

Is This Time Different? The Opportunities and Challenges of Artificial Intelligence

Jason Furman

Chairman, Council of Economic Advisers



**The National Academies of Sciences, Engineering, and Medicine
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The Recent Concern Over Robots Taking Our Jobs



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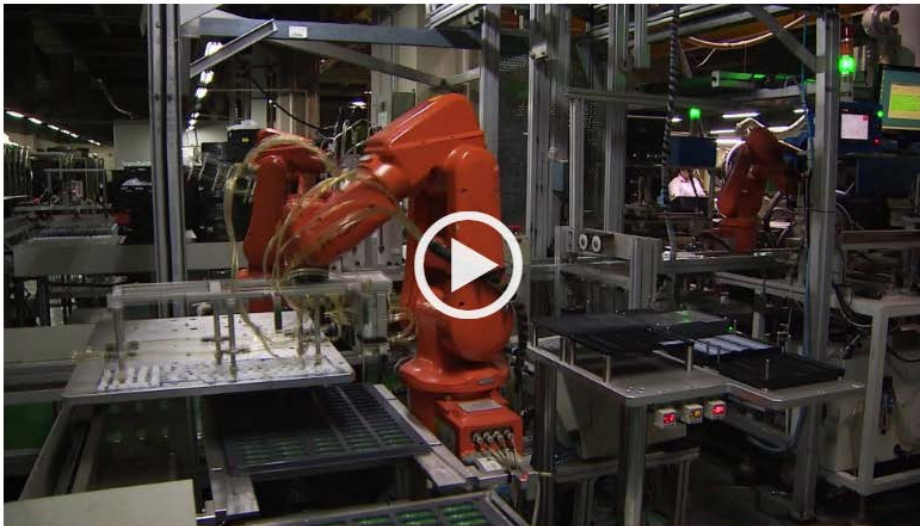


Internet of Things

Smart robots could soon steal your job

by Ivana Kottasova @ivanakottasova

🕒 January 15, 2016: 1:33 PM ET



Robots are taking over China's factory floors

Think you are too smart to be replaced by a robot in your job?
Think again.

Social Surge - What's Trending



JCPenney, Kohl's, Macy's and Sears sued over misleading prices



Your data is not safe. Here's how to lock it down



Ikea renames products after your secret anxieties

Mortgage & Savings

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Mortgage

Personal Loans

Credit Cards

Loan Type	Rate	APR
30-yr fixed	3.63%	3.63%
15-yr fixed	2.88%	2.88%
5/1 ARM	2.63%	3.45%

CNN Money, January 2016

People Were Also Worried in 1980

DETROIT — Technological innovation is widely billed as a miracle cure for the United States' economic doldrums. Its aftereffects, however, may be far from benign. The introduction of revolutionary new technologies such as robots — versatile computer-controlled mechanical arms — raise two painful possibilities: sizeable losses of jobs and a deteriorated quality of working life.

The threat of lost jobs, although also dependent on social and economic factors, is especially critical. Auto makers are already buying robots in record numbers, despite a downturn that has resulted in 250,000 indefinite layoffs. Even the faltering Chrysler Corporation has added 128 of these new "recruits" to its work force for the 1981-model year.

But the robot is only one part of a larger computerization that is affecting virtually every productive activity in society from the office to the machine shop. In fact, many white-collar occupations that promised jobs to displaced blue-collar workers in the past are themselves being automated.

In the case of robots, relatively conservative estimates predict that sales in this country will grow at a compound rate of 25 percent a year for the next decade, culminating in annual sales of \$800 million and production of 17,000 robots a year by 1990. While this hardly seems threatening to a manufacturing work force of 20 million people, robots are only one of the labor-displacing technologies being introduced. Moreover, the employment effects are cumulative and have a dis-

A Robot Is After Your Job

By Harley Shaiken

proportionate impact on a few key industries. Robots that begin work tomorrow will still be on the job in 1990, giving us a robot population of about 80,000. If 40 percent wind up in the auto industry (compared to 55 percent worldwide today), 32,000 robots could displace more than 100,000 auto workers. In fact, the potential loss of jobs is more serious than these figures indicate. New breakthroughs in robot technology such as "sight" and "feel" mean that each robot could displace far more workers in a decade. In addition, some industry observers feel that companies that sell computers may enter the market, resulting in a robot-population explosion in the hundreds of thousands, not tens of thousands.

The quality of working life will also change. While the first generation of robots primarily did such hazardous and hot jobs as welding and foundry work, robots are now being created for jobs where workers have the most control over the pace of work: machine loading and light assembly, among the more desirable production tasks.

Technologies are becoming all too pervasive to assume that enough jobs will automatically be created for the number of people displaced. Economic revitalization no longer means re-employment. And the devastating social cost of unemployment is not reckoned in the savings that technology promises.

Such a socially destructive use of technology need not be inevitable. Jobs for workers displaced and improved working conditions for those who remain ought to be a condition for the introduction of robots. Productivity gains, for example, could translate into a shorter work week at the same pay rather than into fewer jobs. Technology could be designed to enhance human skill and experience rather than make people "interchangeable" with machines. Realistically, these alternatives require worker-union participation in the design and deployment of technology.

The goal, after all, should be a technology that benefits people — not one that destroys them.

Harley Shaiken, a research fellow at the Massachusetts Institute of Technology, is completing a book on automation.

