qualities from the era of hand production—custom design and individualized service. And it retains the most significant gain from the era of mass production—low cost.

Mass production was about producing more stuff. Mass customization is about producing the right stuff.

Customization for the mass market isn't just economists' jargon for variety. The difference lies in which side of the market calls the shots. Variety represents producers' best guess about what consumers will buy. Companies tweak their designs, hoping what they offer is close enough. Even when companies rely on market research, they're still aiming at broad groups of consumers. Variety has delivered great benefits in recent decades, but it is mass production's response to the fact that everybody's tastes differ. (*See Exhibit 7.*) Even at its best, variety is an imperfect substitute for true customization, which eliminates the need for guesswork. Companies that customize don't make anything until they know precisely what the customer wants.

One size fits all? Not anymore. What served as a good slogan for mass production doesn't cut it in today's world.





The reason “you can see the computer age everywhere but in the productivity statistics” is that today’s new technologies—the PC, the Internet, biotech and so on—have as their main advantage the ability to serve individual customers. They’re tools of mass customization, not mass production.

#### **TECHNOLOGY’S ROLE: DRIVING DOWN COSTS**

Why have Americans had to wait until the tail end of the 20th century for mass customization? The simplest answer: until now, the country didn’t have the know-how to customize at low cost. Today’s technology, though, makes it possible.

If there’s a signature tool of mass customization, it’s the microprocessor. This tiny device is indispensable to many of today’s “smart” tools—most notably, powerful computers that process, store and send information. The Internet moves vast amounts of information at the click of a button—not just words and numbers but pictures and sound as well. Search engines—software that brings order to the Internet’s chaos—are key to customizing because they find and organize information based on users’ profiles and inquiries. Lasers are used in bar-code scanners, measurement devices and fiber-optic cables that can transmit whole libraries in seconds. Artificial intelligence programs simplify the design of new products. Computer-

controlled manufacturing makes it faster and cheaper to modify designs and assemble one-of-a-kind items. Breakthroughs in biotechnology are unlocking the secrets of individual cells. The leap from analog to digital greatly expands the capacity of all kinds of communications technologies to process and deliver that most precious of commodities—information.

The tools of the Information Age are indeed powerful. These technologies spawn mass customization by revolutionizing the calculus of production costs. Nearly all business expenses fall into two broad categories—fixed and marginal. Fixed costs include conceiving, designing and organizing the operation, setting up plants, installing equipment, bringing in utilities, hiring workers and slogging through the usual morass of red tape. These costs are incurred before the first sale is made. Marginal costs, on the other hand, aren’t incurred until an enterprise is up and running. They cover expenses for producing additional units of output, including wages, raw materials, electricity, marketing and distribution.

**Exhibit 8: AS YOU LIKE IT**

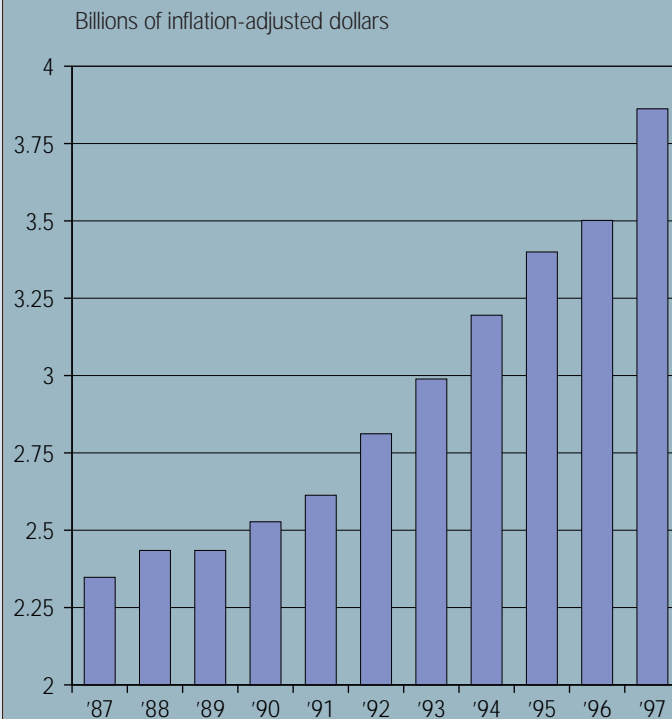
An Internet search for the word *customized* turns up more than 866,000 web pages. Computer-based technologies like the Internet help producer and consumer communicate directly so the goods and services offered more closely match individuals' unique tastes. In virtually every industry—housing, transportation, apparel, medicine, entertainment, finance and so on—modern technologies are shifting the business paradigm from producer-centered productivity to consumer-centered customization.



COMPANY & WEB SITE	PRODUCT & SERVICE
Ford <a href="http://www2.ford.com">www2.ford.com</a>	<b>Autos</b> equipped to your specifications
CDuctive Music <a href="http://www.cductive.com">www.cductive.com</a>	<b>CDs</b> custom-mixed to your taste
Dell <a href="http://www.dell.com">www.dell.com</a>	<b>Computers</b> configured to your requirements
AFE Cosmetics & Skincare <a href="http://www.cosmetics.com">www.cosmetics.com</a>	<b>Cosmetics</b> blended to match your skin tone and type
My Twinn <a href="http://www.mytwinn.com">www.mytwinn.com</a>	<b>Dolls</b> designed to look like your child
Paris-Miki <a href="http://www.paris-miki.com.au">www.paris-miki.com.au</a>	<b>Eyewear</b> customized to fit your face and personality
Charles Schwab <a href="http://www.schwab.com">www.schwab.com</a>	<b>Financial services</b> developed to manage your portfolio
Golf to Fit <a href="http://www.golftofit.com">www.golftofit.com</a>	<b>Golf clubs</b> customized to your body and playing style
American Greetings <a href="http://www.americangreetings.com">www.americangreetings.com</a>	<b>Greeting cards</b> personalized with your look and sentiment
Mortgage.com <a href="http://www.mortgage.com">www.mortgage.com</a>	<b>Home loan shopping</b> personalized for you
Mike Keesee Designs <a href="http://www.mikekeeseedesigns.com">www.mikekeeseedesigns.com</a>	<b>Homes</b> designed by you for your lifestyle
Streamline <a href="http://www.streamline.com">www.streamline.com</a>	<b>Household service</b> needs anticipated and met
Dermatology Assoc. of Dallas <a href="http://www.alkek.com">www.alkek.com</a>	<b>Isolagen</b> cloned from your cells for skin rejuvenation
InterActive Custom Clothes <a href="http://www.ic3d.com">www.ic3d.com</a>	<b>Jeans</b> tailored to your shape and style
CNN Custom News <a href="http://customnews.cnn.com">customnews.cnn.com</a>	<b>News lineup</b> matched to your interests
Footmaxx <a href="http://www.footmaxx.com">www.footmaxx.com</a>	<b>Orthotics</b> fitted to your gait and pressure
WedServ <a href="http://www.wedserv.com">www.wedserv.com</a>	<b>Planning software</b> for your ideal wedding
Imagine Radio <a href="http://www.imagineradio.com">www.imagineradio.com</a>	<b>Radio programming</b> formatted for your pleasure
ShirtCreations <a href="http://www.shirtcreations.com">www.shirtcreations.com</a>	<b>Shirts</b> tailored to your build and taste
Digitoe <a href="http://www.digitoe.com">www.digitoe.com</a>	<b>Shoes</b> fitted to a precise 3D model of your foot
McGraw-Hill <a href="http://www.mcgraw-hill.com">www.mcgraw-hill.com</a>	<b>Textbooks</b> composed of material you select
Acumin <a href="http://www.acumins.com">www.acumins.com</a>	<b>Vitamins</b> formulated to your nutritional needs
The Weather Channel <a href="http://www.weather.com">www.weather.com</a>	<b>Weather forecasts</b> customized to your locale or trip
Andersen Windows <a href="http://www.andersenwindows.com">www.andersenwindows.com</a>	<b>Windows</b> designed to your specifications

### Exhibit 9: MARKET RESEARCH IN THE UNITED STATES

Over the past 10 years, U.S. spending on market research has grown at an average annual pace of over 5.1 percent—much faster than the roughly 2.6-percent rate of the overall economy. The added spending on consumer research indicates that customer focus, not sheer productivity, defines today's business environment. Even more market research takes place behind the veil of Internet traffic.



The interplay of fixed and marginal costs explains both mass production and mass customization. In the Industrial Age, electric motors, engines, winches, conveyor belts, machine tools and other advances reshaped the economy. They were the high technology of the times. These innovations allowed companies to turn out identical products cheaply. The order of the day was standardization—from nuts and bolts to accounting procedures and time zones. The world of mass production usually involved high fixed costs and low marginal costs. Producers made money by cranking out as many units as possible, driving down the average production cost by spreading the huge fixed cost over more and more units. That's precisely what Henry Ford and his successors did. Customers paid lower prices for automobiles, appliances, clothing and household goods, but companies could only bring a limited number of standardized models to the marketplace. With high fixed costs and low marginal costs, it's cheap to make the same product for

everybody but expensive to produce a different product for each customer.

Industrial Age technology replaced muscle power with machine power, which ran the assembly lines. Information Age technology complements machine power with brain power, enabling us to recognize each consumer's preferences and deliver what they want at a reasonable price. (See Exhibit 8.) Once again, the key is costs. Mass customization becomes optimal when both fixed and marginal costs—particularly fixed—are low. If producers can change designs quickly and inexpensively, they'll win customers by targeting individual tastes and preferences. Average costs decline even without long production runs, permitting low prices along with the bonus of getting exactly what we want.

