

The Future of Work

IMPLICATIONS FOR BUSINESS, EDUCATION, AND THE WORKPLACE

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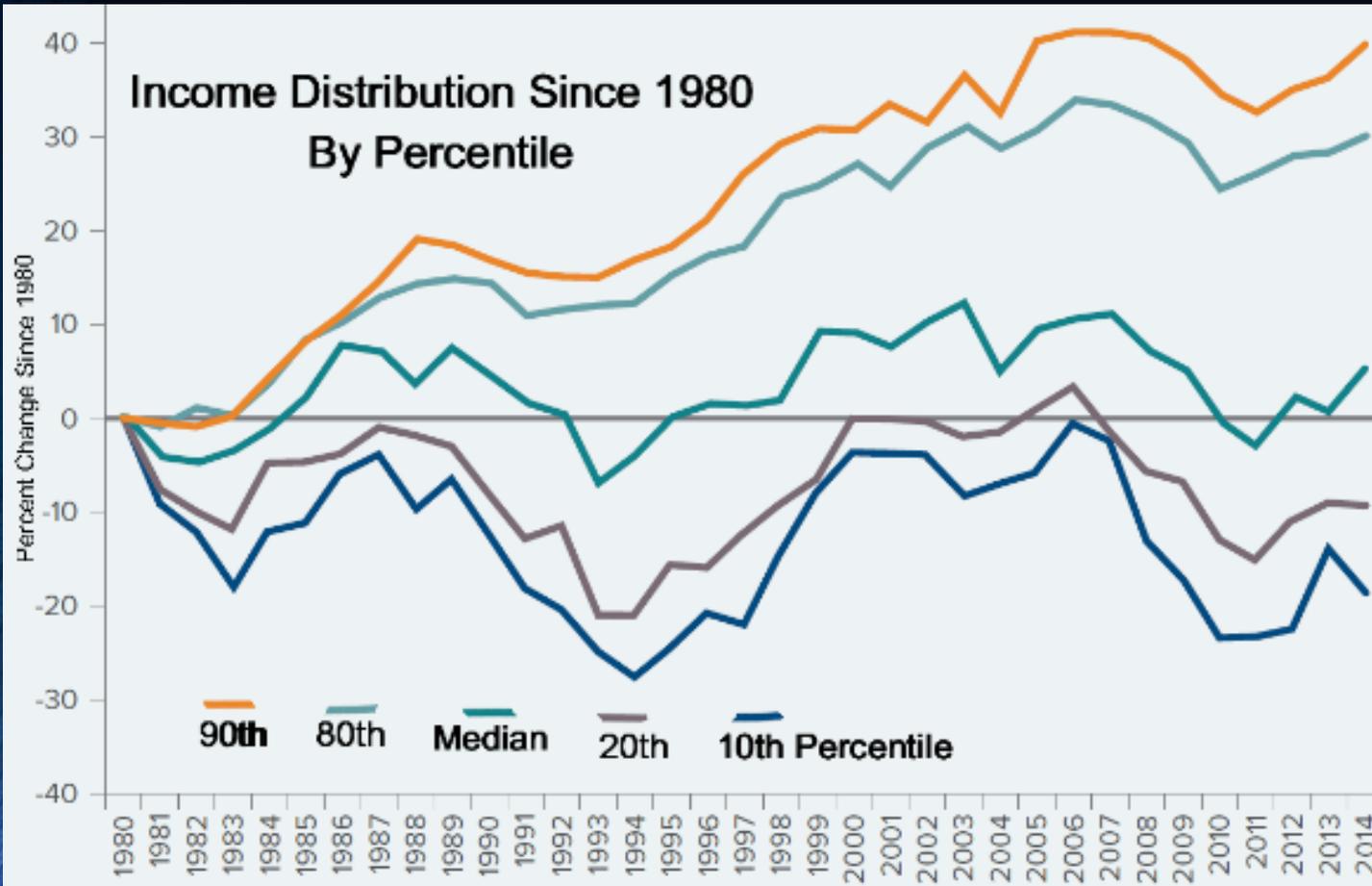
Trends with Socioeconomic Impact

- Income Inequality
- Low Participation Rate in the Workforce
- Decline in Productivity
- Unfilled Middle Skill Jobs



Trends With Socioeconomic Impact

Income Inequality



Recession income decline was greatest for those with lowest income.

Recovery wealth gains greatly favored the rich over those with low income.