New York Times, September 1980

...And in 1960

Robots' Rise

They Bid for Big Jobs
Both in Outer Space
And in U.S. Factories

A.M.F. Designs Robot to Send
To Moon; G.E. Works on
One to Paint New Autos

Beetle's Hazardous Mission

BY THOMAS O'TOOLE

Staff Reporter of THE WALL STREET JOURNAL

GREENWICH, Conn.—America's first astronaut to reach another planet may have long spidery arms and a bell-shaped head with a window in it.

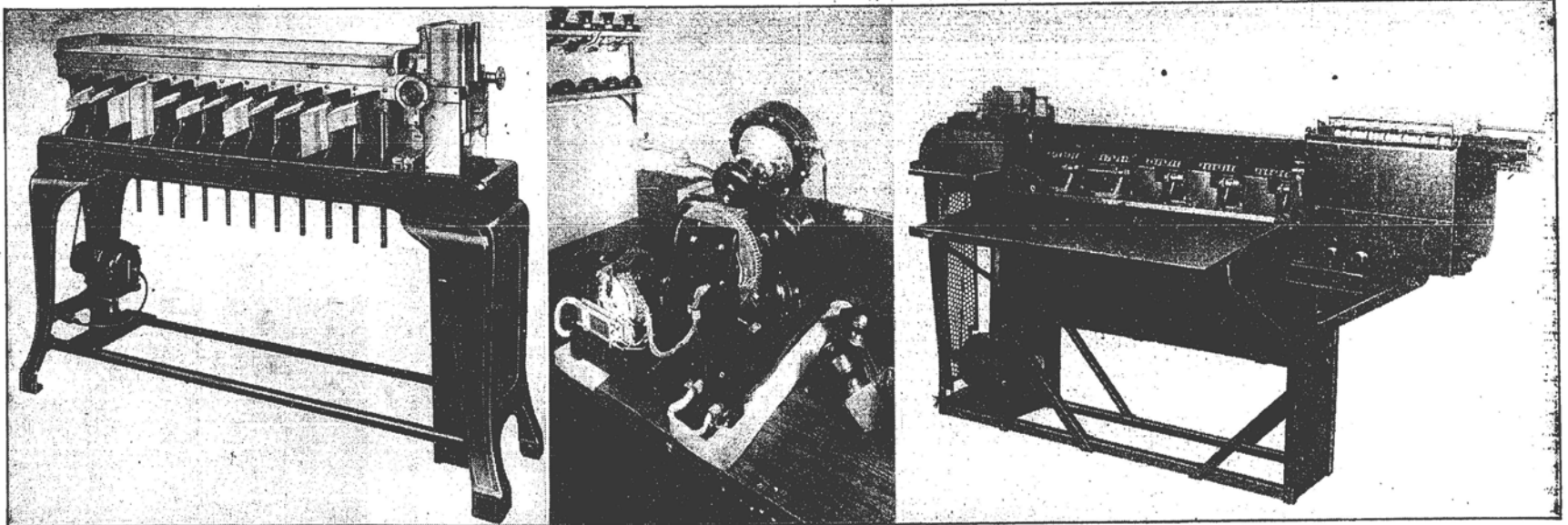
Such an inhuman-appearing space traveler is not as far-fetched as it seems. Even now the creature—a robot—is taking shape here at the Greenwich Engineering division laboratories of American Machine & Foundry Co. A.M.F. engineers believe their robot, remotely controlled from earth, would be far more useful than a human in exploring outer space—at least until rockets can be made powerful enough to be readily capable of returning home from trips to the Moon, Mars, Venus or even more distant targets.

Elsewhere around the country in laboratories and on drawing boards, increasing attention is being paid to robots, once regarded as science-fiction characters with little or no practical value. Indeed, most of the robots in use and development today bear little resemblance to the mechanical bipeds popularized by movie makers and cartoonists. But these machines, nevertheless, are true robots—automatic devices that perform human functions, or operate with seemingly human intelligence.

Wall Street Journal, July 1960

...And in 1935

Robot Brains Outdo Man's Mind in Speed and Accuracy of Results



'Thinking Machines' Replace the Thinker

They Predict Tides, Pick Criminals' Fingerprints,
Calculate Mathematical Problems,
and Perform Amazing Tasks.

Washington Post, January 1935

...And in 1812

347

One Thousand **POUNDS** REWARD.

WHEREAS on the Night of Sunday the 19th
of January, 1812, the Mill belonging to
Messrs. Oates, Wood and Smithson,
Situate at Oatlands, near Leeds, was maliciously set on Fire---And on the Morning of the
Twenty-fourth of March, 1812, several Persons entered the MILL of
MESSRS. WM. THOMPSON & BROTHERS,
Of Rawden, destroyed the SHEARS and MACHINERY therein.--And on the Morning of the 25th, some Person
or Persons broke into the Press Shop of
Messrs. Dickinson, Carr and Co.
SITUATE IN WATER-LANE, LEEDS, AND
Wantonly destroyed Cloth,
TO A CONSIDERABLE AMOUNT.

