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Robotics and the future of the labor force: How robotics will change how we value work and the future shape of (gender) inequality.

AUTOR: Human tasks that have proved most amenable to computerization are those that follow explicit, codifiable procedures—such as multiplication—where computers now vastly exceed human labor in speed, quality, accuracy, and cost efficiency.3 Tasks that have proved most vexing to automate are those that demand **flexibility, judgment, and common sense**—skills that we understand only tacitly—for example, developing a hypothesis or organizing a closet. In these tasks, computers are often less sophisticated than preschool age children. The interplay between machine and human comparative advantage allows computers to substitute for workers in performing routine, codifiable tasks **while amplifying the comparative advantage of workers in supplying problem solving skills, adaptability, and creativity**. Understanding this interplay is central to interpreting and forecasting the changing structure of employment in the U.S. and other industrialized countries. This understanding is also is at the heart of the increasingly prominent debate about whether the rapid pace of automation threatens to render the demand for human labor obsolete over the next several decades.

1. **Technological change and inequality theme:**
   Since the beginning of time technological progress has shaped the labor force: what types of skills are needed, and who are the ones possessing this now increasingly demanded skill, and how are value, status, and high wages getting attached to these skills.

2. **We now have a long historical perspective on tech change and its effect on the labor force:**
   We know about the large historical technological revolutions and its relation to how people work to produce the goods they consume:
   - Hunters Gatherers turn Farmers with the discovery of how to cultivate crops and to domesticate animals (that is the neolitic revolution some 10,000 years ago).
   - Then the industrial revolution which harnest new chemical manufacturing and iron production processes, and improved efficiency of water power, steam power, coal, and machine tools to move production from hand processes to machines.
   - And in the past decades the IT revolution with computerization announcing the entry of robotics into human society at large and the labor force.

3. **What is less emphasized is how these technological changes have effected who wins and who** loses in society. What shape does inequality take.
   Few examples on how what we produce and how we produce it affects the structure of power in our society. And I'd like to give you just one example about how technoloty has far reaching implication on gender inequality.
   - Women and the plow: traditional agricultural practices influenced the historical gender division of labor and the evolution and persistence of gender norms. The descendants of societies that traditionally practiced plough agriculture, today have lower rates of female participation in the workplace, in politics, and in entrepreneurial activities, as well as a greater prevalence of attitudes favoring gender inequality. (Alesina et al. 2011)
   - Another example (time permitting) is green tea harvesting. Green tea needs to be harvested with gentleness and care, so as to not ruin the leafs. It was found that in areas where geography is more favorable to green tea growth, women, who are better suited to pick green tea leafs, have higher relative income to men. What is more astounding is that the share of women relative to men in the population is larger in these areas relative to areas where there are no women.

4. Let us move west and fast forward at the same time to the computerization:
   - It has been argued that the last few decades have been characterized by "skill biased technical change". This means that the IT revolution has been mostly replacing low skill workers (who do routine tasks which can be coded) with smart machines, and these machines need to be operated by other more skilled workers. Hence, IT is a complement to high skills and replaces low skills. Individuals with low skills are replaced, retired and those who are still working experience a decline in wages. On the other hand, high skill workers who can operate complicated machine, write computer programs, and design such machines are in greater demand and their wage increases. (to be exact, IT has replaced the middle of the skill distribution, replaceing repetitive tasks, but leaving untouched manual tasks such as cleaning and sorting that need to adjust to circumstances, and abstract tasks that high skilled workers can perform).
   - Hence, the recent on-going technological change has been responsible to the ever growing gap in earnings, a matter for much concern in the past few years.

- o It is also been argued that the relative increase in women's wages is related to the decline in the demand for braun and the increase in demand for brain. Men, who have a relative advantage in muscles have thus lost some ground and earnings relative to women.

5. And what are we to expect for the future? We can learn a great deal from the historical perspective:
    - o The skills that can be replaced by robots will lose their appeal and command lower wages, while the skills that cannot be replaced by robots will experience higher status and higher wages.
    - o What are these skills that a computer cannot replace? Common sense, adaptability, creativity and sensibility (social intelligence).
        - **Complex perception and manipulation**—These are skills that are performed in an unstructured work environment, involve handling irregular objects, or require tactile feedback. A surgeon is a good example of a role that involves these tasks.
        - **Creative intelligence**—Creativity involves both novelty and value, which are challenging for a computer, because both vary by culture and over time. Examples include fashion designers and biological scientists.
        - **Social intelligence**—Social intelligence is fundamental to professions involving negotiation, persuasion, leadership, or high-touch care. Examples are public relations specialists, event planners, psychologists, and CEOs.
    - o What occupations have these skills? I did some work to see which occupations require high levels of these skills. (O-net dictionary of occupations). I found that the most replacable occupations are packers and sorters of agricultural products. And the most unreplaceable are coaches, chief executives, clergy, artists and their managers, phsychologists, judges, …
    - o What does this mean for inequality? Increasing inequality, as we experience an increase in the demand for skills.
    - o And for women? I ran the occupation's non-replacability index I created against the share of women in the occupations, to see if there is a relationship. And lo and behold, what did I find….? Females are more nonreplaceable. (two forces: men are more in managerial and discretion positions, but women are more in care and emotional-social intelligence occupations). What it means that we can expect the gender wage gap to decline. This is good news. Since usually the forces are such that the strong become stronger since they control the resources and shift investment and R&D to their benefit. But except for that inequality will become stronger: those who have incomes, high mother's education will benefit.