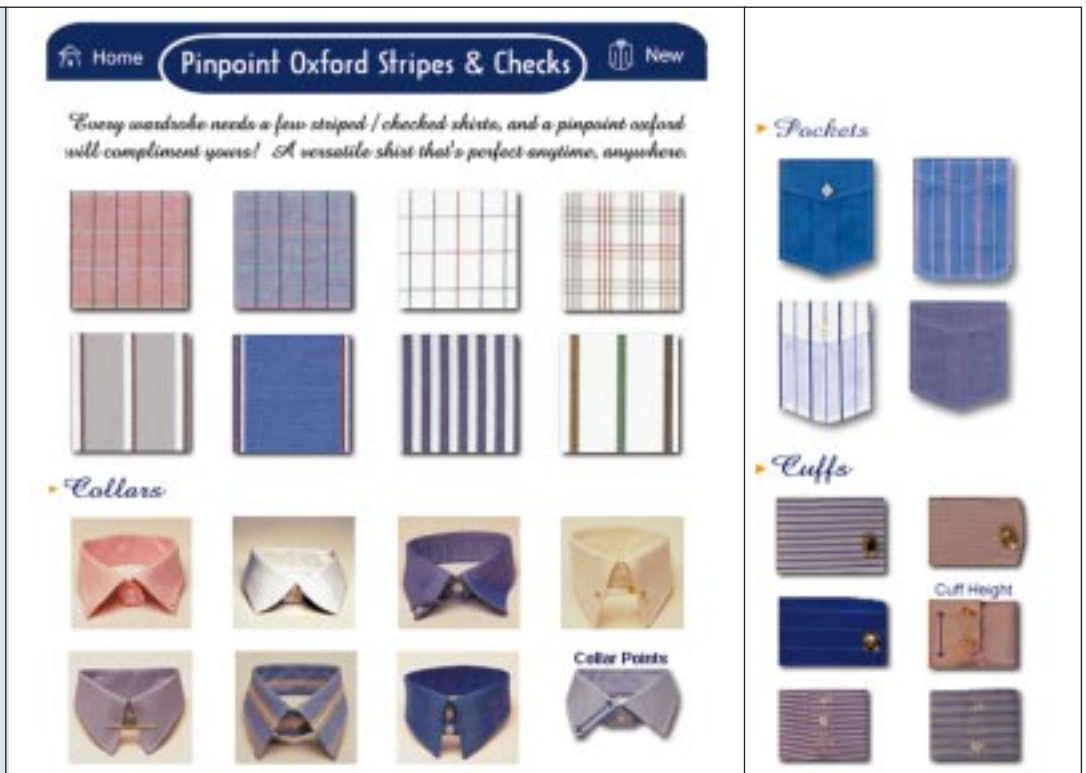
Mass production was the by-product of Industrial Age tools. Mass customization is the dividend of Information Age tools.

Modern technologies slash fixed costs in three areas: information, production and distribution. By



**Exhibit 10: IF THE SHIRT FITS**

Today's fashion-conscious male can point and click his way to a custom-made shirt. New York-based ShirtCreations' web site gives shoppers their choice of collar, cuffs, pockets, monogram style and fit. Tomorrow's shopper may be able to go one better. [TC]<sup>2</sup> is working on a body scanner that replaces the tape measure with lasers, then stores the data on a smart card for future shopping trips.



making it easy to supply *information*, the Internet gives consumers a cheap and easy way to find out what goods and services are on the market. Companies can display immense amounts of product information on their web pages and take orders from anywhere in the world. More important, the Internet frees producers from the expensive proposition of paying firms to gather information on what buyers want. (See Exhibits 9 and 10.) They now find out electronically, at negligible cost. Both InterActive Custom Clothes, the jeans maker, and CDuctive, the producer of custom compact discs, compile consumers' preferences through the Internet. Amazon.com, the Internet bookseller, keeps track of readers' purchases, allowing the online vendor to recommend specific books to individual customers.

By making it cheaper to personalize during *production*, Information Age tools remove the last barriers to providing goods and services for individual customers. It's smart automation that allows CDuctive to personalize compact discs at the click of a

button. Once an order arrives, computers retrieve the selections from a hard drive and burn them directly onto blank discs. InterActive Custom Clothes uses computerized fabric cutters that are quick, precise and inexpensive. Even assembly lines are no longer limited to endless iterations of the same product. Computer-aided designs are replacing costly prototypes. (See Exhibit 11.) Computer-guided machinery allows production to shift from one style to another with a few lines of computer code. At Motorola's pager factory in Boynton Beach, Florida, the specifications for each order arrive in a direct transmission from sales representatives' laptop computers. Within minutes, these specs are translated into bar-code instructions for the assembly process. In theory, the factory could produce 29 million different pagers on the same line, one right after another, without the time and expense of retooling.

Improvements in *distribution*, made possible by such technologies as lasers and computers, reduce the fixed costs of getting products to consumers.



### Exhibit 11: A STEP IN THE RIGHT DIRECTION

Footmaxx uses computerized gait and pressure technologies to analyze an individual's unique walk and build custom orthotics. A patient's walk across the Footmaxx forceplate—which contains 960 pressure points—is scanned 30 times per second. This and other personal data are used to produce a computer-generated analysis from which custom insoles are built to correct each patient's abnormal biomechanics.

Bar-code scanners allow Federal Express and other overnight shippers to improve speed and accuracy while reducing outlays for a global system to pick up, sort, track and deliver packages. As the Internet spreads into more homes and businesses, it makes the delivery of information products relatively inexpensive. What does it cost NewsEdge Corp. to personalize news reports? Next to nothing. Fidelity Investments and other brokerages offer web sites that allow investors to track their portfolios in real time. DirecTV, capitalizing on the increased capacity of satellite television systems, incurs no added expense by offering the entire National Football League schedule every Sunday, so sports fans can choose which games they want to watch.

Michael Dell started his \$16 billion computer business in a University of Texas dorm room in 1983 on the basis of low fixed cost. Dell's masterstroke: build to order and do it quickly. Customization would lose its value if customers had to wait months for their computers. The Internet allows Dell to find out

what each customer wants, instantly and cheaply. Continuous-flow manufacturing cuts the cost of customizing: 35 cargo doors line both ends of Dell's new Round Rock manufacturing facility. On one side, suppliers deliver components throughout the day. On the other, workers load finished products onto trucks. Actual assembly takes five minutes. Even adding time for loading software and testing for quality, the whole process takes just four hours. By economizing on spare parts, product inventory, delivery and every other step of the process, the company provides a customized product at a competitive price. No wonder Michael Dell has been lauded as the Henry Ford of mass customization. (See Exhibit 12.)

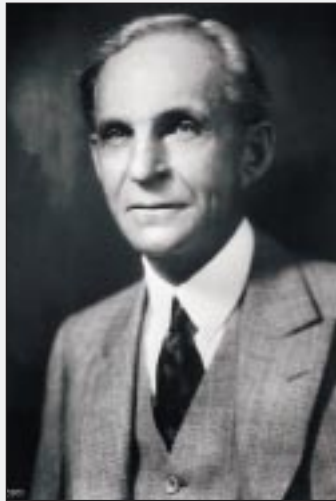
Information Age technology thrusts our economy toward mass customization, but other factors also contribute. The globalization of commerce, for example, makes goods and services more widely available, especially as cutting-edge electronic media reduce the time and expense involved in gathering information. Access to products from around

Exhibit 12: HENRY FORD,  
MEET MICHAEL DELL

**Henry Ford**

*Born July 30, 1863*

Ford built his first car in 1896, 10 years after the auto was invented. He was 32 years old and chief engineer at Edison Illuminating Co. in Detroit. Seven years later he founded Ford Motor Co.



*“The consumer can have any color he wants so long as it’s black.”*

*“I will build a motorcar for the great multitude... It will be so low in price that no man... will be unable to own one.”*

Ford had to defend the assembled car against claims from craft shops that it was an inferior product.

Workers were specialists, each working on just a small part of the auto.

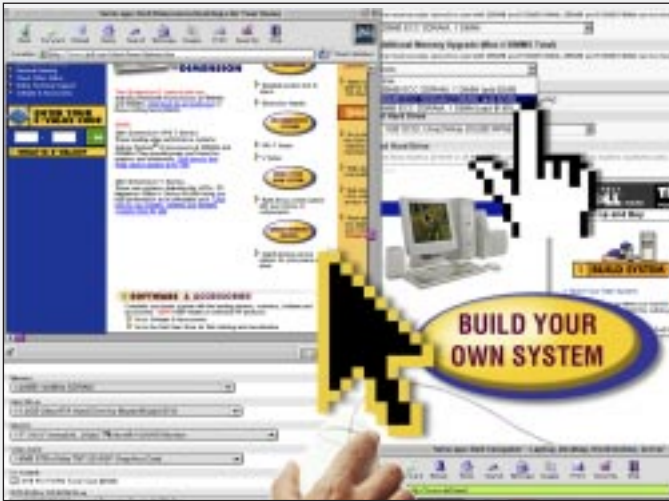
All steps in the manufacturing process—refining the raw materials, molding engine blocks and body parts in a giant steel mill, making windshields in a glass factory and assembling the final product—took place in one 6.9-million-square-foot plant.

Cars were produced before they were sold, then shipped to dealerships that held huge inventories.

Models changed once a year, at most.

The Model T’s exterior went unaltered for 19 years.





**Michael Dell**

*Born February 23, 1965*

Dell built his first computer in 1983, eight years after the PC was invented. He was 18 years old and a freshman at the University of Texas at Austin. A year later he founded Dell Computer Corp.



Dell had to convince consumers that a customized yet unseen computer could be economical and superior to a store-bought model.

Workers are highly trained generalists, each putting together the whole computer.

Parts are delivered on demand from nearby warehouses, and the final product is assembled by one worker, drawing selected components from a kit made up for the individual customer.

Computers are sold over the Internet, then produced and shipped directly to the individual customer. No inventories are kept.

Models change continuously as new technologies become available.

*“Companies that are successful today...are those that can get closest to their customers’ needs.”*

*“Building a business solely on cost or price...[is] not a sustainable advantage.”*



Exhibit 13:

**THREE SPOONS AREN'T  
A PLACE SETTING**

Suppose that a knife, fork and spoon each cost the same to produce. All else being equal, an economy that produced three spoons would register the same GDP and productivity as one that produced a knife, fork and spoon. Diners, though, would surely choose the three-piece place setting. This example illustrates why add-'em-up statistics like GDP and productivity often fall short as business seeks the grander goal: pleasing customers.



the world also makes us more sophisticated consumers, so that even in the home market we demand the nuances of Italian suits or German beer.

Just as mass customization couldn't take root in an isolated society, it couldn't emerge in a poor one. Low-income countries are still dominated by mass production. That's to be expected, because producing quantity is the quickest way out of poverty. Once a nation becomes wealthy, most families' basic needs are satisfied. As they move up the economic ladder, consumers typically move down a list of wants from food, clothing and shelter to luxuries. All of us desire the luxury of goods and services that embody our own tastes and preferences. It's money in the pocket, though, that makes it possible. We're becoming a society of mass customization because we can now afford it.

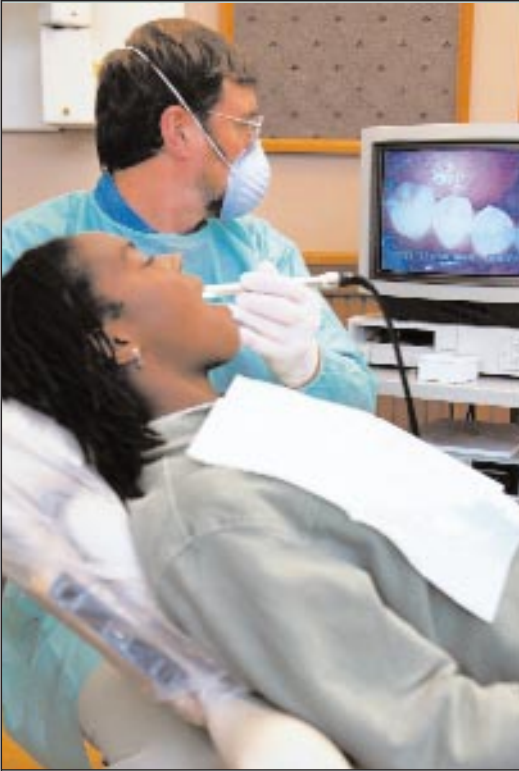
First we meet basic needs through mass production. Then we gratify individual wants through mass customization.