1000 POUNDS REWARD

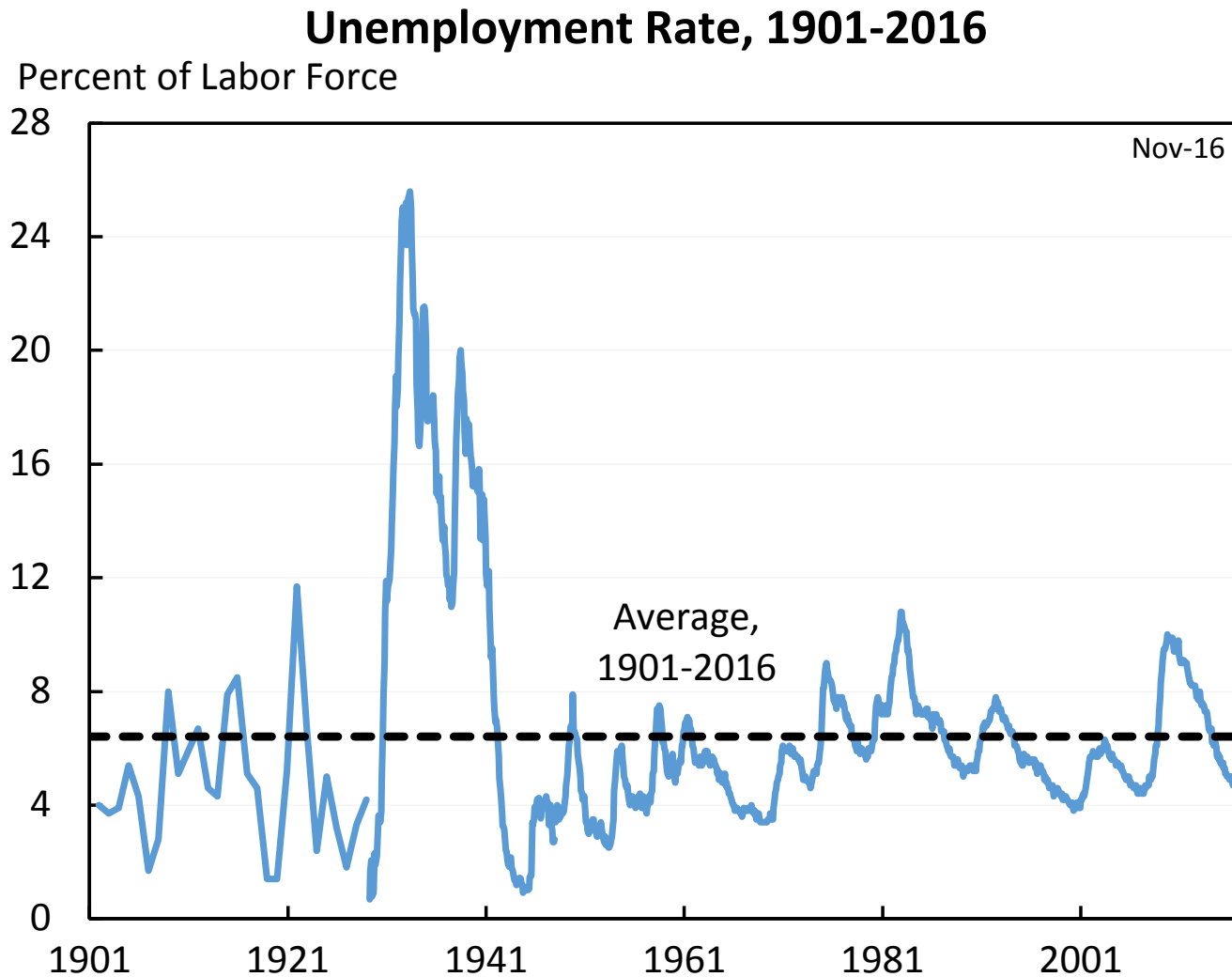
s hereby offered to any Person or Persons who will give such Information
s shall lead to the Conviction of any of the Offenders, on Application at
the Town Clerk's Office, or to any of the above-mentioned Sufferers.

MARCH 25, 1812.

PRINTED AT THE INTELLIGENCE-OFFICE, LEEDS, BY GRIFFITH WRIGHT, JUNR.