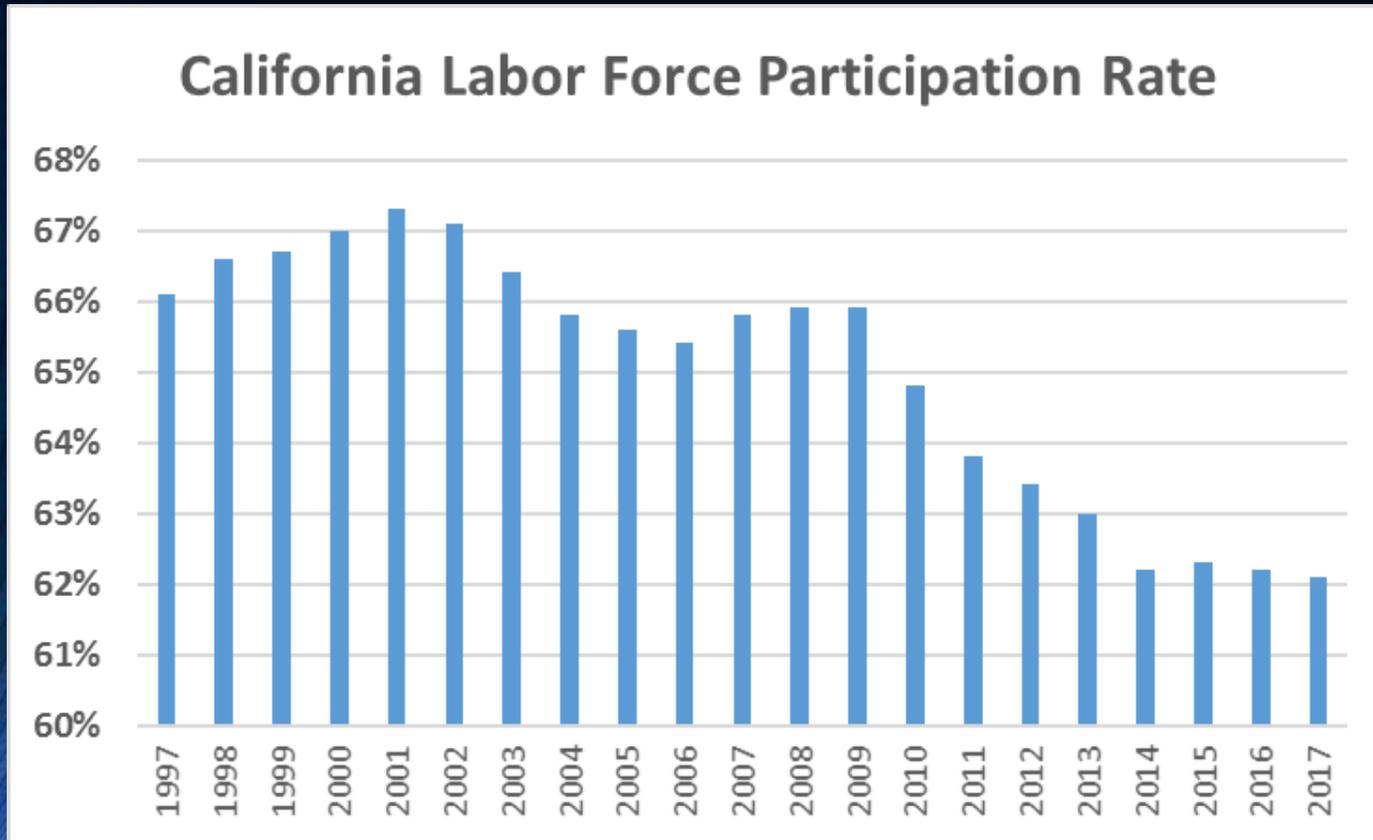
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Trends With Socioeconomic Impact