**RIGHT STUFF, WRONG STATISTICS**

As mass customization becomes part of our everyday lives, most Americans will intuitively understand how it represents an improvement over mass production. Clothes will fit better. Entertainment will be more enjoyable. Doctors and hospitals will have individualized tools to make us healthier.

Yet it may be hard for many Americans to assess how much better off we are. The problem lies in how we measure our economic progress. We tend to rely on a handful of well-publicized statistics—most notably, gross domestic product, the Consumer Price Index and productivity figures. The benefits of mass customization, however, are hard to quantify, especially with the rudimentary economic yardsticks now available.

GDP is a statistic designed for mass production. It's a simple counting—the number of units made. It falls short in measuring intangible benefits. Economic research demonstrates that GDP often fails to capture consumers' gains from better quality and new products. Mass customization introduces a similar



#### VACCINES IN THE WORKS

Asthma  
 Cancer  
 Diabetes  
 Ear infection  
 Hepatitis C  
 Herpes simplex I and II  
 HIV/AIDS  
 Lyme disease  
 Malaria  
 Mononucleosis  
 Multiple sclerosis  
 Streptococcus A and B  
 Streptococcus pneumonia  
 Tooth decay  
 Tuberculosis

#### Exhibit 14: AN OUNCE OF PREVENTION

Roughly \$107 billion was spent fighting cancer in 1998. The federal government alone spent nearly \$3 billion on cancer research. Tallying the bill for all health costs, the nation spent more than \$1 trillion last year, the bulk of which went for treatment and cures.

Scientists aren't just looking for cures—they're seeking to eradicate disease altogether. Clearly their success would be a big boon to society, but by and large GDP wouldn't reflect such progress. In fact, GDP might even fall. (*See the appendix.*) Vaccines and the like save countless lives and untold pain and suffering but shut down whole industries dedicated to research, treatment, fund-raising and public education—all of which add to GDP.

No doubt a big chunk of the economic resources freed by eliminating diseases is eventually recycled into producing other output. But society may well choose to take such progress in other ways, too—such

as enjoying more leisure time and greater product variety—options American households value and have historically chosen in lieu of just having more GDP.

Advances in biotechnology and genomics promise solutions to many public health problems. Numerous vaccines targeting a number of humankind's most stubborn diseases and conditions are in the development stage. Estimates are that in just the next two decades, progress in disease prevention will deliver as many vaccines as have been found so far in all of history.

What's more, the gains in preventive output aren't limited to medicine. Much progress in preventing accidents, pollution and crime has been made over the past quarter century. Even more gains may be near. But as with medical advances, Americans will have to get used to not seeing their progress fully reflected in our economic statistics.

**Exhibit 15: THE PARADOX THAT ISN'T**

*You can see the computer age everywhere but in the productivity statistics.*

This statement by MIT economist Robert Solow stems from the fact that standard measures of productivity have been disappointing in recent decades, just as huge mainframes, increasingly powerful desktops and ever-smaller laptops have penetrated the economy's every nook and cranny. From 1870 to 1973, U.S. productivity increased by an average of 2.3 percent a year. After 1973, the growth rate slowed by a full percentage point.

If computers are making American workers and companies more efficient, why are the nation's productivity measures so lackluster?

This so-called Solow paradox challenges our notions of what creates economic progress. The bellwether inventions of the past fostered great leaps in productivity, which raised wages and living standards. American per capita income quadrupled as consumers reaped the benefits of such world-shaking innovations as steam engines, electricity, refrigeration, telephones and automobiles. If computers aren't providing a big productivity boost, there's reason to doubt Americans' living standards will rise as quickly as they did in the past.

Why haven't computers brought a surge in productivity?

Economists have offered several explanations for the Solow paradox. Among them: there may be a glitch in the productivity data. Computers may

not have achieved critical mass in industry. It may take more time to realize the gains from computers, so the productivity surge will come later. And the most disturbing reason: the computer isn't that big a deal, at least when compared with the great inventions of the past.

None of these explanations considers the gains from variety, customization or preventive goods. Yet the benefits from computers, software, the Internet and other innovations aren't confined to producing just more stuff. These technologies allow companies to produce the right stuff at reasonable prices—making consumers better off in ways not fully captured by standard economic statistics.

The mathematical proof in the appendix shows that GDP and productivity accurately measure the gains in living standards when technological progress lowers marginal costs. But when the economy develops tools that cut fixed costs, the statistics undercount—in fact, totally ignore—the gains. The appendix also shows that GDP falls when society develops preventive goods, such as vaccines to eradicate diseases or antilock brakes to avert accidents, despite the rise in living standards.

In the end, there is no Solow paradox. Computers are doing what inventions have always done: they're benefitting society, and they're making our lives better.

bias, one tied to the fact that we can measure production but not consumers' satisfaction. They aren't the same, even though many commentators casually link them. (*See Exhibit 13.*)

Nobody ever said quantity was the spice of life. GDP statistics tell the same tale whether a business executive owns 12 identical suits or if he possesses a dozen in an array of fabrics and styles. Is it really the same? No individual would think so; that's why our closets are filled with a variety of garments. Will 100 copies of *The Catcher in the Rye* offer as much reading pleasure as one copy of 100 different novels? GDP says so. Most consumers would say no. And just as variety has produced gains for America that have eluded the GDP and productivity statistics, mass customization will produce even more.

Preventive production proves just as slippery for GDP accounting. (*See Exhibit 14.*) If electronic sen-

sors in roads and vehicles can prevent accidents, Americans will have undamaged cars. Without the technology, they might be involved in more collisions, spending money on repairs. Either way, they have the same thing—a car without dents. The first costs less, so GDP accounting would suggest we're worse off, not better off. Similarly, scientists are developing vaccines that will eliminate tooth decay. We will benefit from improved dental health, but the holes not drilled in teeth are net losses to GDP. A stitch in time may indeed save nine, but it also generates one-ninth the GDP.

Inflation-adjusted GDP puts economic growth at an annual average of 2.7 percent over the past two decades. GDP may be entirely accurate as a tally of how much our farms, factories and offices produce, but it's increasingly inadequate as a measure of how well the economy provides what we want—the sat-

isfaction produced. As we grow wealthier, Americans are taking more of our progress in ways that aren't readily quantified. We're refining what we produce—making the right stuff, not just stuff.

If GDP can't detect the benefits of mass customization, it will also miss the mark on productivity, a number that derives straight from the GDP calculations. Some economists are disappointed in America's productivity performance over the past quarter century, a time of rapid spread of new technologies—most notably the computer. They see measured productivity slowing to 1 percent a year and worry that Information Age advances aren't delivering the same economic punch as Industrial Age inventions. It just isn't so. Our statistics don't recognize how the economy is making us better off by producing for us individually rather than en masse. (*See Exhibit 15.*)

Our statistics are a rearview mirror, looking back at the past. We need to focus on the economy that's emerging rather than the one that has been. Tomorrow's progress can't be judged with yesterday's gauges. What's needed are analytical tools that can capture the benefits of mass customization and preventive products.

After all, output and productivity aren't the goals of the economy. Consumer satisfaction is.

Mass customization is already making consumers better off by providing just what we want. And the best is yet to come. What's likely to arrive in coming years will be truly astounding. InterActive Custom Clothes produces jeans to order, but even more elaborate systems are reaching the prototype stage. A customer starts with a stroll through a body scanner, which uses lasers to take 50 measurements from head to toe, then saves the data on a wallet-sized smart card handy for shopping. When ready to buy a new suit, shirt or dress, the customer mixes and matches from among hundreds of fashion accents. At the touch of a button, the order will go to a factory, where computerized cutting and sewing machines will turn out clothing with the buyer's own label sewn inside.

In the field of medicine, Affymetrix already makes devices to decode individuals' DNA. The ability to quickly gather heretofore unknown information about patients is giving birth to a new discipline called pharmacogenomics. Using this distinct genetic portrait, pharmaceutical companies expect to offer drugs tailored to individuals' age, symptoms, condition and hereditary makeup. Personalized drugs will not only ensure correct dosage, they'll also curtail side effects.

Mass customization promises more marvels like these. Interactive television will give families the power, now held by network program directors, to determine the nightly lineup. Automakers are starting to design systems that will build cars to order. Textbooks, scents, electronic gadgets and just about everything else will someday bear our personal stamp.

We might not see faster growth rates or surges in productivity, but mass customization will pay off for America. Resources are wasted guessing what customers want. When more products are customized, we won't squander money on clothing that sits in the closet because it doesn't fit or compact discs with only one or two songs we really like. And goods won't languish on dealers' shelves. Achieving a higher standard of living with fewer demands on natural and labor resources will help ease price pressures and continue this decade's good news on inflation.

Two centuries of American economic progress have brought us a standard of living that's the envy of the world. We wouldn't have it so good without the immense variety provided as companies move from standardization to custom-made. Our economy offers a veritable feast for consumers. Mass customization will make it even better. An economy that's delivering more of what we want and less of what we don't is doing its job in raising living standards. As we enter the 21st century, the United States is moving into a new economic era, one where consumers will be better off than ever before—because we'll live in a world of our own design.

—*W. Michael Cox and Richard Alm*



**APPENDIX**

In the appendix we model and prove mathematically the results stated in the main text.<sup>1</sup> Specifically, we show that gross domestic product accurately measures the gains in society’s living standards when technological progress is of the type that lowers marginal production costs. But GDP undercounts—indeed, totally ignores—the gains in living standards when new technologies cut fixed production costs. Moreover, we show that GDP falls when society develops preventive goods (such as immunities to diseases or antilock brakes to avert accidents), even though these goods raise living standards.

Assume that living standards can be measured by the transformed CES utility function<sup>2</sup>

$$U = \left( x_1^\theta + x_2^\theta + \dots + (x_H - s)^\theta + \dots + x_n^\theta \right)^{\frac{1}{\theta}}$$

where  $U$  represents the utility metric for living standards,  $x_i$  represents the quantity of each of the  $n$  different products produced, and  $s$  represents the subsistence level  $x_H$  must reach before deriving any satisfaction from good  $H$ —such as the level of sickness that must be overcome to enjoy (good) health. The economy faces the constraint

$$R = \alpha n + \beta \sum_{i=1}^n x_i$$

which dictates that the total quantity of resources used in the production of all goods cannot exceed  $R$ , the economy’s resource endowment. In this equation,  $\alpha$  represents the fixed resource cost of producing each of the  $n$  goods and  $\beta$  represents the marginal resource cost of producing one unit of each of the  $n$  goods.