Reward Poster for Luddite Attacks Near Leeds, March 1812

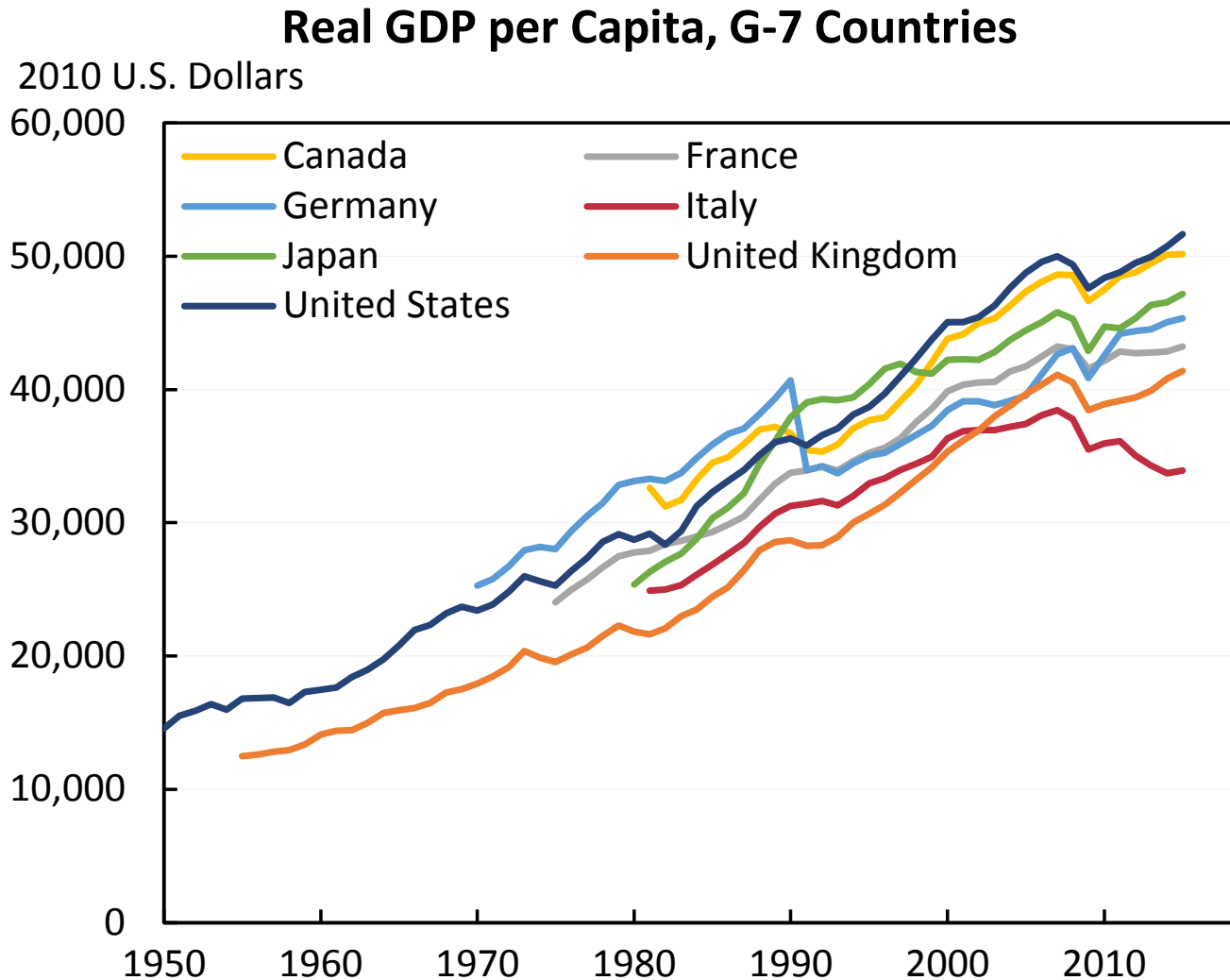
The Unemployment Rate Has Been Roughly Trendless Since We Have Measured It



Note: Data prior to 1929 are annual rates for individuals 14 and older. Data from 1929 to 1947 are monthly rates for individuals 16 and older from the National Bureau of Economic Research. Data from 1948 to 2016 are monthly rates for individuals 16 and older derived from the Current Population Survey.

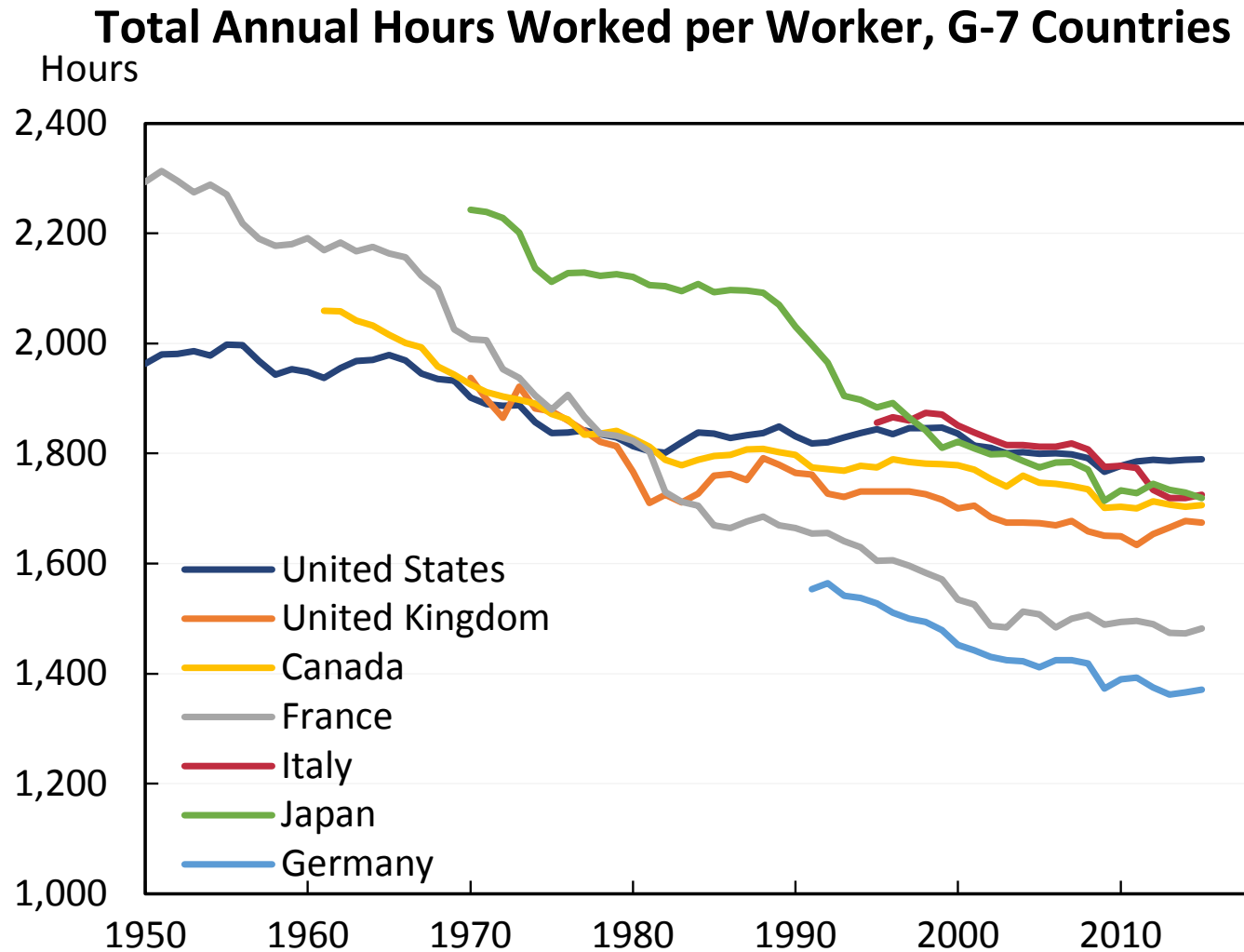
Source: Census Bureau; National Bureau of Economic Research; Bureau of Labor Statistics, Current Population Survey; CEA calculations.