Low Participation Rate in the Workforce

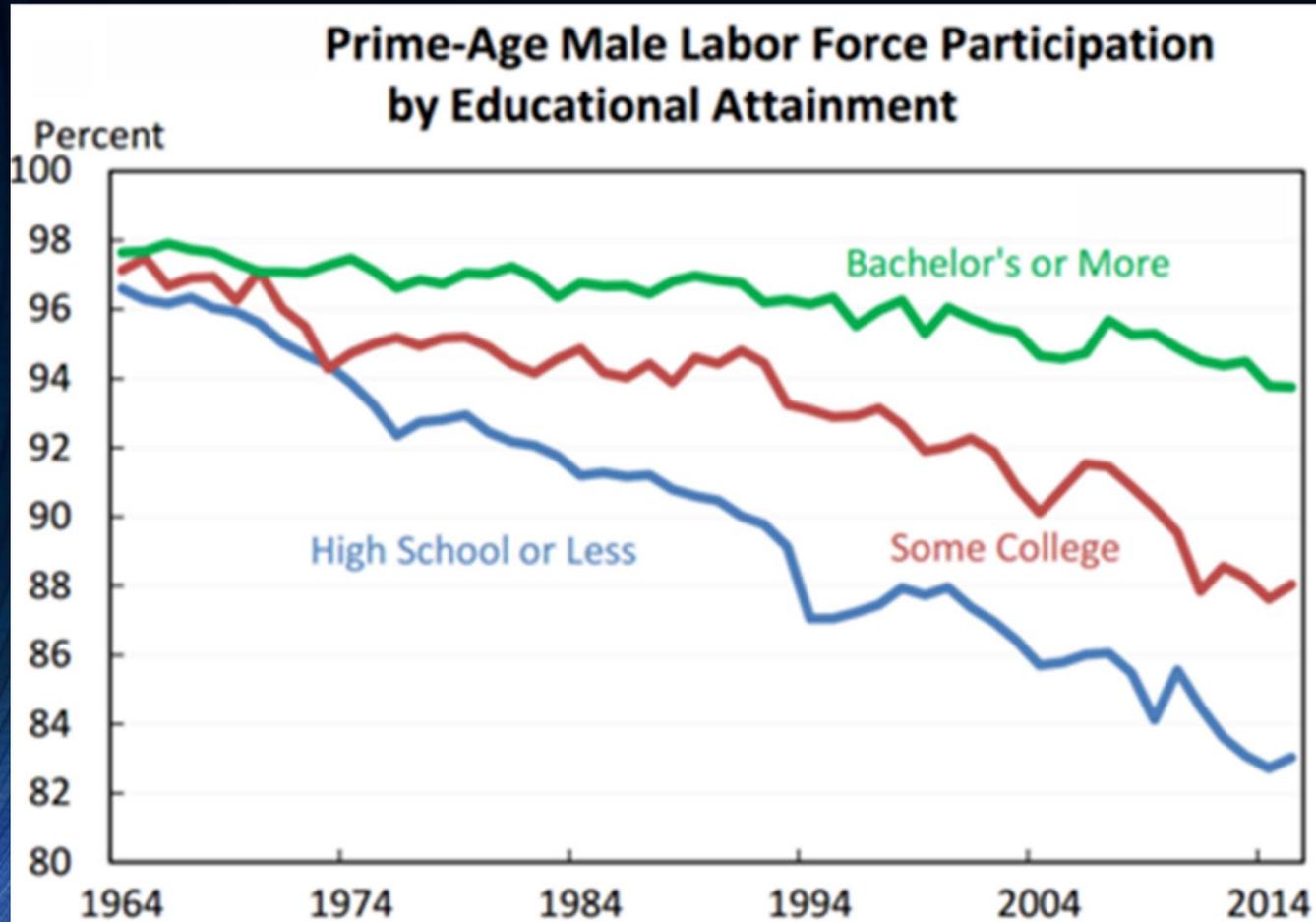


The percent of working age adults with jobs declined in the Recession and never recovered. Many stopped seeking work.