For simplicity, we assume  $\alpha_i = \alpha$  and  $\beta_i = \beta \forall i$ . The assumption of symmetry allows us to infer that the optimal solution involves  $x_1 = x_2 = \dots = x_H - s = \dots = x_n = x$ , and thereby allows us to reduce the objective function to the simple form

$$U = n^{\frac{1}{\theta}} x$$

Taking advantage of the second welfare theorem, we solve the social planner’s problem: maximize  $U$  subject to  $R = \alpha n + \beta (nx + s)$  by choosing the welfare-maximizing quantity of each good to produce ( $x$ ) and the variety of goods ( $n$ ) to produce overall.<sup>3</sup> This yields

$$x = \frac{\alpha}{\beta} \frac{\theta}{1-\theta}, \quad n = \left( \frac{1-\theta}{\alpha} \right) (R - \beta s) \quad \text{and} \quad U = \frac{\theta}{\beta} (R - \beta s)^{\frac{1}{\theta}} \left( \frac{1-\theta}{\alpha} \right)^{\frac{1-\theta}{\theta}}$$

as the optimal solutions.<sup>4</sup> By definition, GDP is the total quantity of goods produced in the economy, or

$$GDP = nx + s = \frac{\theta}{\beta} R + (1 - \theta)s$$

Essentially, consumers value variety, but firms must expend resources to set up production of the different goods. The optimal trade-off between mass pro-

ducing a few goods and creating variety depends on the fixed and marginal costs of production ( $\alpha$  and  $\beta$ , respectively), the total resources available for production ( $R$ ), the resource cost of overcoming the subsistence level of good  $H$ , and  $\theta$ , which reflects the sharpness of the decline in the marginal utility of consumption of each good.

Examining the effect of technological progress on quantity, variety, GDP and living standards, the equations show that a fall in marginal production costs ( $\beta$ ) raises  $x$ ,  $n$ ,  $U$  and GDP; however, a fall in fixed costs ( $\alpha$ ) lowers  $x$ , raises  $n$  and  $U$  but has no effect on GDP. GDP and living standards rise together in the face of technological progress that reduces  $\beta$ , but progress totally eludes the GDP statistic when new tools that cut fixed costs are developed (when  $\alpha$  falls).

Note further that the GDP statistic gives an erroneous (that is, opposite) indication of what happens to living standards when progress is made in reducing subsistence levels. For example, a fall in the indigenous level of sickness (a lower  $s$ ) made possible, say, by finding vaccines, raises  $n$  and  $U$  with no effect on  $x$ , but GDP actually declines. Vaccines reduce the economic activity (GDP) previously expended in treatment, and some of the resources saved pay the fixed costs of expanding product variety. Overall GDP falls.

These findings imply that aggregate output (and its derivative, productivity) may have been an adequate gauge of economic progress when such innovations as the assembly line, standardized nuts and bolts, electricity and motors lowered mass production costs. But GDP at best understates today’s progress when innovations such as the microchip, the personal computer, the Internet and fiber optics make possible an era of mass customization. What’s more, technological progress in biotech, genomics and preventive outputs may greatly improve society’s living standards yet manifest itself in a recession.

It is worth remembering that a market economy strives to raise our living standards—not simply GDP—because that’s where business profits lie. Thus, the real paradox is not why “you can see the computer age everywhere but in the productivity statistics”<sup>5</sup> but why economists who preach that individuals maximize utility and firms maximize profit look for signs of progress exclusively in the productivity data.

<sup>1</sup> See Cox and Ruffin (1998).

<sup>2</sup> This formulation assumes homogeneous economic agents, so that the individual’s and society’s utility functions are the same. Generalizing the setup to heterogeneous agents would introduce the potential for even further gains in living standards as product variety increases, but at best would complicate the aggregation of social welfare and at worst would prove mathematically intractable.

<sup>3</sup> The second welfare theorem states that under certain conditions (satisfied here) the solution to the central planner’s problem of maximizing social welfare is the same as that of the private market economy, in which individuals maximize utility and firms maximize profit.

<sup>4</sup> The solution for  $x_H$  exceeds the other  $x_i$  by  $s$ .

<sup>5</sup> Solow (1987).

**ACKNOWLEDGMENTS**

"The Right Stuff: America's Move to Mass Customization" was written by W. Michael Cox and Richard Alm. The essay is based on research conducted by Cox, senior vice president and chief economist, Federal Reserve Bank of Dallas. Meredith Walker provided important research assistance throughout the course of the project. Thanks also go to Maria Coello, Gallin Fortunov, Charlene Howell, Sergei Polevikov and Stephen Stout.

**SELECTED REFERENCES**

Barry, James P., *Henry Ford and Mass Production* (New York: Franklin Watts, 1973).

Burness, Tad, *Cars of the Early Twenties* (Philadelphia: Chilton Book Co., 1968).

Cox, W. Michael, and Roy J. Ruffin, "What Should Economists Measure? The Implications of Mass Production vs. Mass Customization," Federal Reserve Bank of Dallas, Working Paper no. 98-03 (July 1998).

Dell, Michael, *Direct from Dell* (New York: HarperBusiness, 1999).

Ford Motor Co., <<http://www2.ford.com>>.

Gates, Bill, *The Road Ahead* (New York: Viking, 1995).

Gilmore, James H., and B. Joseph Pine II, "The Four Faces of Customization," *Harvard Business Review*, January–February 1997, pp. 91–101.

Gordon, Robert J., "Monetary Policy in the Age of Information Technology: Computers and the Solow Paradox," prepared for the conference "Monetary Policy in a World of Knowledge-Based Growth, Quality Change and Uncertain Measurement," Bank of Japan, June 18–19, 1998.

Greenspan, Alan, "Is There a New Economy?" remarks at the Haas Annual Business Faculty Research Dialogue, University of California at Berkeley, Sept. 4, 1998.

Greenspan, Alan, "Problems of Price Measurement," remarks at the Center for Financial Studies, Frankfurt, Germany, Nov. 7, 1997.

Krugman, Paul, "Scale Economies, Product Differentiation and the Pattern of Trade," *Journal of Political Economy*, December 1980, pp. 950–59.

Lancaster, Kelvin J., *Variety, Equity, and Efficiency* (New York: Columbia University Press, 1979).

Peppers and Rogers Group, Marketing 1 to 1, <<http://www.1to1.com>>.

Pine, B. Joseph II, *Mass Customization: The New Frontier in Business Competition* (Boston: Harvard Business School Press, 1993).

Schonfeld, Erick, "The Customized, Digitized, Have-It-Your Way Economy," *Fortune*, Sept. 28, 1998, pp. 114–21.

Sears, Stephen W., *The American Heritage History of the Automobile in America* (New York: American Heritage Publishing, 1977).

Solow, Robert M., "We'd Better Watch Out," *New York Times*, July 12, 1987, p. 36.

Toffler, Alvin, *The Third Wave* (New York: Bantam Books, 1980).

Toffler, Alvin, quoted in "Toffler: Change—or Else," *Inc.*, May 1, 1998, p. 23.

**EXHIBIT NOTES AND DATA SOURCES**

Page 4, **More Choices Than Ever**

Data on product variety are scarce. The numbers in this table represent the authors' best estimates, using the sources listed below.

**Vehicle models:** 1970, *NADA Official Used Car Guide*, January 1970; 1998, Ward's AutoInfoBank.

**Vehicle styles:** 1970, *NADA Official Used Car Guide*, January 1970; 1998, <<http://www.dealernet.com>>.

**SUV models:** 1970, *NADA Official Used Car Guide*, January 1971; 1998, Ward's AutoInfoBank.

**SUV styles:** 1970, *NADA Official Used Car Guide*, January 1971; 1998, <<http://www.dealernet.com>>.

**Personal computer models:** 1998, computers reviewed by CNET Computers.com, <<http://computers.com>>, as of Jan. 5, 1999.

**Software titles:** 1998, number of files available in CNET's shareware.com software library, <<http://www.shareware.com>>, as of Jan. 4, 1999.

**Web sites:** 1998, NetNames, <[www.domainstats.com](http://www.domainstats.com)>, as of Nov. 29, 1998.

**Movie releases, airports, magazine titles, new book titles, community colleges and amusement parks:** see notes for Variety on the Rise.

**TV screen sizes:** 1972, *Popular Science*, August 1972; 1998, number of screen sizes available at Best Buy.

**Houston TV channels:** 1970, *TV Guide*, Southeast Texas Edition, Sept. 12–18, 1970; 1998, DirecTV.

**Radio broadcast stations:** 1970 and 1998 (as of Nov. 30), Federal Communications Commission.

**McDonald's menu items:** 1970 and 1998, McDonald's Corp.

**KFC menu items:** 1970 and 1998, KFC.

**Frito-Lay chip varieties:** 1970 and 1996, Frito-Lay Inc.

**Breakfast cereals:** 1980 and mid-1990s, *The Economics of New Goods* (Chicago: University of Chicago Press for NBER, 1996).

**Pop-Tarts:** 1970 and 1998, Kellogg Co.

**National soft drink brands:** 1970, *The Commercial and Financial Chronicle*, Jan. 7, 1971; mid-1990s, *Beverage World*, April 1994; *Beverage World*, March 1995.

**Bottled water brands:** 1970 and 1998, numerous industry web sites, including <<http://www.bottledwater.org>> and <<http://www.bottledwaterweb.com>>.

**Milk types:** 1970 and 1998, numerous industry web sites, including <<http://www.whymilk.com>> and <<http://www.milk.co.uk>>.

**Colgate toothpastes:** 1970 and 1998, Colgate-Palmolive Co.

**Mouthwashes:** 1970, numerous newspapers, including *Wall Street Journal*, Sept. 16, 1970; 1998, brands available at Dallas-area stores.

**Dental flosses:** 1978, Mediamark Research Inc., product summary report; 1998, brands available at Dallas-area stores.

**Prescription drugs:** 1978 and 1998, *Physicians' Desk Reference* (Montvale, N.J.: Medical Economics Co., 1978 and 1998).

**Over-the-counter pain relievers:** 1970 and 1998, numerous industry sources and Dallas-area stores.

**Levi's jean styles:** spring 1972 and 1998, Levi Strauss & Co.

**Running shoe styles:** 1970, numerous company and industry sources, including *Runner's World*, September 1970; 1998, Holabird Sports, <<http://www.holabirdsports.com>>.

**Women's hosiery styles:** 1970 and 1998, National Association of Hosiery Manufacturers.

**Contact lens types:** 1970 (note: soft lenses were introduced in 1971), *Consumer Reports*, May 1972; 1998 total reflects possible combinations of material, wear schedule, replacement schedule and correction modality, plus types of tinted lenses; numerous industry web sites consulted.