But We Have Become Richer in Material Goods...



Note: Real GDP per capita using 2010 prices and exchange rates.
Source: National sources via Haver Analytics.

...And Also Richer in Leisure

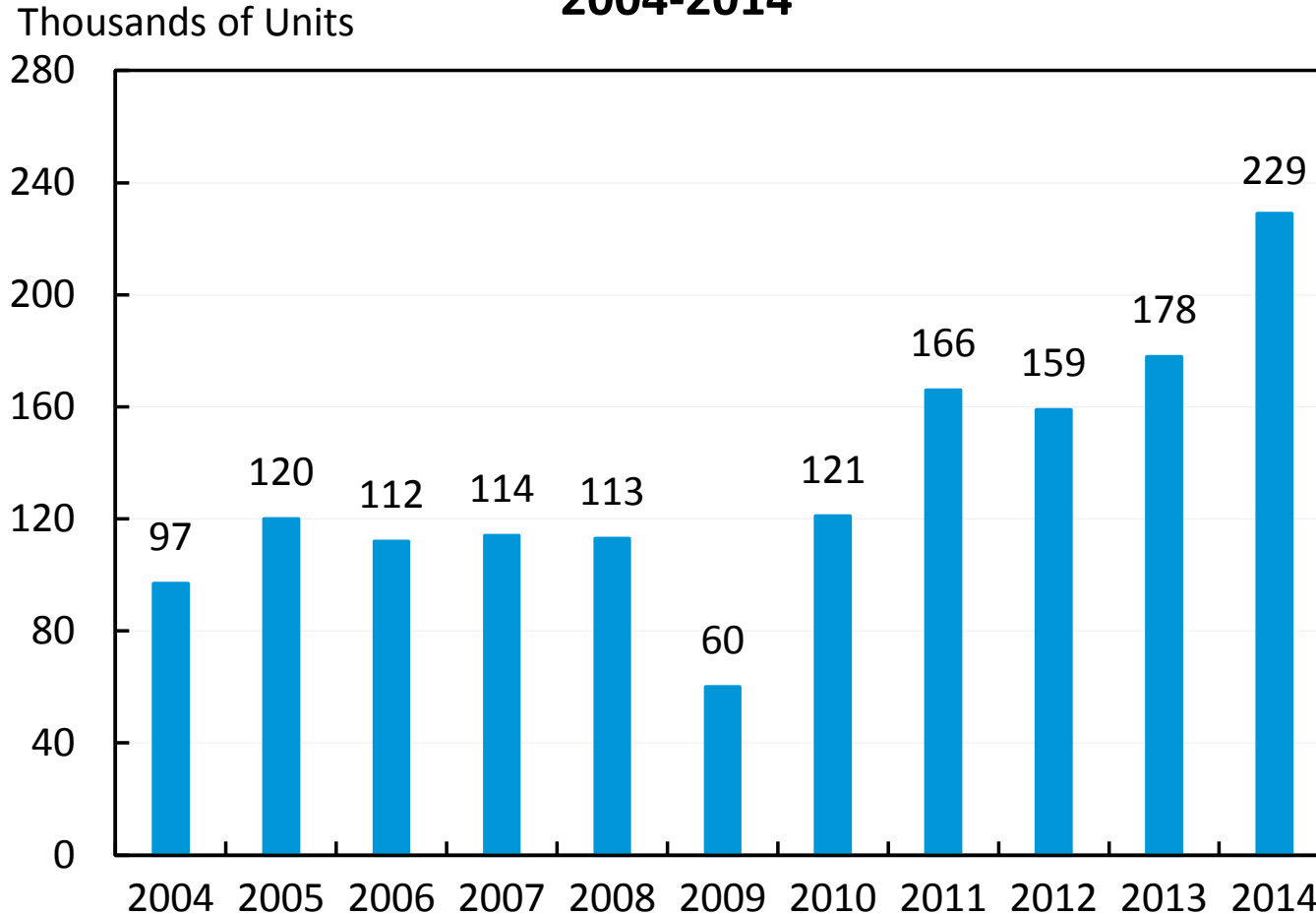


Our Recent Concern is Too Little Productivity Growth, Not Too Much



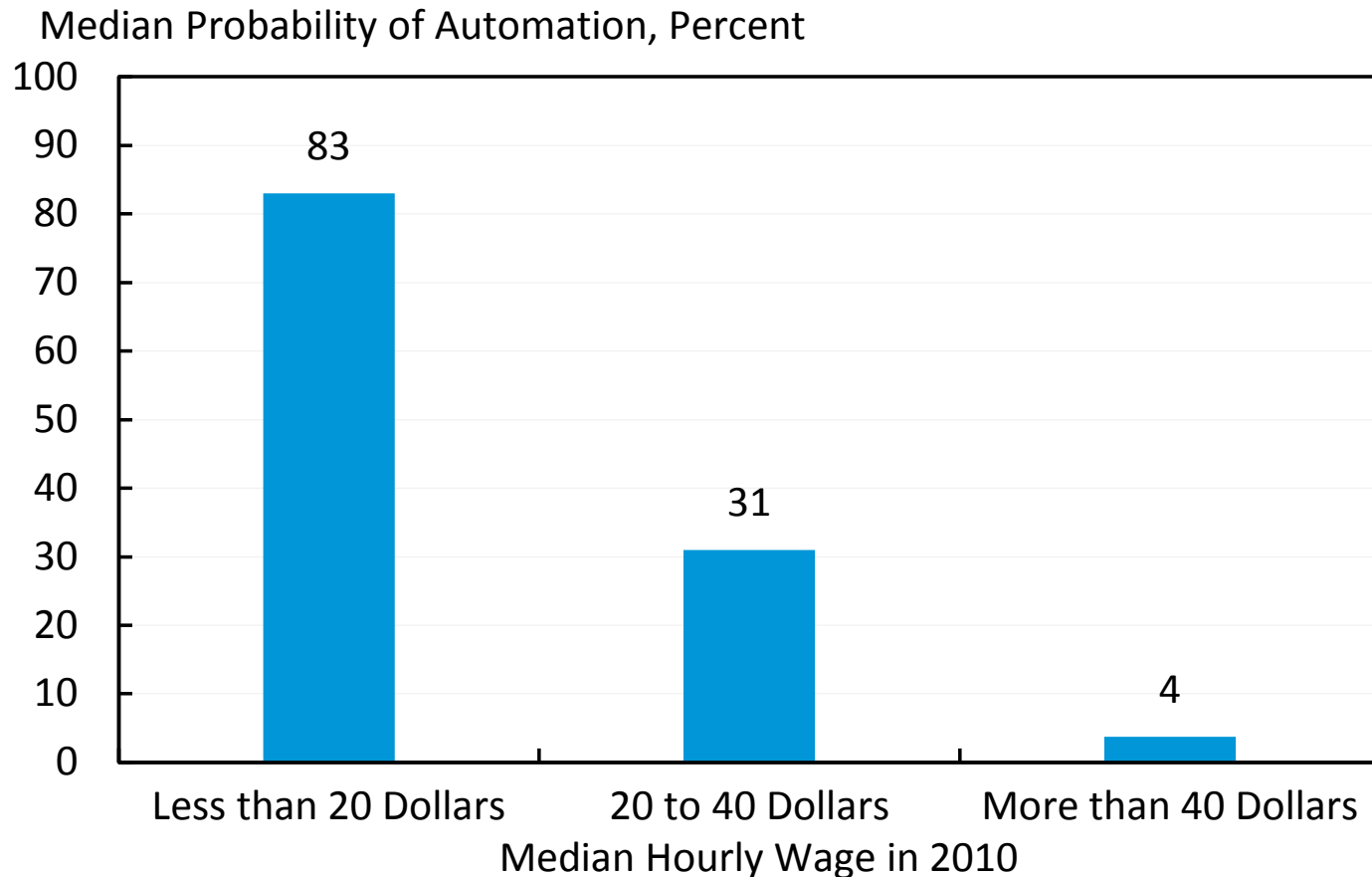
Robots Have Helped Productivity, But Not Enough to Offset Other Forces Slowing Productivity Growth

