Address: Job Insecurity and Technology

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I regret that I was unable to join you for the earlier portions of this conference. I know that you have had some important explorations of the process through which technology contributes to economic growth. What I would like to do in this session is perhaps augment these discussions by shifting gears a bit. I would like to focus on the question of how people *perceive* the benefits of recent technological change.

Today a truly puzzling phenomenon confronts the American economy: I refer to the pervasiveness of job insecurity in the context of an economic recovery that has been running for more than five years, inflation that has been contained, and a layoff rate that is historically quite low. Yet, in the face of all this seemingly good news, a sense persists that something is fundamentally wrong. This afternoon I want to try to explain where I believe the insecurity is coming from and, I hope, raise some suggestions as to how it might be assuaged.

The issue, as best I can judge, appears to be rooted in one of those rare, perhaps once-in-a-century events—a structural technological advance. The advent of the transistor and the integrated circuit and, as a consequence, the emergence of modern computer, telecommunication, and satellite technologies have fundamentally changed the structure of the American economy. Since the beginning of the Industrial Revolution, our economy and, to only a slightly lesser degree, the economies of our industrial trading partners have been progressing toward a regime in which abstract ideas and concepts are the dominant element in the creation of economic value. A hundred years ago, physical brawn was critical to value-added determination. People who personally could lift

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rolled sheet steel and help haul it from one part of the plant to another performed an activity that was valuable in the marketplace. Today, several generations later, the structure of production has become, to a remarkable degree, idea-determined.

On the output side, at the turn of the twentieth century, we produced steel, industrial chemicals, and heavy fabrics in abundance; what impressed was the very size and bulk of the productive facilities and the output itself. Today, the products that we find remarkable are those that are lighter, smaller, and in some cases, almost invisible. Our radios used to be activated by large vacuum tubes; today we have pocket-sized transistors to perform the same function. Thin fiber optic cables have replaced huge tonnages of copper wire. In the past, buildings were so over-structured and sturdy that, when their time for replacement arrived, demolition was a Herculean task. Owing to conceptual advances in metallurgy, engineering, and architectural design, we now can enclose as much or more space with fewer materials.

Indeed, such advances have created an overall national output whose physical weight probably is only modestly greater than that of whatever we produced a hundred years ago. Real GDP, that is, price-adjusted value added, of course is much higher today; and by far, ideas account for the difference. That trend will doubtless continue because idea creation is irreversible. Knowledge, once acquired, does not disappear.

If anything, this process has accelerated in recent years, and that acceleration seems to have had two important side effects. First, it has had a major influence on the distribution of income in this country; and second, a related but different concept, it has imparted a degree of insecurity, uncertainty, and even fear to a vast segment of jobholders. The consequence of both effects, as I will explain shortly, has been to create a sense that something in the economy is awry, which is wholly at odds with what the macroeconomic data seemingly imply—economic success, tranquility, and progress.

The roots of this puzzling situation go back a few decades. As ideas became especially valuable relative to physical activity in the creation of value added, education and intellectual skill became increasingly major determinants of income. Throughout the 1960s and 1970s, the rapid rise in the number of college graduates apparently kept the supply of educated workers moving up with the demand. However, by the latter 1970s and into the 1980s, demand seemed to have outstripped supply; the apparent consequence was a fairly pronounced rise in compensation going to college graduates relative to the compensation going to those who had only high school diplomas. A similar disparity of earnings developed between those who had graduated from high school and those who had dropped out.

After the mid 1970s, productivity slowed quite markedly, for reasons

that are not wholly apparent, and so did average real incomes. As a consequence, the widening disparity also means that a not insignificant portion of our work force—primarily those whose work involves less conceptual activities—has been experiencing either stagnant or falling real incomes in the past 10 or 15 years. A substantial number of these people understandably feel that they have been on a treadmill and are barely able to make ends meet from their incomes. That feeling has engendered significant concerns about economic and financial well-being among this part of our work force.

I suspect that other concerns affect an even larger group—composed of those who have average-or-above incomes and have been employed in their current jobs for a number of years. These are the people with higher skills, who interact closely day by day with the high-tech part of our capital stock. Because that stock, reflecting computer and telecommunications-based technologies, is turning over very rapidly, the involved workers have a high degree of uncertainty and insecurity about their jobs. As one affected employee commented to a *Wall Street Journal* reporter a couple of weeks ago, "Is . . . somebody getting ready to change my whole life for me?"[1] These workers perceive the job skills that they have acquired through high school or college to be increasingly open to competitive challenge. One must wonder how highly skilled, turn-of-the-century telegraphers felt with the onset of the telephone or the skilled buggy-whip craftsman with the advent of the automobile. Today, large numbers of people have become so demonstrably insecure about whether their skills will still be relevant in, say, five years that they fear for their jobs.