**Bicycle types:** 1970 and 1998, Jay Townley & Associates, Lyndon Station, Wis.

Page 5, **Variety on the Rise:** amusement parks, U.S. Bureau of the Census, *County Business Patterns*, various years; general and farm magazine titles, Magazine Publishers of America, from Audit Bureau of Circulations; new book titles, U.S. Bureau of the Census, *Statistical Abstract of the United States*, various years; airports, Federal Aviation Administration, *Statistical Handbook of Aviation*, various years; community colleges, National Center for Education Statistics; movies released, Motion Picture Association of America.

Page 6, **The More the Merrier:** new product introductions of consumer packaged goods by number of new SKUs, Marketing Intelligence Service Ltd., New York.

Page 7, **Product Variety at U.S. Grocery Stores:** average number of SKUs by type of store, Willard Bishop Consulting, *Competitive Edge*, May issues, 1990–98.

Pages 8, 9, **Food for Thought:** average lunch prices reported by Dallas-area restaurants, phone survey, week of Jan. 17, 1999.

Pages 10, 11, **Providing What Consumers Want:** Burness (1968).

Page 12, **Vehicle Models, 1980–97:** Ward's AutoInfoBank, used by permission of Ward's Communications, Southfield, Mich.

Page 15, **Market Research in the United States:** research spending in 1997 dollars, *Marketing News*, June 8, 1998.

Page 21, **An Ounce of Prevention:** \$107 billion in 1998 is the total of \$37 billion in direct costs and \$70 billion in indirect morbidity and mortality costs associated with cancer. American Cancer Society; National Cancer Institute; National Academy of Sciences Institute of Medicine; *U.S. News and World Report*, Nov. 23, 1998.

#### PHOTO CREDITS

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*Alan Buckwalter is filling the unexpired term of John Adams, who resigned from the Houston board in August 1998. J. Michael Solar retired from the Houston board in December 1998.*



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*Charles Doyle retired as  
Federal Advisory Council  
Member in December 1998.*

Effective January 1, 1999

Effective December 31, 1998



February 5, 1999

To the Board of Directors of the  
Federal Reserve Bank of Dallas:

The management of the Federal Reserve Bank of Dallas (FRBD) is responsible for the preparation and fair presentation of the Statement of Condition, Statement of Income, and Statement of Changes in Capital as of December 31, 1998 (the "Financial Statements"). The Financial Statements have been prepared in conformity with the accounting principles, policies, and practices established by the Board of Governors of the Federal Reserve System and as set forth in the Financial Accounting Manual for the Federal Reserve Banks, and as such, include amounts, some of which are based on judgments and estimates of management.

The management of the FRBD is responsible for maintaining an effective process of internal controls over financial reporting including the safeguarding of assets as they relate to the Financial Statements. Such internal controls are designed to provide reasonable assurance to management and to the Board of Directors regarding the preparation of reliable Financial Statements. This process of internal controls contains self-monitoring mechanisms, including, but not limited to, divisions of responsibility and a code of conduct. Once identified, any material deficiencies in the process of internal controls are reported to management, and appropriate corrective measures are implemented.

Even an effective process of internal controls, no matter how well designed, has inherent limitations, including the possibility of human error, and therefore can provide only reasonable assurance with respect to the preparation of reliable Financial Statements.

The management of the FRBD assessed its process of internal controls over financial reporting including the safeguarding of assets reflected in the Financial Statements, based upon the criteria established in the "Internal Control-Integrated Framework" issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on this assessment, the management of the FRBD believes that the FRBD maintained an effective process of internal controls over financial reporting including the safeguarding of assets as they relate to the Financial Statements.



President

*Federal Reserve Bank of Dallas*



First Vice President

*Federal Reserve Bank of Dallas*



## REPORT OF INDEPENDENT ACCOUNTANTS

To the Board of Directors of the  
Federal Reserve Bank of Dallas:

We have examined management's assertion that the Federal Reserve Bank of Dallas ("FRB Dallas") maintained effective internal control over financial reporting and the safeguarding of assets as they relate to the Financial Statements as of December 31, 1998, included in the accompanying Management's Assertion.

Our examination was made in accordance with standards established by the American Institute of Certified Public Accountants, and accordingly, included obtaining an understanding of the internal control over financial reporting, testing, and evaluating the design and operating effectiveness of the internal control, and such other procedures as we considered necessary in the circumstances. We believe that our examination provides a reasonable basis for our opinion.

Because of inherent limitations in any internal control, misstatements due to error or fraud may occur and not be detected. Also, projections of any evaluation of the internal control over financial reporting to future periods are subject to the risk that the internal control may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

In our opinion, management's assertion that the FRB Dallas maintained effective internal control over financial reporting and over the safeguarding of assets as they relate to the Financial Statements as of December 31, 1998, is fairly stated, in all material respects, based upon criteria described in "Internal Control - Integrated Framework" issued by the Committee of Sponsoring Organizations of the Treadway Commission.

*PricewaterhouseCoopers LLP*

Dallas, Texas

March 5, 1999

## REPORT OF INDEPENDENT ACCOUNTANTS

PricewaterhouseCoopers LLP

To the Board of Governors of the Federal Reserve System  
and the Board of Directors of the Federal Reserve Bank of Dallas:

We have audited the accompanying statements of condition of the Federal Reserve Bank of Dallas (the "Bank") as of December 31, 1998 and 1997, and the related statements of income and changes in capital for the years then ended. These financial statements are the responsibility of the Bank's management. Our responsibility is to express an opinion on the Financial Statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

As discussed in Note 3, the financial statements were prepared in conformity with the accounting principles, policies, and practices established by the Board of Governors of the Federal Reserve System. These principles, policies, and practices, which were designed to meet the specialized accounting and reporting needs of the Federal Reserve System, are set forth in the "Financial Accounting Manual for Federal Reserve Banks" and constitute a comprehensive basis of accounting other than generally accepted accounting principles.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Bank as of December 31, 1998 and 1997, and results of its operations for the years then ended, on the basis of accounting described in Note 3.



Dallas, Texas

March 5, 1999

## STATEMENTS OF CONDITION (IN MILLIONS)

	December 31, 1998	December 31, 1997
<b>ASSETS</b>		
Gold certificates	\$ 530	\$ 459
Special drawing rights certificates	367	367
Coin	40	37
Items in process of collection	392	359
U.S. government and federal agency securities, net	20,764	15,761
Investments denominated in foreign currencies	1,029	951
Accrued interest receivable	196	149
Interdistrict settlement account	1,680	5,259
Bank premises and equipment, net	182	185
Other assets	18	12
	<u>          </u>	<u>          </u>
<b>Total assets</b>	<b>\$ 25,198</b>	<b>\$ 23,539</b>
	<u>          </u>	<u>          </u>
<b>LIABILITIES AND CAPITAL</b>		
<b>Liabilities</b>		
Federal Reserve notes outstanding, net	\$ 23,072	\$ 20,007
Deposits:		
Depository institutions	1,166	2,480
Other deposits	9	10
Deferred credit items	334	424
Surplus transfer due U.S. Treasury	103	12
Accrued benefit cost	49	45
Other liabilities	11	8
	<u>          </u>	<u>          </u>
<b>Total liabilities</b>	<b>\$ 24,744</b>	<b>\$ 22,986</b>
	<u>          </u>	<u>          </u>
<b>Capital</b>		
Capital paid-in	227	283
Surplus	227	270
	<u>          </u>	<u>          </u>
<b>Total capital</b>	<b>\$ 454</b>	<b>\$ 553</b>
	<u>          </u>	<u>          </u>
<b>Total liabilities and capital</b>	<b>\$ 25,198</b>	<b>\$ 23,539</b>
	<u>          </u>	<u>          </u>

The accompanying notes are an integral part of these financial statements.

**STATEMENTS OF INCOME (IN MILLIONS)**

	FOR THE YEARS ENDED	
	December 31, 1998	December 31, 1997
<b>INTEREST INCOME</b>		
Interest on U.S. government securities	\$ 1,136	\$ 910
Interest on foreign currencies	23	21
<b>Total interest income</b>	<b>\$ 1,159</b>	<b>\$ 931</b>
<b>OTHER OPERATING INCOME (LOSS)</b>		
Income from services	\$ 56	\$ 53
Reimbursable services to government agencies	11	7
Foreign currency gains (losses), net	97	(144)
Government securities gains, net	2	–
Other income	1	1
<b>Total other operating income (loss)</b>	<b>\$ 167</b>	<b>(\$ 83)</b>
<b>OPERATING EXPENSES</b>		
Salaries and other benefits	\$ 81	\$ 78
Occupancy expense	11	11
Equipment expense	10	10
Cost of unreimbursed Treasury services	–	2
Assessments by Board of Governors	27	23
Other expenses	54	51
<b>Total operating expenses</b>	<b>\$ 183</b>	<b>\$ 175</b>
<b>Net income prior to distribution</b>	<b>\$ 1,143</b>	<b>\$ 673</b>
<b>DISTRIBUTION OF NET INCOME</b>		
Dividends paid to member banks	\$ 14	\$ 16
Transferred to (from) surplus	(43)	26
Payments to U.S. Treasury as interest on Federal Reserve notes	441	–
Payments to U.S. Treasury as required by statute	731	631
<b>Total distribution</b>	<b>\$ 1,143</b>	<b>\$ 673</b>

The accompanying notes are an integral part of these financial statements.



**STATEMENTS OF CHANGES IN CAPITAL  
FOR THE YEARS ENDED DECEMBER 31, 1998,  
AND DECEMBER 31, 1997 (IN MILLIONS)**

	Capital Paid-In	Surplus	Total Capital
<b>BALANCE AT JANUARY 1, 1997</b>			
<b>(5.1 MILLION SHARES)</b>	<b>\$ 257</b>	<b>\$ 250</b>	<b>\$ 507</b>
Net income transferred to surplus	-	26	26
Statutory surplus transfer to the U.S. Treasury	-	( 6)	( 6)
Net change in capital stock issued (0.5 million shares)	26	-	26
	<hr/>	<hr/>	<hr/>
<b>BALANCE AT DECEMBER 31, 1997</b>			
<b>(5.6 MILLION SHARES)</b>	<b>\$ 283</b>	<b>\$ 270</b>	<b>\$ 553</b>
Net income transferred (from) surplus	-	(43)	(43)
Net change in capital stock (redeemed) (1.1 million shares)	(56)	-	(56)
	<hr/>	<hr/>	<hr/>
<b>BALANCE AT DECEMBER 31, 1998</b>			
<b>(4.5 MILLION SHARES)</b>	<b>\$ 227</b>	<b>\$ 227</b>	<b>\$ 454</b>
	<hr/>	<hr/>	<hr/>

The accompanying notes are an integral part of these financial statements.