Trends With Socioeconomic Impact

Low Participation Rate in the Workforce

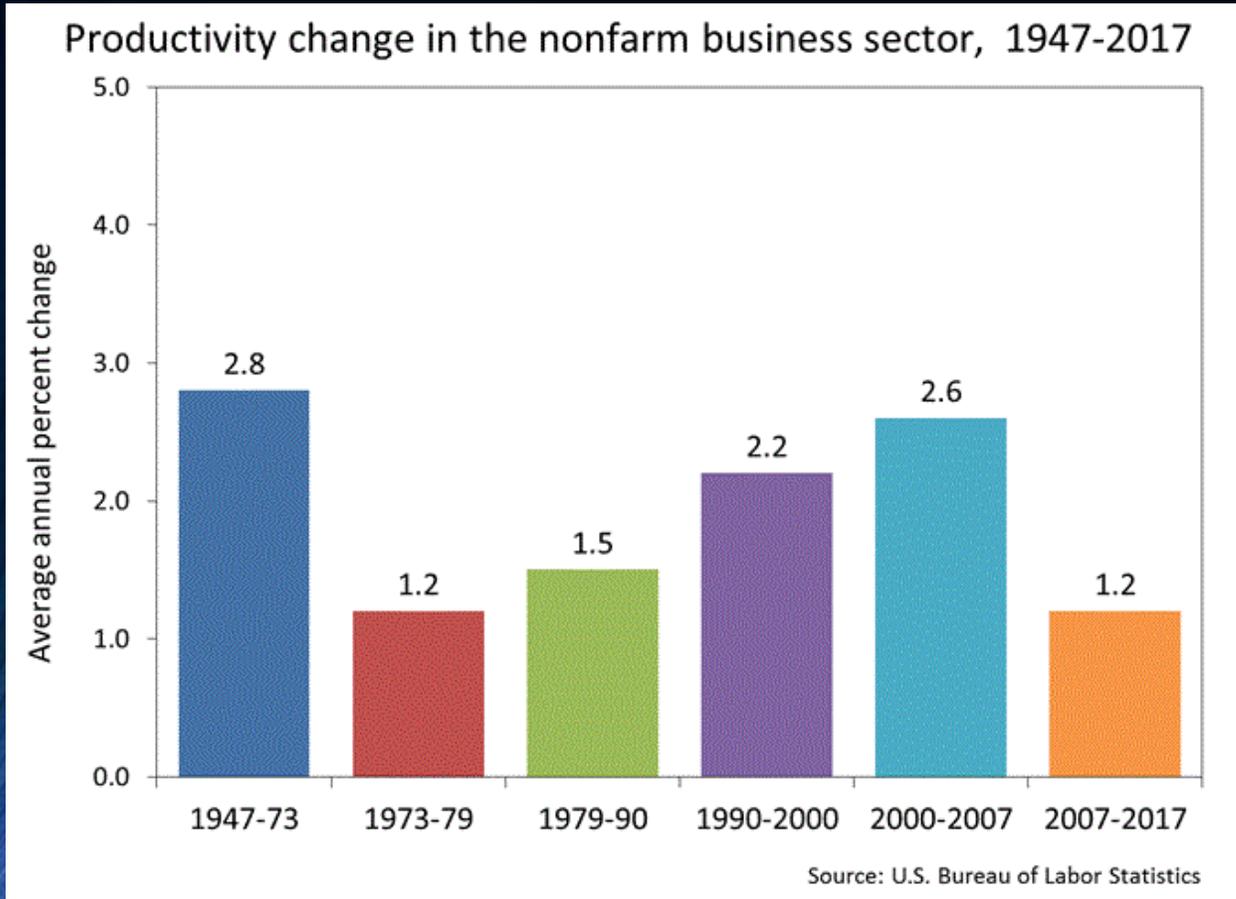


Less educated males in particular have left the workforce. This is a decades long trend.



Trends With Socioeconomic Impact

Low Productivity



Recession Productivity Decline and Slow Recovery

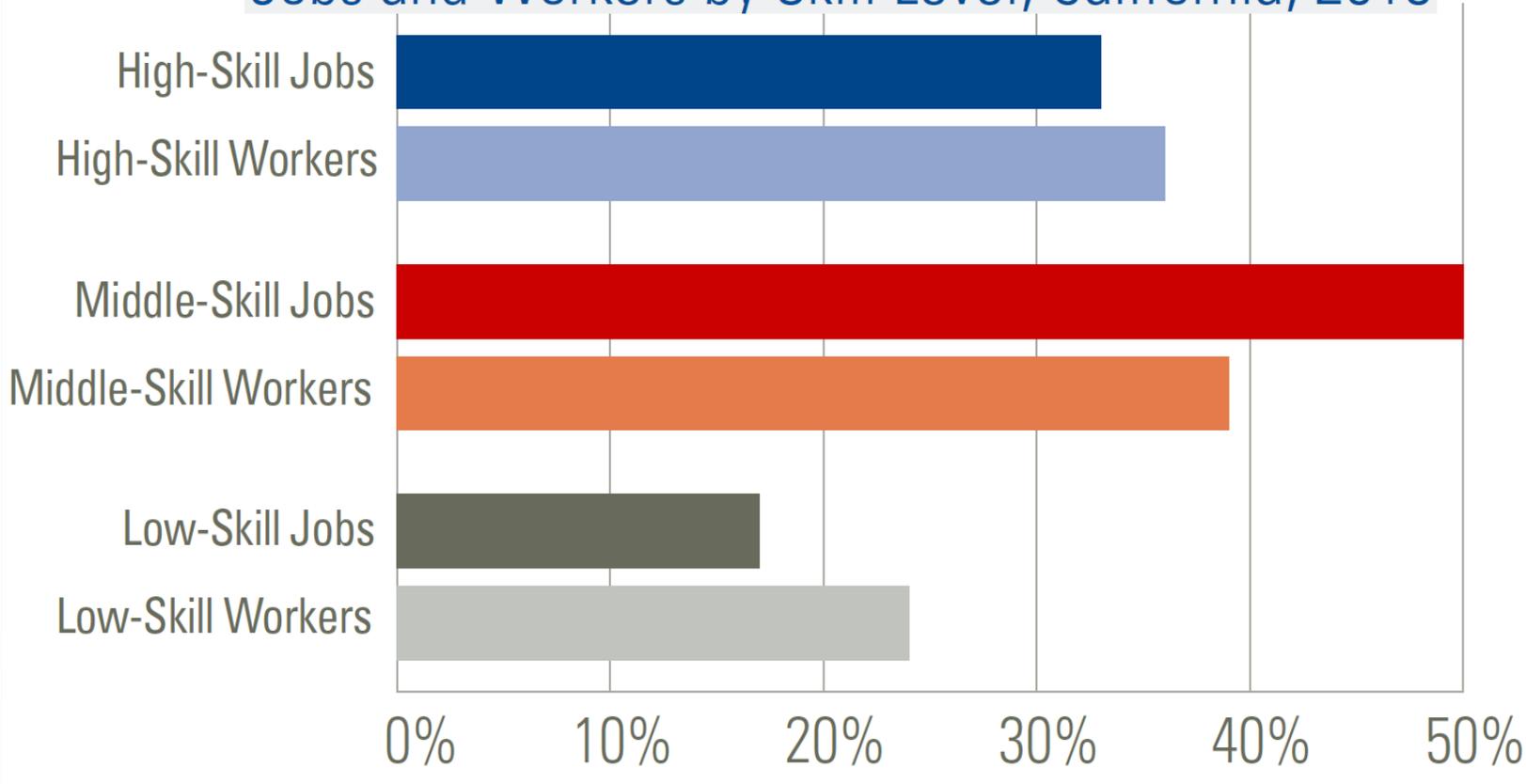
- Less experienced workers
- Slowing of capital investment
- R&D investment leveling-off
- Changes in work attitudes