This insecurity is evidenced by the fact that they have increasingly forgone wage hikes for job security. As a consequence, the past few years have been a period of extraordinary labor peace. In fact, 1995 had the lowest strike record for a half-century. Moreover, labor contracts, which historically almost never extended beyond 36 months, are now sometimes going out five and six years as people try to lock in job security, often willing to forgo significant wage increases in the process.

This sense of job insecurity is so deep that many workers are truly scared. Some fear that their skills will no longer be appropriate for the future. Some fear their ability to make ends meet in the future. Many appear truly concerned about a prospective decline in their standard of living.

This development is startling considering the overall state of the economy suggested by the macroeconomic data. It is certainly the case that growth in average real income has slowed and that the disparity in real incomes has widened. After reaching a postwar low in the late 1960s,

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[1] *Wall Street Journal*, May 16, 1996, page A:16.

income disparities, as measured by Gini coefficients, climbed steadily through 1994—the most recent year for which data are available. Moreover, disparities in the distribution of wealth (net wealth) as measured by the Federal Reserve's Survey of Consumer Finances also widened significantly between the surveys taken in 1963 and 1992, with much of that increase in Gini coefficients occurring during the 1980s. Doubtless, that disparity has widened further in recent years in the wake of major increases in stock and bond prices. But the notion that the economic well-being of the lower-income segments of our work force has deteriorated as much as might be suggested by the widening disparities in the income and wealth statistics is open to question.

I say this because there is a surprising difference between trends in the dispersion of holdings of *claims* to goods and services (that is, income and wealth) and trends in the dispersion of actual consumption, which is, of course, the ultimate determinant of material or economic well-being. Put another way, well-being is determined by things people consume, either directly from their incomes and accumulated savings or indirectly from the stock of household goods they already own—automobiles, telephones, TVS, VCRs, and so forth, not to mention the homes themselves. And disparities in consumption and ownership of hard goods do not appear to have widened nearly as much as income disparities.

I do not wish to disparage income as a partial antidote to insecurity. Nevertheless, some aspects of economic well-being may be more accurately discerned by examining consumption.

A number of researchers have compared trends in the distribution of consumption with the distribution of income. Many of these studies rely on data from the Consumer Expenditure Survey that the Bureau of Labor Statistics conducts, and much of the analytical research on distributional issues has been carried out by BLS economists. A recent study by David Johnson and Stephanie Shipp of the BLS finds that "income inequality is more volatile than consumption and the level is about 30 percent more than that of consumption inequality."[2]

These findings are not surprising. As is well known, consumers tend to maintain their levels of consumption in the face of temporary changes in income. Variations in asset holdings and debt buffer changes in income. In short, consumption patterns tend to look more like patterns in income that has been averaged over several years, rather than the one-year convention of our statistics.

But, besides finding differences in the levels of consumption and income inequality, Johnson and Shipp find differences in the inequality

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[2] David Johnson and Stephanie Shipp, "Changing Inequality in the U.S. from 1980–1994: A Consumption Viewpoint," manuscript, U.S. Bureau of Labor Statistics, January 1996, and U.S. Department of Labor, *Report on the American Workforce*, 1995.

Table 1
Gini Coefficients for Consumption and Income[a]

Year	Consumption	Income
1980	.291	.365
1981	.286	.369
1982	.299	.380
1983	.298	.382
1984	.307	.383
1985	.315	.389
1986	.326	.392
1987	.322	.393
1988	.320	.395
1989	.325	.401
1990	.325	.396
1991	.321	.397
1992	.331	.403
1993	.321	.429
1994	.317	.426

[a] Based on annual average data.

Source: Consumption data are from the *Consumer Expenditure Survey*, U.S. Bureau of Labor Statistics. Income data are from the U.S. Bureau of the Census.

trends. In particular, although consumption inequality has increased, on average, since 1981, the rise has been only three-fourths as large as that of income inequality (Table 1).