**NOTES TO FINANCIAL STATEMENTS****1. ORGANIZATION**

The Federal Reserve Bank of Dallas (“Bank”) is part of the Federal Reserve System (“System”) created by Congress under the Federal Reserve Act of 1913 (“Federal Reserve Act”), which established the central bank of the United States. The System consists of the Board of Governors of the Federal Reserve System (“Board of Governors”) and 12 Federal Reserve Banks (“Reserve Banks”). The Reserve Banks are chartered by the federal government and possess a unique set of governmental, corporate, and central bank characteristics. Other major elements of the System are the Federal Open Market Committee (“FOMC”) and the Federal Advisory Council. The FOMC is composed of members of the Board of Governors, the president of the Federal Reserve Bank of New York (“FRBNY”), and, on a rotating basis, four other Reserve Bank presidents.

**Structure**

The Bank and its branches in El Paso, Houston, and San Antonio serve the Eleventh Federal Reserve District, which includes Texas and portions of Louisiana and New Mexico. In accordance with the Federal Reserve Act, supervision and control of the Bank are exercised by a board of directors. Banks that are members of the System include all national banks and any state-chartered bank that applies and is approved for membership in the System.

**Board of Directors**

The Federal Reserve Act specifies the composition of the board of directors for each of the Reserve Banks. Each board is composed of nine members serving three-year terms: three directors, including those designated as chairman and deputy chairman, are appointed by the Board of Governors, and six directors are elected by member banks. Of the six elected by member banks, three represent the public and three represent member banks. Member banks are divided into three classes according to size. Member banks in each class elect one director representing member banks and one representing the public. In any election of directors, each member bank receives one vote, regardless of the number of shares of Reserve Bank stock it holds.

**2. OPERATIONS AND SERVICES**

The System performs a variety of services and operations. Functions include formulating and conducting monetary policy; participating actively in the payments mechanism, including large-dollar transfers of funds, automated clearinghouse operations, and check processing; distributing coin and currency; providing fiscal agency functions for the U.S. Treasury and certain federal agencies; serving as the federal government’s bank; providing short-term loans to depository institutions; serving the consumer and the community by providing educational materials and information regarding consumer laws; supervising bank holding companies and state member banks; and administering other regulations of the Board of Governors. The Board of Governors’ operating costs are funded through assessments on the Reserve Banks.

The FOMC establishes policy regarding open market operations, oversees these operations, and issues authorizations and directives to the FRBNY for its execution of transactions. Authorized transaction types include direct purchase and sale of securities, matched sale–purchase transactions, purchase of securities under agreements to resell, and lending of U.S. government securities. Additionally, the FRBNY is authorized by the FOMC to hold balances of, and to execute spot and forward foreign exchange and securities contracts in, 14 foreign currencies; maintain reciprocal currency arrangements (“F/X swaps”) with various central banks; and “warehouse” foreign currencies for the U.S. Treasury Exchange Stabilization Fund (“ESF”) through the Reserve Banks.

**3. SIGNIFICANT ACCOUNTING POLICIES**

Accounting principles for entities with the unique powers and responsibilities of the nation’s central bank have not been formulated by the Financial Accounting Standards Board. The Board of Governors has developed specialized accounting principles and practices that it believes are appropriate for the significantly different nature and function of a central bank as compared with

the private sector. These accounting principles and practices are documented in the “Financial Accounting Manual for Federal Reserve Banks” (“Financial Accounting Manual”), which is issued by the Board of Governors. All Reserve Banks are required to adopt and apply accounting policies and practices that are consistent with the Financial Accounting Manual.

The financial statements have been prepared in accordance with the Financial Accounting Manual. Differences exist between the accounting principles and practices of the System and generally accepted accounting principles (“GAAP”). The primary differences are the presentation of all security holdings at amortized cost rather than at the fair value presentation requirements of GAAP, and the accounting for matched sale–purchase transactions as separate sales and purchases rather than secured borrowings with pledged collateral, as is required by GAAP. In addition, the Bank has elected not to include a Statement of Cash Flows or a Statement of Comprehensive Income. The Statement of Cash Flows has not been included, as the liquidity and cash position of the Bank are not of primary concern to users of these financial statements. The Statement of Comprehensive Income, which comprises net income plus or minus certain adjustments, such as the fair value adjustment for securities, has not been included because, as stated above, the securities are recorded at amortized cost and there are no other adjustments in the determination of Comprehensive Income applicable to the Bank. Other information regarding the Bank’s activities is provided in, or may be derived from, the Statements of Condition, Income, and Changes in Capital. Therefore, a Statement of Cash Flows or a Statement of Comprehensive Income would not provide any additional useful information. There are no other significant differences between the policies outlined in the Financial Accounting Manual and GAAP.

The preparation of the financial statements in conformity with the Financial Accounting Manual requires management to make certain estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of income and expenses during the reporting period. Actual results could differ from those estimates. Unique accounts and significant accounting policies are explained below.

#### **a. Gold Certificates**

The Secretary of the Treasury is authorized to issue gold certificates to the Reserve Banks to monetize gold held by the U.S. Treasury. Payment for the gold certificates by the Reserve Banks is made by crediting equivalent amounts in dollars into the account established for the U.S. Treasury. These gold certificates held by the Reserve Banks are required to be backed by the gold of the U.S. Treasury. The U.S. Treasury may reacquire the gold certificates at any time, and the Reserve Banks must deliver them to the U.S. Treasury. At such time, the U.S. Treasury’s account is charged and the Reserve Banks’ gold certificate accounts are lowered. The value of gold for purposes of backing the gold certificates is set by law at \$42-2/9 a fine troy ounce. The Board of Governors allocates the gold certificates among Reserve Banks once a year based upon Federal Reserve notes outstanding in each District at the end of the preceding year.

#### **b. Special Drawing Rights Certificates**

Special drawing rights (“SDRs”) are issued by the International Monetary Fund (“Fund”) to its members in proportion to each member’s quota in the Fund at the time of issuance. SDRs serve as a supplement to international monetary reserves and may be transferred from one national monetary authority to another. Under the law providing for U.S. participation in the SDR system, the Secretary of the U.S. Treasury is authorized to issue SDR certificates, somewhat like gold certificates, to the Reserve Banks. At such time, equivalent amounts in dollars are credited to the account established for the U.S. Treasury, and the Reserve Banks’ SDR certificate accounts are increased. The Reserve Banks are required to purchase SDRs, at the direction of the U.S. Treasury, for the purpose of financing SDR certificate acquisitions or for financing exchange stabilization operations. The Board of Governors allocates each SDR transaction among Reserve Banks based upon Federal Reserve notes outstanding in each District at the end of the preceding year.

### c. Loans to Depository Institutions

The Depository Institutions Deregulation and Monetary Control Act of 1980 provides that all depository institutions that maintain reservable transaction accounts or nonpersonal time deposits, as defined in Regulation D issued by the Board of Governors, have borrowing privileges at the discretion of the Reserve Banks. Borrowers execute certain lending agreements and deposit sufficient collateral before credit is extended. Loans are evaluated for collectibility, and currently all are considered collectible and fully collateralized. If any loans were deemed to be uncollectible, an appropriate reserve would be established. Interest is recorded on the accrual basis and is charged at the applicable discount rate established at least every 14 days by the boards of directors of the Reserve Banks, subject to review by the Board of Governors. However, Reserve Banks retain the option to impose a surcharge above the basic rate in certain circumstances. There were no outstanding loans to depository institutions at December 31, 1998, and December 31, 1997, respectively.

### d. U.S. Government and Federal Agency Securities and Investments Denominated in Foreign Currencies

The FOMC has designated the FRBNY to execute open market transactions on its behalf and to hold the resulting securities in the portfolio known as the System Open Market Account ("SOMA"). In addition to authorizing and directing operations in the domestic securities market, the FOMC authorizes and directs the FRBNY to execute operations in foreign markets for major currencies in order to counter disorderly conditions in exchange markets or to meet other needs specified by the FOMC in carrying out the System's central bank responsibilities.

Purchases of securities under agreements to resell and matched sale–purchase transactions are accounted for as separate sale and purchase transactions. Purchases under agreements to resell are transactions in which the FRBNY purchases a security and sells it back at the rate specified at the commencement of the transaction. Matched sale–purchase transactions are transactions in which the FRBNY sells a security and buys it back at the rate specified at the commencement of the transaction.

Reserve Banks are authorized by the FOMC to lend U.S. government securities held in the SOMA to U.S. government securities dealers and to banks participating in U.S. government securities clearing arrangements, in order to facilitate the effective functioning of the domestic securities market. These securities-lending transactions are fully collateralized by other U.S. government securities. FOMC policy requires the lending Reserve Bank to take possession of collateral in amounts in excess of the market values of the securities loaned. The market values of the collateral and the securities loaned are monitored by the lending Reserve Bank on a daily basis, with additional collateral obtained as necessary. The securities loaned continue to be accounted for in the SOMA.

Foreign exchange contracts are contractual agreements between two parties to exchange specified currencies at a specified price on a specified date. Spot foreign contracts normally settle two days after the trade date, whereas the settlement date on forward contracts is negotiated between the contracting parties, but will extend beyond two days from the trade date. The FRBNY generally enters into spot contracts, with any forward contracts generally limited to the second leg of a swap/warehousing transaction.

The FRBNY, on behalf of the Reserve Banks, maintains renewable, short-term F/X swap arrangements with authorized foreign central banks. The parties agree to exchange their currencies up to a prearranged maximum amount and for an agreed-upon period of time (up to 12 months) at an agreed-upon interest rate. These arrangements give the FOMC temporary access to foreign currencies that it may need for intervention operations to support the dollar and give the partner foreign central bank temporary access to dollars it may need to support its own currency. Drawings under the F/X swap arrangements can be initiated by either the FRBNY or the partner foreign central bank, and must be agreed to by the drawee. The F/X swaps are struc-



tured so that the party initiating the transaction (the drawer) bears the exchange rate risk upon maturity. The FRBNY will generally invest the foreign currency received under an F/X swap in interest-bearing instruments.

Warehousing is an arrangement under which the FOMC agrees to exchange, at the request of the Treasury, U.S. dollars for foreign currencies held by the Treasury or ESF over a limited period of time. The purpose of the warehousing facility is to supplement the U.S. dollar resources of the Treasury and ESF for financing purchases of foreign currencies and related international operations.

In connection with its foreign currency activities, the FRBNY, on behalf of the Reserve Banks, may enter into contracts that contain varying degrees of off-balance sheet market risk, because they represent contractual commitments involving future settlement, and counterparty credit risk. The FRBNY controls credit risk by obtaining credit approvals, establishing transaction limits, and performing daily monitoring procedures.