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. eststo: reg  NRnew shf  HGC_MOTHER_1979  totalincome if scale_id=="IM"
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Source	SS	df	MS
Model	1333.79441	3	444.598135
Residual	4042.99236	406	9.95810927
Total	5376.78677	409	13.1461779

Number of obs = 410
F(3, 406) = 44.65
Prob > F = 0.0000
R-squared = 0.2481
Adj R-squared = 0.2425
Root MSE = 3.1556

NRnew	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
shf	2.015437	.4277553	4.71	0.000	1.174545	2.856329
HGC_MOTHER_1979	.3201337	.0638342	5.02	0.000	.194647	.4456205
totalincome	.0000373	4.82e-06	7.75	0.000	.0000279	.0000468
_cons	21.20949	.6680078	31.75	0.000	19.8963	22.52268

ONET TASKS:

robotable	element_name
1	Persuasion
1	Social Perceptiveness
1	Management of Personnel Resources
1	Negotiation
2	Critical Thinking
4	Active Listening
5	Active Learning
5	Writing
5	Service Orientation
5	Learning Strategies
5	Judgment and Decision Making
5	Reading Comprehension
7	Technology Design
8	Complex Problem Solving
8	Speaking
8	Science
8	Systems Analysis
9	Troubleshooting
9	Instructing
10	Equipment Selection
10	Repairing
10	Coordination
10	Management of Financial Resources
10	Programming
10	Operations Analysis
10	Operation and Control
10	Quality Control Analysis
10	Mathematics
10	Time Management
10	Installation
10	Systems Evaluation
10	Management of Material Resources
10	Operation Monitoring
10	Monitoring
10	Equipment Maintenance

o

        Packers and Packagers, Hand
        Graders and Sorters, Agricultural Products
        Pressers, Textile, Garment, and Related Materials
        Mathematical Technicians
        Court Reporters

Unreplaceable:

NRnew	o_net_title
33.039	Financial Examiners
33.082	Dentists, General
33.087	Judges, Magistrate Judges, and Magistrates
33.157	Clinical Nurse Specialists
33.205	Nurse Practitioners
33.284	Surgeons
33.295	Fashion Designers
33.316	Program Directors
33.318	Government Property Inspectors and Investigators
33.344	Emergency Management Specialists
33.369	Clinical Psychologists
33.461	Gaming Managers
33.543	Hospitalists
33.554	Human Resources Managers
33.565	Nuclear Medicine Physicians
33.571	First-Line Supervisors/Managers of Office and Administrative Support Workers
33.611	Preventive Medicine Physicians
33.635	Instructional Coordinators
33.653	Family and General Practitioners
33.654	First-Line Supervisors/Managers of Police and Detectives
33.661	Farm and Home Management Advisors

33.717 Child, Family, and School Social Workers

33.725 Financial Managers, Branch or Department

33.882 Sales Engineers

33.992 Social and Community Service Managers

34.018 Sales Managers

34.05 Neuropsychologists and Clinical Neuropsychologists

34.065 Counseling Psychologists

34.093 Education Administrators, Postsecondary

34.154 Lodging Managers

34.193 Arbitrators, Mediators, and Conciliators

34.2 Educational, Vocational, and School Counselors

34.207 Marriage and Family Therapists

34.27 Podiatrists

34.289 School Psychologists

34.312 Lawyers

34.399 Medical and Health Services Managers

34.813 Mental Health Counselors

35.405 Education Administrators, Elementary and Secondary School

35.691 Psychiatrists

36.662 Chief Executives

36.932 Coaches and Scouts

37.002 Clergy

But does that mean that clergymen (and woman?) will be the most highly regarded people?

Not necessarily:

1. That depends on the relevant abundance of "clergyical skills" around.
2. But moreover, we cannot really predict what will be the demand for religion in the future. Perhaps we will all abandon it and believe in the devine computer?...

- Are there any industries that are "robot-proof"? more than industries, jobs.
That require**: tacit knowledge, common sense, creativity, and social intelligence**.
All that is hard to codify or machine-learn.
Care, creativity, (feminine). Professional, trust and legitimacy.
Judges will be robots? Computational dispute resolution automatic.
Doctors: diagnose better with computer that computes all. Human intuition, aggregation. Color,
speech tone. Harder but possible. (what they ate…).
WHAT is INTUITION: you know something without calculating. Experience. Emotional intelligence
(body language, movement, tone, energy –understand if someone is happy or sad).
Psychology,
ALL THINGS FEMALE are not replaceable. But then they will cancel the robots.
***tech change in past has replace brawn and complements brain. Has increased.**

WHICH JOBS WILL REPLACE?

- Under what conditions might existing workers accept robots in the workforce?

Won't: team work, be under their supervision,
Would there be specialization. That they can do better.

- Will humans accept robots as peers or even as supervisors?
Probably better they do something else. Cannot be peers (there is talent in how

- Should these machines be considered equipment or labor?
You pay capital.

- Should humans insist on dominant decision-making roles vis-a-vis robots? Under what criteria?
Legitimacy, decision, people-related.

- What kind of teamwork can we expect between humans and robots?
The human factor will always be missing: reciprocity. Many things team work relate to relationship, will be missing.

- Who bears responsibility for the robot's functioning and malfunctioning?

- What are the repercussions of a working team, classroom, hospital ward, or office, in which there are more autonomous robots than humans?
What can they do?

- What engineering, interface, or social conditions could affect human acceptance of robot direction, instruction, and orders?
Legitimacy: when there is something they are better than us. Computation power.

- Robotics is becoming more of an interdisciplinary field. How do you see your field influencing robotics research and vice versa?