Trends with Socioeconomic Impact

Unfilled Openings for Middle Skill Jobs

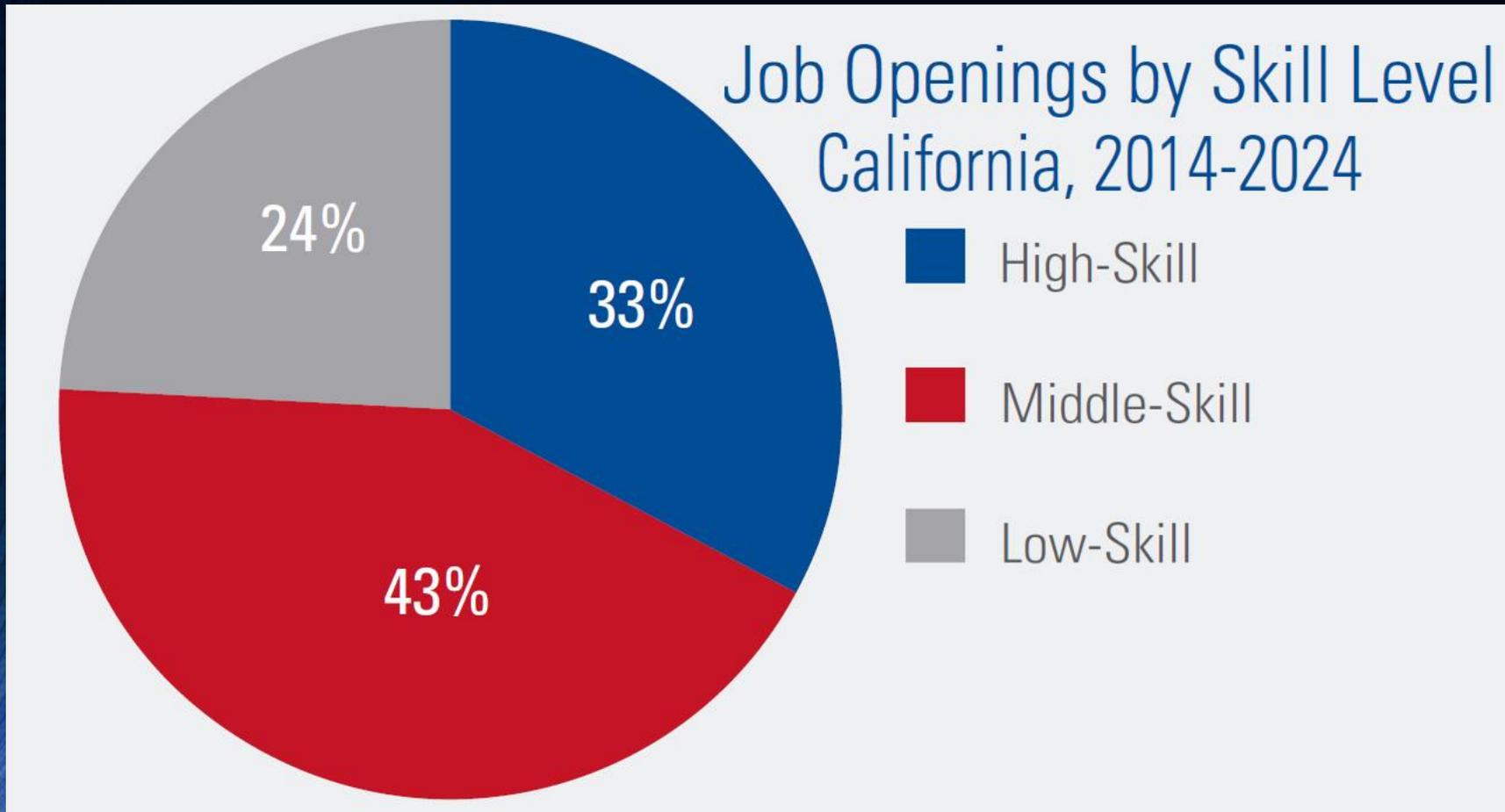
Jobs and Workers by Skill Level, California, 2015



Middle skill jobs account for 50% of California labor market. Only 39% of workers are trained to middle skill levels.