While the application of current market prices to the securities currently held in the SOMA portfolio and investments denominated in foreign currencies may result in values substantially above or below their carrying values, these unrealized changes in value would have no direct effect on the quantity of reserves available to the banking system or on the prospects for future Reserve Bank earnings or capital. Both the domestic and foreign components of the SOMA portfolio from time to time involve transactions that can result in gains or losses when holdings are sold prior to maturity. However, decisions regarding the securities and foreign currencies transactions, including their purchase and sale, are motivated by monetary policy objectives rather than profit. Accordingly, earnings and any gains or losses resulting from the sale of such currencies and securities are incidental to the open market operations and do not motivate its activities or policy decisions.

U.S. government and federal agency securities and investments denominated in foreign currencies comprising the SOMA are recorded at cost, on a settlement-date basis, and adjusted for amortization of premiums or accretion of discounts on a straight-line basis. Interest income is accrued on a straight-line basis and is reported as "Interest on U.S. government securities" or "Interest on foreign currencies," as appropriate. Income earned on securities-lending transactions is reported as a component of "Other income." Gains and losses resulting from sales of securities are determined by specific issues based on average cost. Gains and losses on the sales of U.S. government and federal agency securities are reported as "Government securities gains, net" and "Other income" for the years ended December 31, 1998, and December 31, 1997, respectively. Foreign-currency-denominated assets are revalued monthly at current market exchange rates in order to report these assets in U.S. dollars. Realized and unrealized gains and losses on investments denominated in foreign currencies are reported as "Foreign currency gains (losses), net." Foreign currencies held through F/X swaps, when initiated by the counterparty, and warehousing arrangements are revalued monthly, with the unrealized gain or loss reported by the FRBNY as a component of "Other assets" or "Other liabilities," as appropriate.

Balances of U.S. government and federal agency securities bought outright, investments denominated in foreign currency, interest income, amortization of premiums and discounts on securities bought outright, gains and losses on sales of securities, and realized and unrealized gains and losses on investments denominated in foreign currencies, excluding those held under an F/X swap arrangement, are allocated to each Reserve Bank. Securities purchased under agreements to resell and the related premiums, discounts and income, and unrealized gains and losses on the revaluation of foreign currency holdings under F/X swaps and warehousing arrangements are allocated to the FRBNY and not to other Reserve Banks. Income from securities-lending transactions is recognized only by the lending Reserve Bank.

**e. Bank Premises and Equipment**

Bank premises and equipment are stated at cost less accumulated depreciation. Depreciation is calculated on a straight-line basis over estimated useful lives of assets ranging from 2 to 50 years. New assets, major alterations, renovations, and improvements are capitalized at cost as additions to the asset accounts. Maintenance, repairs, and minor replacements are charged to operations in the year incurred.

**f. Interdistrict Settlement Account**

At the close of business each day, all Reserve Banks and branches assemble the payments due to or from other Reserve Banks and branches as a result of transactions involving accounts residing in other Districts that occurred during the day's operations. Such transactions may include funds settlement, check clearing and automated clearinghouse ("ACH") operations, and allocations of shared expenses. The cumulative net amount due to or from other Reserve Banks is reported as the "Interdistrict settlement account."

**g. Federal Reserve Notes**

Federal Reserve notes are the circulating currency of the United States. These notes are issued through the various Federal Reserve Agents to the Reserve Banks upon deposit with such Agents of certain classes of collateral security, typically U.S. government securities. These notes are identified as issued to a specific Reserve Bank. The Federal Reserve Act provides that the collateral security tendered by the Reserve Bank to the Federal Reserve Agent must be equal to the sum of the notes applied for by such Reserve Bank. In accordance with the Federal Reserve Act, gold certificates, special drawing rights certificates, U.S. government and agency securities, loans allowed under Section 13, and investments denominated in foreign currencies are pledged as collateral for net Federal Reserve notes outstanding. The collateral value is equal to the book value of the collateral tendered, with the exception of securities, whose collateral value is equal to the par value of the securities tendered. The Board of Governors may, at any time, call upon a Reserve Bank for additional security to adequately collateralize the Federal Reserve notes. To satisfy their obligation to provide sufficient collateral for their outstanding Federal Reserve notes, the Reserve Banks have entered into an agreement that provides that certain assets of the Reserve Banks are jointly pledged as collateral for the Federal Reserve notes of all Reserve Banks. In the event that this collateral is insufficient, the Federal Reserve Act provides that Federal Reserve notes become a first and paramount lien on all the assets of the Reserve Banks. Finally, as obligations of the United States, Federal Reserve notes are backed by the full faith and credit of the U.S. government.

The "Federal Reserve notes outstanding, net" account represents Federal Reserve notes reduced by cash held in the vaults of the Bank of \$10,606 million and \$6,047 million at December 31, 1998, and December 31, 1997, respectively.

**h. Capital Paid-in**

The Federal Reserve Act requires that each member bank subscribe to the capital stock of the Reserve Bank in an amount equal to 6 percent of the capital and surplus of the member bank. As a member bank's capital and surplus change, its holdings of the Reserve Bank's stock must be adjusted. Member banks are those state-chartered banks that apply and are approved for membership in the System and all national banks. Currently, only one-half of the subscription is paid-in, and the remainder is subject to call. These shares are nonvoting, with a par value of \$100. They may not be transferred or hypothecated. By law, each member bank is entitled to receive an annual dividend of 6 percent on the paid-in capital stock. This cumulative dividend is paid semiannually. A member bank is liable for Reserve Bank liabilities up to twice the par value of stock subscribed by it.

**i. Surplus**

The Board of Governors requires Reserve Banks to maintain a surplus equal to the amount of capital paid-in as of December 31. This amount is intended to provide additional capital and reduce

the possibility that the Reserve Banks would be required to call on member banks for additional capital. Reserve Banks are required by the Board of Governors to transfer to the U.S. Treasury excess earnings, after providing for the costs of operations, payment of dividends, and reservation of an amount necessary to equate surplus with capital paid-in. Payments made after September 30, 1998, represent payment of interest on Federal Reserve notes outstanding.

The Omnibus Budget Reconciliation Act of 1993 (Public Law 103-66, Section 3002) codified the existing Board surplus policies as statutory surplus transfers, rather than as payments of interest on Federal Reserve notes, for federal government fiscal years 1998 and 1997 (which began on October 1, 1997, and October 1, 1996, respectively). In addition, the legislation directed the Reserve Banks to transfer to the U.S. Treasury additional surplus funds of \$107 million and \$106 million during fiscal years 1998 and 1997, respectively. Reserve Banks were not permitted to replenish surplus for these amounts during this time. The Reserve Banks made these transfers on October 1, 1997, and October 1, 1996, respectively. The Bank's share of the 1997 transfer is reported on the Statement of Changes in Capital as "Statutory surplus transfer to the U.S. Treasury."

In the event of losses, payments to the U.S. Treasury are suspended until such losses are recovered through subsequent earnings. Weekly payments to the U.S. Treasury vary significantly.

#### j. Cost of Unreimbursed Treasury Services

The Bank is required by the Federal Reserve Act to serve as fiscal agent and depository of the United States. By statute, the Department of the Treasury is permitted, but not required, to pay for these services. The costs of providing fiscal agency and depository services to the Treasury Department that have been billed but will not be paid are reported as the "Cost of unreimbursed Treasury services."

#### k. Taxes

The Reserve Banks are exempt from federal, state, and local taxes, except for taxes on real property, which are reported as a component of "Occupancy expense."

### 4. U.S. GOVERNMENT AND FEDERAL AGENCY SECURITIES

Securities bought outright and held under agreements to resell are held in the SOMA at the FRBNY. An undivided interest in SOMA activity, with the exception of securities held under agreements to resell and the related premiums, discounts, and income, is allocated to each Reserve Bank on a percentage basis derived from an annual settlement of interdistrict clearings. The settlement, performed in April of each year, equalizes Reserve Bank gold certificate holdings to Federal Reserve notes outstanding. The Bank's allocated share of SOMA balances was approximately 4.547 percent and 3.632 percent at December 31, 1998, and December 31, 1997, respectively.

The Bank's allocated share of securities held in the SOMA at December 31, 1998, and December 31, 1997, that were bought outright, were as follows (in millions):

	1998	1997
Par value:		
Federal agency	\$ 15	\$ 25
U.S. government		
Bills	8,856	7,159
Notes	8,543	6,326
Bonds	3,159	2,157
Total par value	\$ 20,573	\$ 15,667
Unamortized premiums	336	225
Unaccreted discounts	(145)	(131)
<b>Total allocated to Bank</b>	<b>\$ 20,764</b>	<b>\$ 15,761</b>

Total SOMA securities bought outright were \$456,667 million and \$434,001 million at December 31, 1998, and December 31, 1997, respectively.

The maturities of U.S. government and federal agency securities bought outright, which were allocated to the Bank at December 31, 1998, were as follows (in millions):

Maturities of Securities Held	Par value		
	U.S. Government Securities	Federal Agency Obligations	Total
Within 15 days	\$ 53	\$ –	\$ 53
16 days to 90 days	4,507	1	4,508
91 days to 1 year	6,531	3	6,534
Over 1 year to 5 years	4,898	3	4,901
Over 5 years to 10 years	2,038	8	2,046
Over 10 years	2,531	–	2,531
<b>Total</b>	<b>\$ 20,558</b>	<b>\$ 15</b>	<b>\$ 20,573</b>

At December 31, 1998, and December 31, 1997, matched sale–purchase transactions involving U.S. government securities with par values of \$20,927 million and \$17,027 million, respectively, were outstanding, of which \$952 million and \$618 million were allocated to the Bank. Matched sale–purchase transactions are generally overnight arrangements.

## 5. INVESTMENTS DENOMINATED IN FOREIGN CURRENCIES

The FRBNY, on behalf of the Reserve Banks, holds foreign currency deposits with foreign central banks and the Bank for International Settlements and invests in foreign government debt instruments. Foreign government debt instruments held include both securities bought outright and securities held under agreements to resell. These investments are guaranteed as to principal and interest by the foreign governments.

Each Reserve Bank is allocated a share of foreign-currency-denominated assets, the related interest income, and realized and unrealized foreign currency gains and losses, with the exception of unrealized gains and losses on F/X swaps and warehousing transactions. This allocation is based on the ratio of each Reserve Bank's capital and surplus to aggregate capital and surplus at the preceding December 31. The Bank's allocated share of investments denominated in foreign currencies was approximately 5.203 percent and 5.577 percent at December 31, 1998, and December 31, 1997, respectively.