An evaluation that views consumption not in terms of outlays but, rather, in terms of the flow of services that comes from purchases, indicates an additional qualification. The reason, of course, for examining the flow of services from spending, and not just current-period spending alone, is that while outlays for food and haircuts, for example, are consumed immediately, a television set that is purchased today provides entertainment over its entire service life. Thus, unless ownership of household appliances and other consumer durables is brought into the evaluation, the story of the dispersion of material well-being is incomplete.

What do the numbers show? During the 1960s and 1970s, the real net stock of consumer durables per household increased an average of 3.1 percent per year. The average growth rate has slowed slightly since then—to a pace of 2.5 percent—but all of that slowing occurred during the recessions of 1980 and 1981–82. Indeed, since 1982 households have been adding to their stock of durables at an annual rate per household of 3.3 percent—slightly faster than in the 1960s and 1970s.[3]

[3] The growth rate of the net stock of owner-occupied housing (measured in 1992 dollars) per household was 2.3 percent annually from 1959 to 1979; 1.3 percent from 1979 to 1994; and 1.8 percent from 1982 to 1994.

Table 2
"Gini Coefficients" for Ownership Rates of Selected Consumer Durables
By income decile

	1980	1994
Microwave ovens	.28	.08
Dishwashers	.29	.22
Clothes dryers	.17	.12
Garbage disposals	.26	.19
Motor vehicles	.09	.07
Freezers	.06	.07
Clothes washers	.08	.09
Refrigerators	.01	.01
Stoves	.01	.01

Source: Based on tabulations from the *Consumer Expenditure Survey*, U.S. Bureau of Labor Statistics. See the technical note for a discussion of the method used to calculate the "Gini coefficients."

Moreover, we have apparently not had a widening disparity in holdings of hard assets like the one that appears in the income and wealth data. Stephanie Shipp and her colleagues in the Division of Consumer Expenditure Surveys at the BLS generously provided the Board's staff with detailed tabulations of the ownership of consumer goods and vehicles by income decile. To be sure, these data show that ownership rates for consumer durables clearly rise with income. But the data also show that for motor vehicles and a number of appliances—for example, dishwashers, clothes dryers, microwave ovens, and even garbage disposals—the distribution of ownership rates by income decile moved toward greater *equality* between 1980 and 1994 (Table 2).[4]

For some consumer goods we are moving toward greater equality because the proportion of households with access to these items is moving close to saturation. For example, nearly all poor families have access to a refrigerator, stove, and color TV. In addition, three-fourths of poor households have telephones, and nearly two-thirds have microwave ovens and VCRs.[5]

These encouraging findings are not without qualification, however. As an example, for personal computers, which nowadays are critical for economic success, the disparity in ownership rates is quite large—around 10 percent for lower-income households in 1994 compared with more than 50 percent for the highest-income decile. And, even when most families own a durable good or vehicle, the number owned by the low-

[4] The calculation of the measure of distributional inequality used to support this statement is described in the attached technical note.

[5] Some of these data are taken from Kathleen Short and Martina Shea, "Beyond Poverty, Extended Measures of Well-Being: 1992," U.S. Bureau of the Census, *Current Population Reports*, P70-50RV, November 1995.

Table 3
"Gini Coefficients" for Number of Units Owned Per Household of Selected Consumer Durables
By income decile

	1984	1994
Microwave ovens	.24	.08
Dishwashers	.27	.21
Clothes dryers	.15	.12
Garbage disposals	.23	.19
Motor vehicles	.14	.13
Freezers	.06	.07
Clothes washers	.08	.09
Refrigerators	.03	.02
Stoves	.03	.02

Source: Based on tabulations from the *Consumer Expenditure Survey*, U.S. Bureau of Labor Statistics. See the technical note for a discussion of the method used to calculate the "Gini coefficients."

income group typically is less than that owned by the upper-income groups. For example, in 1994 lower-income families owned slightly more than one color television set, on average, whereas high-income families tended to own more than two. The figures for motor vehicles are similar—slightly under one per household at the lower end of the income distribution and slightly more than two at the upper end. Nonetheless, even though the inequality in the number of units owned per household is often greater than that in the ownership rate, the degree of inequality measured on this basis narrowed between 1984 and 1994 in a manner similar to the shifts for ownership rates (compare Tables 2 and 3).[6]

But, even if the number of hard assets per family were the same for rich and poor, it is not evident how much this would assuage the current deep-seated sense of insecurity that pervades such a large segment of our work force. Clearly, there is more to economic security than owning consumer durables. In fact, the very forces that load our households with every sort of gadget come from an economy that apparently is changing too quickly for many Americans to absorb readily. Accelerated change fosters fear in all walks of life. It is a rational human response to such an imperative.

