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Remarks by

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Chairman

Board of Governors of the Federal Reserve System

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It is a pleasure to be with you this evening, and accept your honorary award.

The Conference Board has been an important institution in my life. It was where I started as an economist. It was where I came into contact with a business world I had never known before. The year was 1948, and I brought my newly minted degree to what was then called the National Industrial Conference Board, to work with my old professor, then chief economist at the Conference Board, Martin Gainsbrugh. Although I had other offers of employment at higher pay, it was an easy call to come work at a research operation with, perhaps, one of the best business-oriented libraries in the country. Much of my professional development, I trace back to those early days rummaging through a remarkable array of documents, books, statistics--all available at a young economist's fingertips. What I learned during my five years at the Board proved invaluable in later life. Accordingly, I am most grateful and privileged to be here to celebrate with you on your eightieth anniversary.

The world of 1948 was vastly different from the world of 1996. The American economy, more then than now, was viewed as the ultimate in technology and productivity in virtually all fields of economic endeavor. The quintessential model of industrial might in those days was the array of vast, smoke-encased integrated steel mills in the Pittsburgh district and on

the shores of Lake Michigan. Output was things, big physical things.

Virtually unimaginable a half century ago was the extent to which concepts and ideas would substitute for physical resources and human brawn in the production of goods and services. In 1948 radios were still being powered by vacuum tubes. Today, transistors deliver far higher quality with a mere fraction of the bulk. Fiber-optics has replaced huge tonnages of copper wire, and advances in architectural and engineering design have made possible the construction of buildings with much greater floor space but significantly less physical material than the buildings erected just after World War II. Accordingly, while the weight of current economic output is probably only modestly higher than it was a half century ago, value added, adjusted for price change, has risen well over threefold.

The displacement of human physical effort by ideas is, of course, also evident in changed production processes. Word processors have markedly reduced the effort required to produce a manuscript. Turn-of-the-century steel mills, and even those operating in 1948, valued the physical brawn that could move coiled sheets from one segment of a plant to another. Today, we perform these tasks with devices whose mechanical leverage is designed and guided by the insights coded into a computer program.

Radical transformations in what we produce in the way of goods and services and how we produce them occur perhaps once or

twice in a century, at most. After the Civil War, the rapid spread of railroads and the transcontinental development of the telegraph opened up national markets where virtually none existed earlier. Large national companies emerged to do business from coast to coast and increasingly abroad. Productivity accelerated. At the turn of the century, electric power began its major expansion, revolutionizing the means of production in a manner that eventually created significant productivity advances.

Yet, with all the extraordinary technological advances of the past couple of decades, why have our recent productivity data failed to register any improvement? That there has been an acceleration of overall technological change is scarcely in doubt. Indeed, to a significant segment of our work force it has contributed to a heightened fear of job skill obsolescence, and a resultant sense of job insecurity. Is it possible that that much of the frenetic activity is mere wheel spinning and, as a consequence, very little real value added is being produced--or maybe ever will be?

I suspect this view is mistaken, for two reasons. First, insofar as recent productivity growth is concerned, I have a serious question about the quality of the data that we employ to measure output in today's economy. I shall come back to that issue shortly. Second, like the major technological advances of earlier periods, it will take time for our newest innovations to work their way into the nation's infrastructure in a productive manner.

Motor vehicle transportation, for example, did not become a major productive force in the industrial world until highways and service stations permitted their capabilities to be activated. Similarly, as Professor Paul David of Stanford and others have observed in an interesting line of research, it took a generation for electric motors to replace the steam engine to a point where aggregate productivity was measurably accelerated in the manufacturing area. To capitalize on gravity and function most effectively, steam engines, and their vertically rotating belts, were installed in factories that tended to be tall and narrow. When electric motors were substituted for steam engines in these buildings, their superior capabilities were significantly constrained by an older infrastructure. It was only when plants were built horizontally that the electric motor came into its own and became a major factor in the advance of manufacturing productivity.