The Bank's allocated share of investments denominated in foreign currencies, valued at current exchange rates at December 31, 1998, and December 31, 1997, were as follows (in millions):

	1998	1997
German marks:		
Foreign currency deposits	\$ 544	\$ 461
Government debt instruments including agreements to resell	123	179
Japanese yen:		
Foreign currency deposits	35	32
Government debt instruments including agreements to resell	322	274
Accrued interest	5	5
<b>Total</b>	<b>\$ 1,029</b>	<b>\$ 951</b>



Total investments denominated in foreign currencies were \$19,769 million and \$17,046 million at December 31, 1998, and December 31, 1997, respectively, which include \$15 million and \$3 million in unearned interest for 1998 and 1997, respectively, collected on certain foreign currency holdings that is allocated solely to the FRBNY.

The maturities of investments denominated in foreign currencies that were allocated to the Bank at December 31, 1998, were as follows (in millions):

Maturities of Investments Denominated in Foreign Currencies	
Within 1 year	\$ 979
Over 1 year to 5 years	26
Over 5 years to 10 years	24
Over 10 years	—
<b>Total</b>	<b>\$ 1,029</b>

At December 31, 1998, and December 31, 1997, there were no open foreign exchange contracts or outstanding F/X swaps.

At December 31, 1998, the warehousing facility was \$5,000 million, with zero outstanding.

## 6. BANK PREMISES AND EQUIPMENT

A summary of bank premises and equipment at December 31, 1998, and December 31, 1997, is as follows (in millions):

	1998	1997
Bank premises and equipment:		
Land	\$ 32	\$ 31
Buildings	115	115
Building machinery and equipment	24	24
Construction in progress	2	1
Furniture and equipment	77	77
	250	248
Accumulated depreciation	(68)	(63)
<b>Bank premises and equipment, net</b>	<b>\$ 182</b>	<b>\$ 185</b>

Depreciation expense was \$11 million for both the years ended December 31, 1998, and December 31, 1997, respectively.

The Bank leases unused space to outside tenants. These leases expired in 1998. Rental income from such leases was \$30,000 and \$49,000 for the years ended December 31, 1998, and December 31, 1997, respectively.

## 7. COMMITMENTS AND CONTINGENCIES

At December 31, 1998, the Bank was obligated under noncancelable leases for premises and equipment with terms ranging from one to approximately five years. These leases provide for increased rentals based upon increases in real estate taxes, operating costs, or selected price indices.

Rental expense under operating leases for certain operating facilities, warehouses, and data processing and office equipment (including taxes, insurance and maintenance when included in rent), net of sublease rentals, was \$399,000 and \$382,000 for the years ended December 31, 1998, and December 31, 1997, respectively. Certain of the Bank's leases have options to renew.

Future minimum rental payments under noncancelable operating leases, net of sublease rentals, with terms of one year or more, at December 31, 1998, were as follows (in thousands):

1999	\$	363
2000		342
2001		333
2002		333
2003		55
<b>Total</b>	<b>\$</b>	<b>1,426</b>

There were no capital leases at December 31, 1998.

There were no other commitments and long-term obligations in excess of one year at December 31, 1998.

Under the Insurance Agreement of the Federal Reserve Banks dated June 7, 1994, each of the Reserve Banks has agreed to bear, on a per-incident basis, a pro rata share of losses in excess of 1 percent of the capital of the claiming Reserve Bank, up to 50 percent of the total capital and surplus of all Reserve Banks. Losses are borne in the ratio that a Reserve Bank's capital bears to the total capital of all Reserve Banks at the beginning of the calendar year in which the loss is shared. No claims were outstanding under such agreement at December 31, 1998, or December 31, 1997.

The Bank is involved in certain legal actions and claims arising in the ordinary course of business. Although it is difficult to predict the ultimate outcome of these actions, in management's opinion, based on discussions with counsel, the aforementioned litigation and claims will be resolved without material adverse effect on the financial position or results of operations of the Bank.

## 8. RETIREMENT AND THRIFT PLANS

### Retirement Plans

The Bank currently offers two defined benefit retirement plans to its employees, based on length of service and level of compensation. Substantially all of the Bank's employees participate in the Retirement Plan for Employees of the Federal Reserve System ("System Plan") and the Benefit Equalization Retirement Plan ("BEP"). The System Plan is a multi-employer plan with contributions fully funded by participating employers. No separate accounting is maintained of assets contributed by the participating employers. The Bank's projected benefit obligation and net pension costs for the BEP at December 31, 1998, and December 31, 1997, and for the years then ended, are not material.

### Thrift Plan

Employees of the Bank may also participate in the defined contribution Thrift Plan for Employees of the Federal Reserve System ("Thrift Plan"). The Bank's Thrift Plan contributions totaled \$3 million and \$2 million for the years ended December 31, 1998, and December 31, 1997, respectively, and are reported as a component of "Salaries and other benefits."

## 9. POSTRETIREMENT BENEFITS OTHER THAN PENSIONS AND POSTEMPLOYMENT BENEFITS

### Postretirement Benefits Other Than Pensions

In addition to the Bank's retirement plans, employees who have met certain age and length-of-service requirements are eligible for both medical benefits and life insurance coverage during retirement.

The Bank funds benefits payable under the medical and life insurance plans as due and, accordingly, there are no plan assets. Net postretirement benefit cost is actuarially determined, using a January 1 measurement date.

Following is a reconciliation of beginning and ending balances of the benefit obligations as of December 31, 1998, and December 31, 1997 (in millions):

	1998	1997
Accumulated postretirement benefit obligation at January 1	\$ 40.2	\$ 38.7
Service cost—benefits earned during the period	1.4	1.4
Interest cost of accumulated benefit obligation	2.7	2.7
Actuarial loss (gain)	2.9	(1.5)
Contributions by plan participants	0.3	0.3
Benefits paid	(1.2)	(1.4)
Plan amendments, acquisitions, foreign currency exchange rate changes, business combinations, divestitures, curtailments, settlements, special termination benefits	(9.6)	—
<b>Accumulated postretirement benefit obligation at December 31</b>	<b>\$ 36.7</b>	<b>\$ 40.2</b>

Following is a reconciliation of the beginning and ending balance of the plan assets, the unfunded postretirement benefit obligation, and the accrued postretirement benefit cost as of December 31, 1998, and December 31, 1997 (in millions):

	1998	1997
Fair value of plan assets at January 1	\$ —	\$ —
Actual return on plan assets	—	—
Contributions by the employer	0.9	1.1
Contributions by plan participants	0.3	0.3
Benefits paid	(1.2)	(1.4)
<b>Fair value of plan assets at December 31</b>	<b>\$ —</b>	<b>\$ —</b>
Unfunded postretirement benefit obligation	\$ 36.7	\$ 40.2
Unrecognized initial net transition asset (obligation)	—	—
Unrecognized prior service cost	16.4	7.4
Unrecognized net actuarial (loss)	(9.9)	(7.2)
<b>Accrued postretirement benefit cost</b>	<b>\$ 43.2</b>	<b>\$ 40.4</b>

Accrued postretirement benefit cost is reported as a component of "Accrued benefit cost."

The weighted-average assumption used in developing the postretirement benefit obligation as of December 31, 1998, and December 31, 1997, is as follows:

	1998	1997
Discount rate	6.25%	7.00%

For measurement purposes, an 8.5 percent annual rate of increase in the cost of covered health care benefits was assumed for 1999. Ultimately, the health care cost trend rate is expected to decrease gradually to 4.75 percent by 2006, and remain at that level thereafter.

Assumed health care cost trend rates have a significant effect on the amounts reported for health care plans. A 1 percentage point change in assumed health care cost trend rates would have the following effects for the year ended December 31, 1998 (in millions):

	1 Percentage Point Increase	1 Percentage Point Decrease
Effect on aggregate of service and interest cost components of net periodic postretirement benefit cost	\$ 1.0	\$ (0.8)
Effect on accumulated postretirement benefit obligation	7.5	(6.9)

The following is a summary of the components of net periodic postretirement benefit cost for the years ended December 31, 1998, and December 31, 1997 (in millions):

	1998	1997
Service cost—benefits earned during the period	\$ 1.4	\$ 1.3
Interest cost of accumulated benefit obligation	2.7	2.7
Amortization of prior service cost	(0.5)	(0.5)
Recognized net actuarial loss	0.1	0.2
<b>Net periodic postretirement benefit cost</b>	<b>\$ 3.7</b>	<b>\$ 3.7</b>

Net periodic postretirement benefit cost is reported as a component of "Salaries and other benefits."

### Postemployment Benefits

The Bank offers benefits to former or inactive employees. Postemployment benefit costs are actuarially determined and include the cost of medical and dental insurance, survivor income, and disability benefits. Costs were projected using the same discount rate and health care trend rates as were used for projecting postretirement costs. The accrued postemployment benefit costs recognized by the Bank at December 31, 1998, and December 31, 1997, were \$6 million and \$5 million, respectively. This cost is included as a component of "Accrued benefit cost." Net periodic postemployment benefit costs included in 1998 and 1997 operating expenses were \$1 million each year.



**VOLUME OF OPERATIONS  
(UNAUDITED)**

	Number of Items Handled (Thousands)		Dollar Amount (Millions)	
	1998	1997	1998	1997
<b>SERVICES TO DEPOSITORY INSTITUTIONS</b>				
<b>CASH SERVICES</b>				
Currency received from circulation	1,789,661	1,582,135	27,779	24,582
Coin received from circulation	1,512,784	827,340	139	112
<b>CHECK PROCESSING</b>				
Commercial—processed	1,204,449	1,121,958	705,416	651,531
Commercial—fine sorted	193,347	240,946	72,545	88,709
U.S. government checks	26,236	26,736	24,893	26,636
<b>ELECTRONIC PAYMENTS</b>				
Automated Clearinghouse items originated	210,360	187,438	639,038	586,317
Funds transfers processed	11,686	8,811	16,097,218	13,207,835
Book-entry security transfers processed	155	291	2,452,537	3,437,462
<b>LOANS</b>				
Advances made	59*	158*	327	176
<b>SERVICES TO THE U.S. TREASURY AND GOVERNMENT AGENCIES</b>				
Issues and reinvestments of Treasury securities	14	20	892	932
Food coupons destroyed	739	787	3	4

\*Individual loans, not in thousands.



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## About the Dallas Fed

The Federal Reserve Bank of Dallas is one of 12 regional Federal Reserve Banks in the United States. Together with the Board of Governors in Washington, D.C., these organizations form the Federal Reserve System and function as the nation's central bank. The System's basic purpose is to provide a flow of money and credit that will foster orderly economic growth and a stable dollar. In addition, Federal Reserve Banks supervise banks and bank holding companies and provide certain financial services to the banking industry, the federal government and the public.

The Federal Reserve Bank of Dallas has served the financial institutions in the Eleventh District since 1914. The District encompasses 350,000 square miles and comprises the state of Texas, northern Louisiana and southern New Mexico. The three branch offices of the Federal Reserve Bank of Dallas are in El Paso, Houston and San Antonio.

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