Finding a solution to such insecurity is not simple. If job insecurity is largely a fear of skill obsolescence, real or imagined, some way must be found to enhance skills. People who believe that their skills are up-to-date and readily marketable do not inordinately fear job layoffs.

Bolstered by signals from the marketplace, education clearly is

[6] Collection of data in the Consumer Expenditure Survey on the average number of units owned per household did not begin until 1984.

increasingly becoming a lifetime activity. Resting on one's skills as the world rapidly goes by will only intensify a sense of job insecurity. Ongoing schooling and training are becoming ever more relevant for the average worker.

Fortunately, developing human capital is rapidly being perceived by many corporations as adding to shareholder value. If ideas are increasingly the factor that engenders value added, then training and education are crucial to the expansion of company value added and profitability.

As a consequence, corporate universities are emerging as a growth industry in this country. A significant and expanding number of companies require that employees attend class, say, twice a week, at company expense, to augment their on-the-job techniques. Moreover, there is a growing peripheral industry whose basic product is the training of company employees in the latest technologies. Such trends should decidedly be encouraged. Hopefully, in that environment, efforts to increase the competitive skills of workers in the lower half of the income distribution will succeed in narrowing income disparities.

At this point it is unclear whether the particular current surge of technology is peaking and will eventually slow down or whether we are in its early stages. Much of this surge may well represent more wheel-spinning than real increases in production, as our subdued national productivity data suggest. Nathan Rosenberg in his paper for this conference points out that organizational changes and further development of complementary technologies likely will be required before we see the productivity payoff to computer technology. If so, as the infrastructure of the economy finally adjusts itself to the new semiconductor-based revolution, the rapid changes are likely to finally become more evident in increased measured productivity and growth.

In any event, a new world is emerging. The twenty-first century will be different—much more rapidly paced and changing than any of us who have been around for a while have experienced in our lifetimes. There will be a different America out there. Fortunately, job insecurity does not appear to be a problem for a 21-year-old who has experienced nothing else, and even less for a six-year-old who seems to be far more computer literate than grandfather.

As a consequence, with the inexorable turnover of the population, people will adjust. When we go through a period of transition, inevitable symptoms of friction, uncertainty, and fear arise. They will pass.

TECHNICAL NOTE

The raw data on the ownership rates of consumer durables by income decile are not in a form that can be used directly to calculate standard measures of inequality (for example, Gini coefficients or mean log deviations). However, William Cleveland of the Board's staff suggested a transformation of the raw data that allows one to calculate a measure of inequality that looks like a Gini coefficient. This note describes the procedure.

The first step is to transform the raw data into a discrete probability distribution. In the case of ownership rates for consumer durables, the calculation for a given consumer good is:

$$p_i = r_i / \sum_{i=1}^{10} r_i \qquad (1)$$

where p_i is the fraction of all households that own the consumer good who are in income decile i, and r_i is the actual ownership rate for the i^{th} decile. By construction, the sum of the p_i's is equal to one. For goods that have ownership rates that are relatively equal across deciles (regardless of the level of the ownership rate), these probability distributions are fairly flat, with values of P_i close to 0.1. For goods that are more concentrated among the affluent households, the probability distributions tend to rise across income deciles.

The next step is to take the probability distributions and create cumulative probability distributions (CPD) (for example, the value of the CPD for the second decile equals $P_1 + P_2$). The CPDs look like Lorenz curves. The standard formula for the Gini coefficient is then used to construct a measure of the degree of inequality implied by the CPDs.[7] These are shown in Table 2.

The calculation of "Gini coefficients" for the average number of units owned per household in each income decile (u_i) is the same, except u_i is substituted for r_i in equation (1). These "Gini coefficients" are shown in Table 3.

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[7] The "Gini coefficient" is defined as one minus twice the area under the CPD. Although this statistic looks like a Gini coefficient, it does not have all the properties of a true Gini coefficient. For example, a true Gini coefficient must fall between zero and one; but the "Gini coefficient" calculated here could have turned out to be negative if, say, poor people had owned more microwave ovens than rich people.