Trends with Socioeconomic Impact Unfilled Openings for Middle Skill Jobs



Future job growth is highest in middle skill occupations



Can California Grow its Workforce, Expand Business, and Restore Social Balance?



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The Future of Work: Emerging Trends

- Technology
 - Automation
 - Artificial Intelligence
 - Mobile Devices
 - Big Data
- The Gig Economy
- Innovation



Job
Growth:
Robot
repair



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Technology: Automation

- Automation will improve productivity per work hour.
- Today's high school grads will have 8-10 jobs by 40—with very different tasks.
- Businesses and education will enhance machine-human work.
- Machine-human work will meet “retro” need for “high touch” service.
- “Digital resource conductors” will be fueled by in-the-moment work-based learning.



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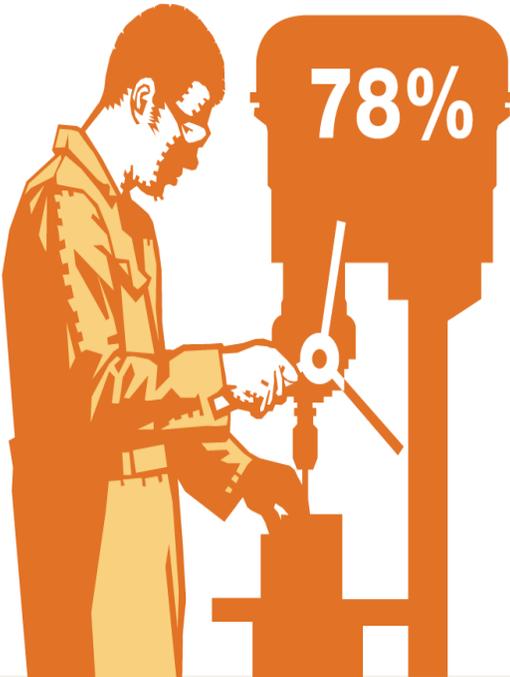