Professor David suspects, with many good reasons, that the ability of computer-based technologies to become fully reflected in our overall national productivity is being delayed, as the infrastructure gradually, but progressively, adjusts to new modes of production. With the ongoing turnover of the capital stock, computer-related synergies will, presumably, substantially raise real value added per hour in the years ahead.

One of the crucial ways in which computerization is already elevating living standards is by facilitating increasing customization to meet particular consumer needs. The ability to

pick and choose among a widening variety of products clearly enhances the well-being and satisfaction of consumers. In the 1920s, as legend has it, Henry Ford learned that a market limited to only black sedans was soon threatened by early customization. Color choices of other automakers helped undercut Ford's market.

While there can be little doubt that major gains are being made in today's market in the quality, choice, and availability of goods and services for American consumers, it is also clear that we measure these trends rather poorly. To measure productivity and standards of living we need measures of output but, to measure output, we need to be able to define products clearly and in terms of units that do not change from one period to the next.

These conditions hold, more or less, for electrolytic copper, for cold rolled carbon steel, and for certain types of coal. In these cases we can define reasonably well the unit of output and, accordingly, can know the price per unit.

But what is the unit of software? What is its price per unit and how does that price move from one period to the next? Also, we know that we are expending an increasing proportion of our gross domestic product denominated in current dollars on medical services. But what is the physical equivalent unit of output of medical care? What is the true price trend for the removal of cataracts, when the technology and the nature of the whole procedure is so dramatically different from what it was, say, forty or even twenty years ago? How does one price

procedures when there has been a shift toward less invasive arthroscopic surgery? How does one evaluate the changed aftermath of such procedures on the day-by-day lives of patients?

We do our best to construct overall price indexes. They may have served our purposes well in 1948, when industrial product was the centerpiece of the economy and certainly at the time of the founding of the Conference Board in 1916. But what do they tell us today? Indeed, how will we measure inflation, and the associated financial market implications, in the twenty-first century when our data--using current techniques--could become increasingly less adequate to trace price trends over time?

But so long as individuals make future contractual arrangements valued in dollars, there must be a presumption on the part of those involved in the transaction about the future purchasing power of money. No matter how complex individual products become, there will always be some general sense of the purchasing power of money both across time and across goods and services. Hence, we must assume that embodied in all products is some unit of output and hence of price that is recognizable to producers and consumers and upon which they will base their decisions. Doubtless, we will develop new techniques of price measurement to unearth them as the years go on. I recognize that we are dealing with issues that have difficult metaphysical dimensions--deciding what actually constitutes the definable "physical" or "real" unit of a given good. Recognizing that philosophers have been addressing related questions for over two

thousand years, perhaps we should not be too optimistic about reaching quick, definitive answers in all cases. But I trust that you will agree that we should encourage a good deal more research on the issue than it has received in recent years.

Other challenges at least as great as complications of price measurement will surely confront us as we advance into, and through, the twenty-first century. But forecasting the future and its challenges is forecasting technology and, as another Stanford professor, Nathan Rosenberg, has documented so well, technology projections are a precarious activity. History is strewn with the most erudite scientists of earlier ages proffering forecasts of technological developments, which, in retrospect, seem incomprehensible in their degree of inaccuracy.

But as Rosenberg points out, the evolution of even mature technologies is uncertain because most advances reflect the synergy of two or more innovations that are often chance outcomes, rendering the direction of change exceptionally difficult to predict.

While the future, as always, is fog-bound, with the inexorable turn of the calendar, the twenty-first century will nonetheless arrive. And one thing we can be sure of: it will be full of technological surprises.

When I first joined the National Industrial Conference Board, nearly a half century ago, a world of satellites, microchips, and laser technology was wholly unimaginable. To my great grandfather, the notion of radio, not to mention

television, was far beyond the possible. What new world lies in wait for the newly minted college graduate of 1996? He, or she, is surely in for a surprise--indeed, our recent graduates probably will create many of them.