**Estimated Worldwide Annual Supply of Industrial Robots,
2004-2014**



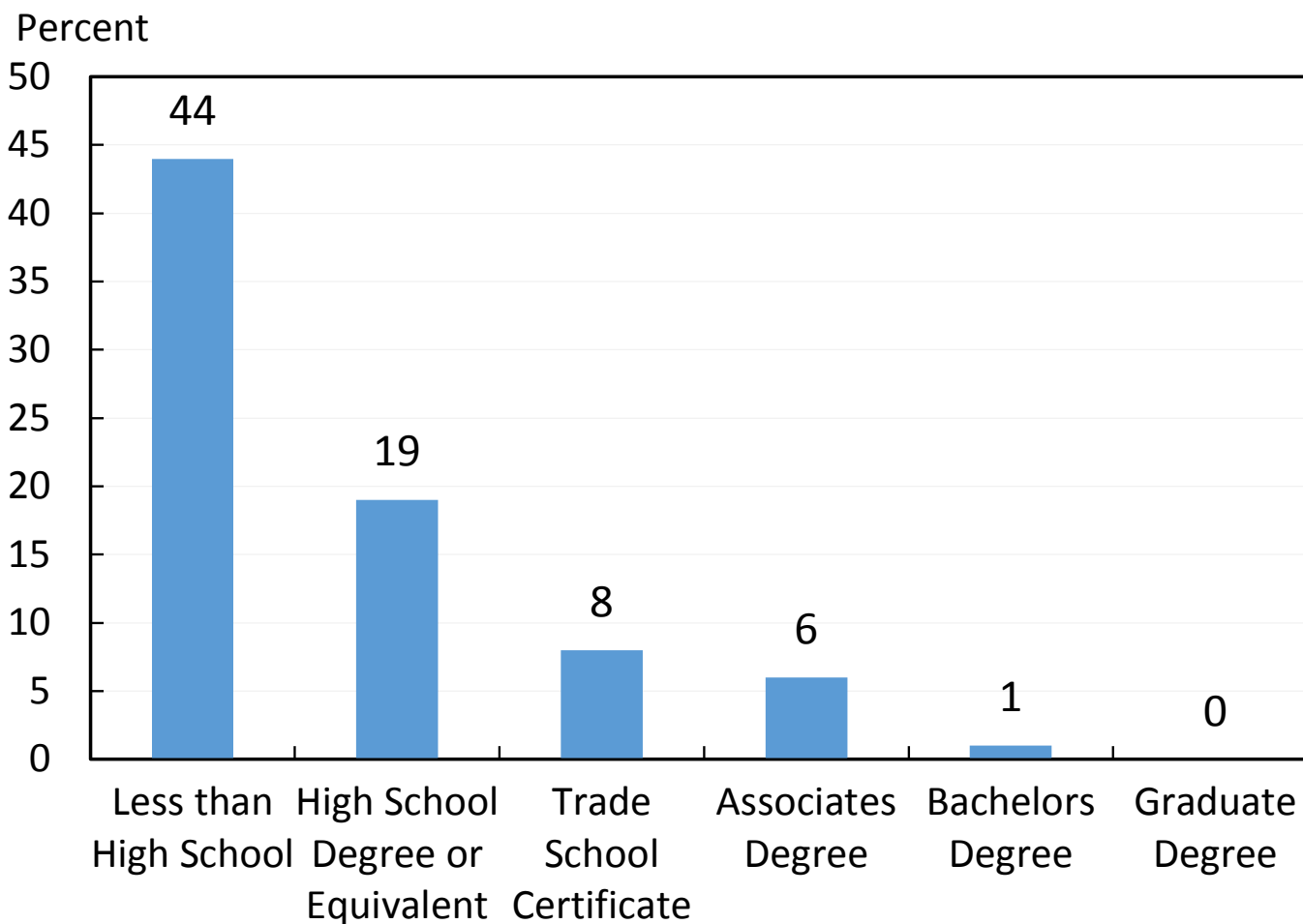
The Probability of an Occupation's Automation Varies Dramatically Across the Wage Spectrum