Automation Impact on Jobs and Productivity

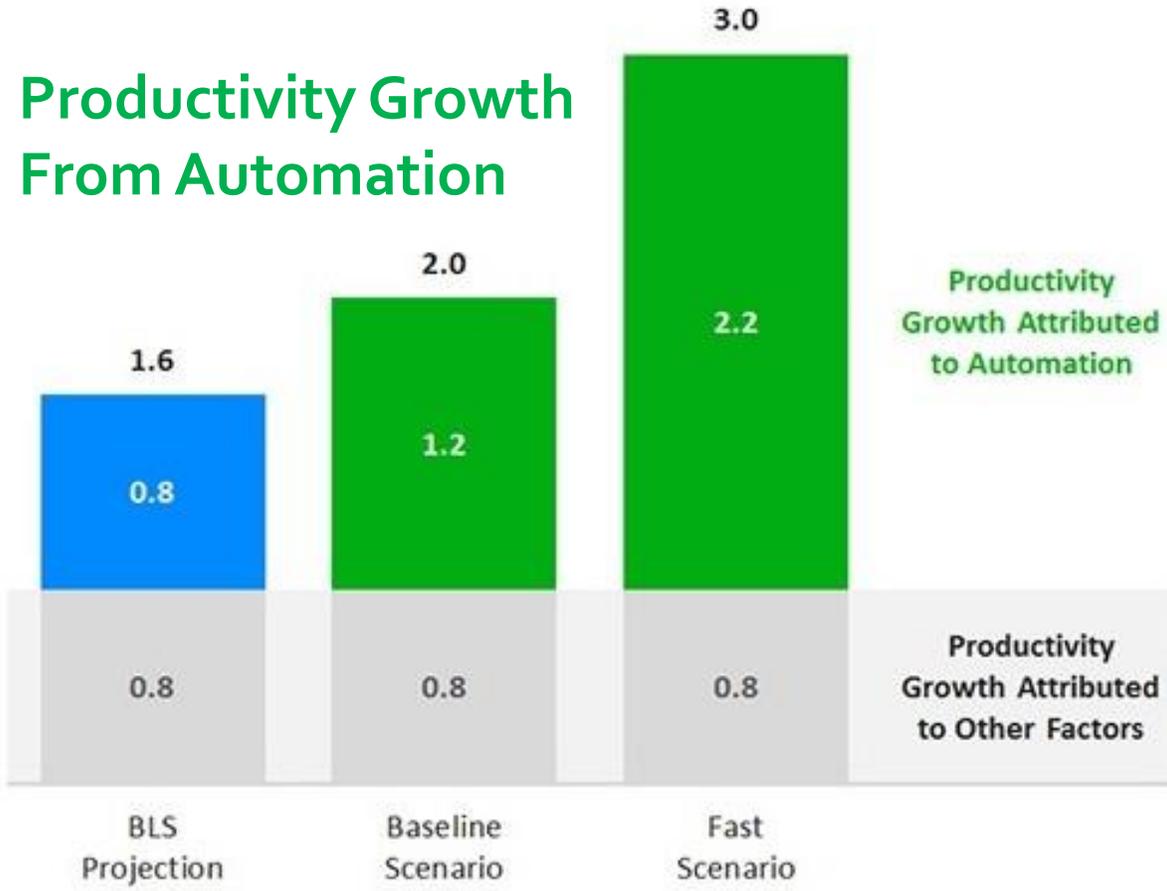
Technology Feasibility of Automation, %

Predictable physical work

Unpredictable physical work



Productivity Growth From Automation

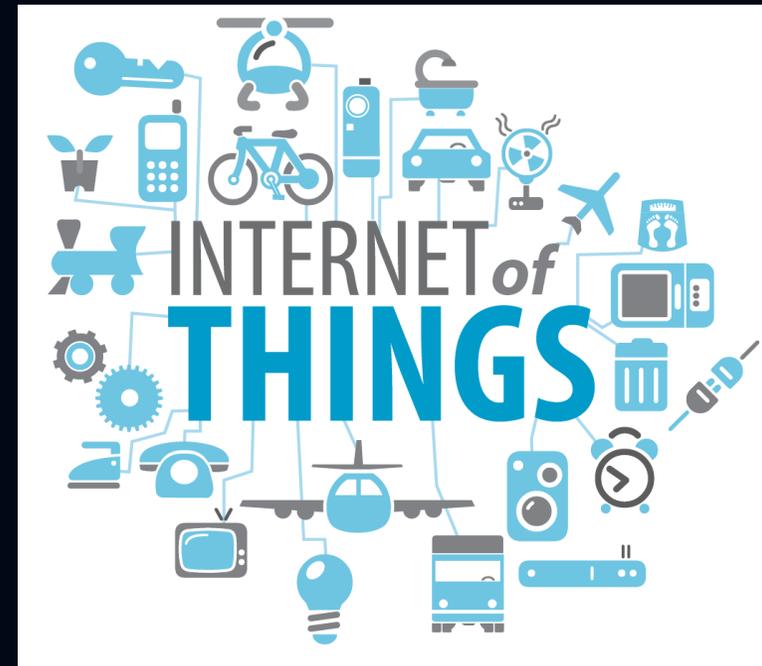


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Technology: Artificial Intelligence

- By 2020: over 26 billion connected devices.
- Cross-device integration, machine self-diagnosis, human-machine interfaces
- AI replaces routine work. e.g. chatbots.
- Business will control AI by evaluating risk, assessing fallibility.
- Business & education will retain and retrain employees to meet high end Artificial Intelligence needs.



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Libelium Smart World

Air Pollution

Control of CO₂ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection

Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing

Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care

Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care

Vital signs monitoring in high performance centers and fields.

Structural Health

Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions

Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection

Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control

Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels

Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels

Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion

Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads

Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting

Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping

Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps

Sound monitoring in bar areas and centric zones in real time.

Water Leakages

Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis

Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location

Search of individual items in big surfaces like warehouses or harbours.

Waste Management

Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking

Monitoring of parking spaces availability in the city.

Golf Courses

Selective irrigation in dry zones to reduce the water resources required in the green.

Water Quality

Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Technology: Mobile & Integrated Devices

- Explosion of mobile devices
- Device platform integration
- Job consolidation across platforms
- Data sharing—DEVICES TALK TO EACH OTHER
- Explosion of digital sales and services
- Radical integration of the consumer experience—physical and virtual



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Technology: Big Data & Business Practices

- Big data and analytics
DISCOVER new business opportunities and practices
- Decline in routine business practices
- Move to jobs with higher critical thinking skills



Technology: Opportunities

Managing the Rate of Technology & Workforce Change

Change Rates for:	From NOW	To NEXT
Technology	Rapid	Steady
Workforce Training	Slow	Rapid
Workforce Mobility	Slow	Steady

Rate of change is critical to adjusting to technology advances in the workforce.



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Technology: Opportunities

Changing the Paradigm thru Partnerships

- Transition training—“upskilling” and “reskilling”
- New jobs for machine-human work
- Businesses can support Workforce Mobility
 - “Redeploying labor”—sustained employment.
 - Intake of new workers with transitional workbased learning partner with business

Only 5% of jobs can be 100% automated, but 50% can be partially automated



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Technology: Challenges

- Worker displacement due to tech-driven changes
- Current labor shortage—really a middle-skill shortage
- Transition to competency-based gap training
- Partnerships with business in defining emerging competencies and providing work-based learning



Gig Economy & the Workforce

What Gigs Make up the Gig Economy and by What Percent?

- Gig Workers are temp agency, on-call, contract, and independent workers
- Gig workers rose from 10.1% of the workforce in 2005 to 15.8% in 2015.
- Gig workers with online intermediaries, such as Uber, were 0.5% in 2015.
- Contract workers rose from 0.6% to 3.1%

42 Million 1099 Workers	65 Million by 2020
34% of Workers Have a 2nd Job	1 of 3 Millennials Freelance

Gig is slang for a live musical performance, short for the word "engagement," now refers to paid work.