Probability of Automation by an Occupation's Median Hourly Wage

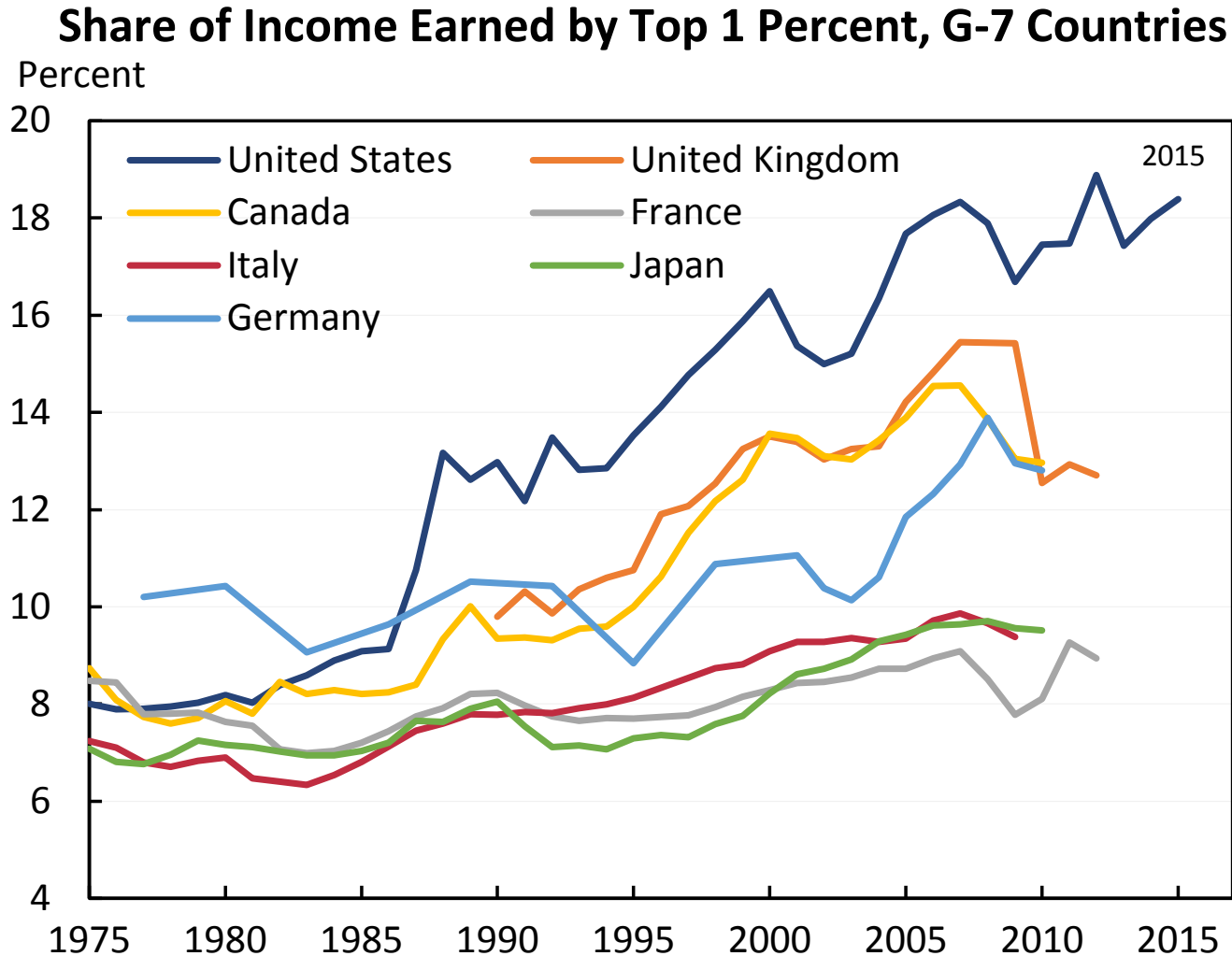


Similarly, It Varies Across the Educational Attainment Spectrum

Share of Jobs with Highly Automatable Skills, by Education

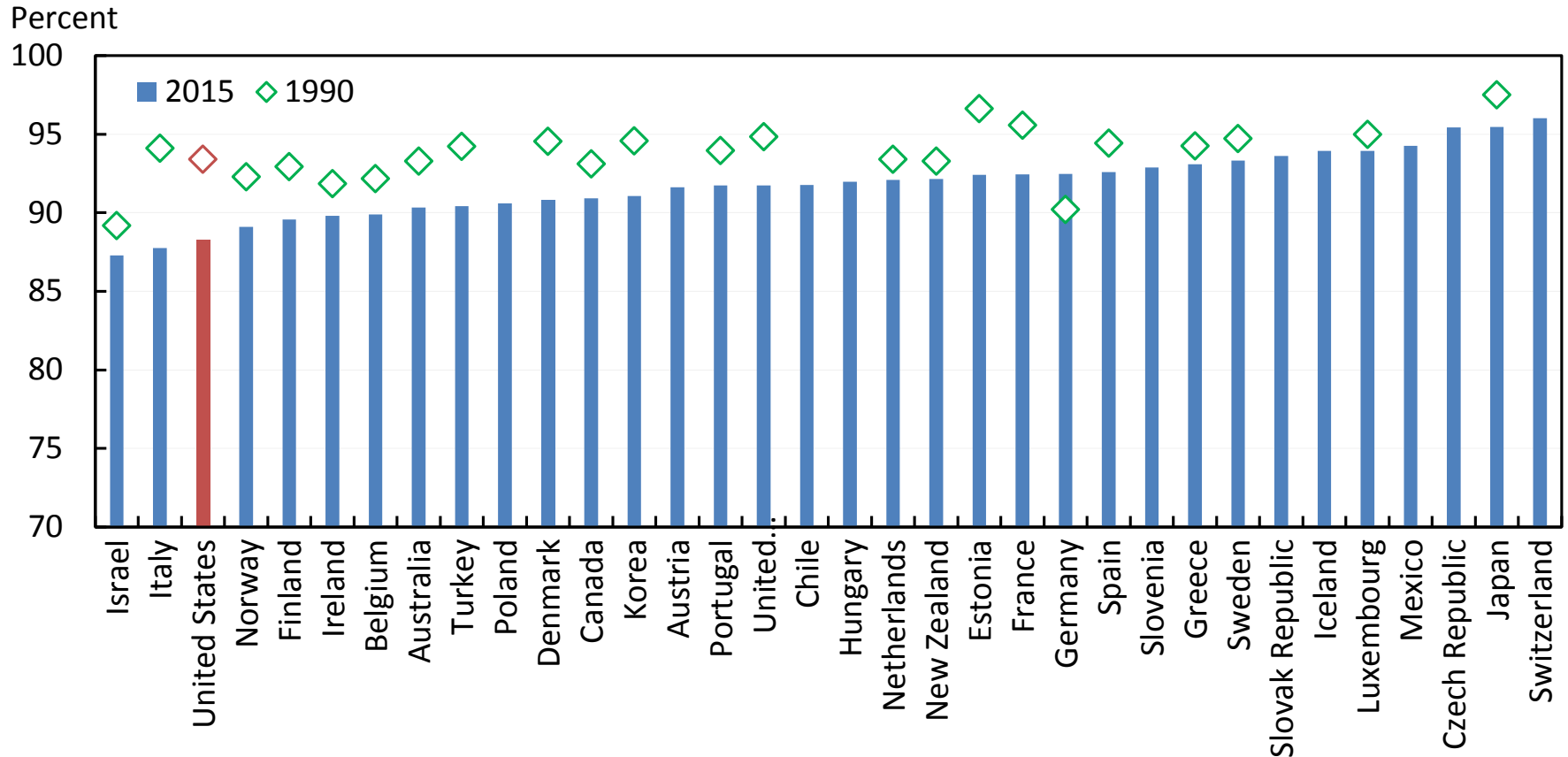


High and Rising Inequality is a Problem Across Major Advanced Economies, But Particularly for the United States



The U.S. Decline in Prime-Age Male Labor Force Has Been Steeper Than in Almost Every Other Advanced Economy

Prime-Age Male Labor Force Participation Rates Across the OECD



Policy Implications

We Need More AI

1. Investing in Basic Research
2. Fostering a Workforce to Develop AI
3. Increasing Competition
4. Supporting Privacy
5. Promoting Cybersecurity

We Need to Help Workers Thrive With More AI

1. Educating Youth for the Jobs of the Future
2. Expanding Access to Training and Re-Training
3. Empowering Workers and Job Seekers
4. Modernizing and Strengthening the Social Safety Net
5. Modernizing Tax and Economic Policy

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