Gig Economy Worker Opportunities & Challenges

• Opportunities

- Flexibility ,sense of independence from the corporate walls
- Increased pay for highly valued skills and competencies
- Opportunity for better work-life balance—a sense of control

• Challenges

- Lack of benefits, job security, protection of workplace rights
- Risk of low levels of compensation and steady work



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Gig Economy: Intermediaries



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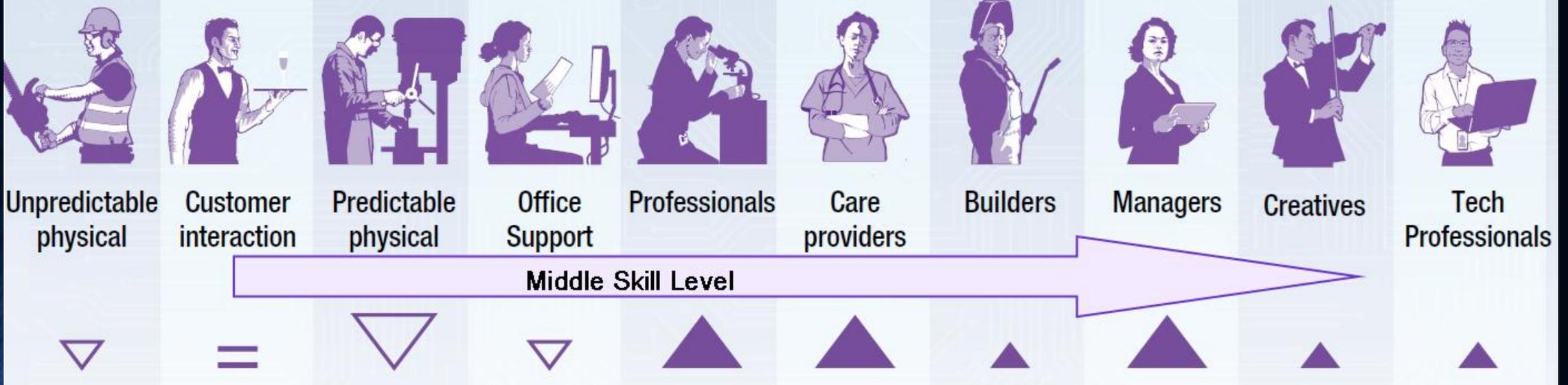
Gig Economy: Role of Business and Education

	Business	Education
Opportunities	Pay Just for Work Product Meets Flexible Demands Ready Expansion of Scope	Non-Traditional Learners: Work-Based Learning Incumbent Worker Training
Challenges	Not a Dependable Workforce Needs Skills May be Scarce Less Control Over Work	Difficult to Keep up with Skills to Teach Not a Steady Source of Enrollment (\$) Not Enough Students Needing Each Skill



Future of Work: Middle Skill Transitions

Jobs of the future: some occupations will grow, others will decline, and new ones we cannot envision will be created



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Innovation: Healthcare by 2025

- Pharm spending up 8% yearly.
- Med tech sales up \$800 M yearly
- Most patients have access to their medical records
- Medicine is predictive, preventive, personalized, preventive
- Funding: year-of-care tariffs, pooled budgets, personal health budgets
- Biosensors and wearables are common



"There's a pill for that"



"Hook me up, doc!"



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Innovation: Healthcare

Opportunities

- Wearables revolutionize healthcare through remote monitoring, disease management, and early detection

Challenges

- Need to transform fitness tools into health monitors
- Regulation of health care struggles to keep up with innovation
- High levels of unmet healthcare needs outside developed world
- Access and affordability –low public aid insurance coverage
- Need for infusion of tech skills across the spectrum of jobs



Workforce Transitions

Priorities for Policy, Business, and Education

ECONOMIC GROWTH

Ensuring robust growth and economic dynamism; economies that are not expanding don't create jobs

SKILLS UPGRADE

Upgrading workforce skills, especially retraining midcareer workers, as people work more with machines

FLUID LABOR MARKET

The shifting occupational mix will require more fluid labor markets, greater mobility, and better job matching

TRANSITION SUPPORT

Adapting income and transition support to help workers and enable those displaced to find new employment

Workforce transitions

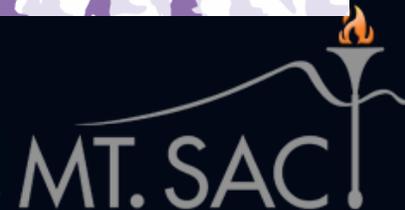
SWITCHING OCCUPATIONS...

75M–375M

Number of people who may need to switch occupational categories by 2030, under our midpoint to rapid automation adoption scenarios



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