Impact of SRI Technology on Agricultural Workers' Income in Western Africa

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1. OVERVIEW

CONTEXT	**Problems:** • **62%** of Sub-Saharan Africans work in agriculture and as the rural population will continue to rise • Agriculture will need to provide additional income-earning opportunities **Solution:** • The **System of Rice Intensification (SRI)** is a rice farming technology that aims to establish early and healthy plant, minimize competition between plants, increase soil fertility and avoid flooding and water stress • SRI is widely promoted in West Africa and could address the problem
OBJECTS	• **Accumulating farmers:** produce for the market, invest in farming and hire labor – both labor and employer • **Marginal farmers:** operate small allotments but fundamentally depend on wage hour
METHODS	• **Quantitative + Qualitative**

2. Benefits of SRI for The Households

Accumulating Farmers

- Have sufficient resources, act as both employer and labor
  - Have more lands, larger operation scale, and more funds to hire labor
- Have higher risk tolerance
  - Risk of lacking water supply, more structures to maintain stable water supply
- More capable in scientific production

Marginal Farmers & External Labors

- Need to give out labor to earn income, act as labor
  - External labors are labors does not rent land and does not own land
- More likely to be influenced by unexpected risks.
- More likely to plant in ways that reduce costs.

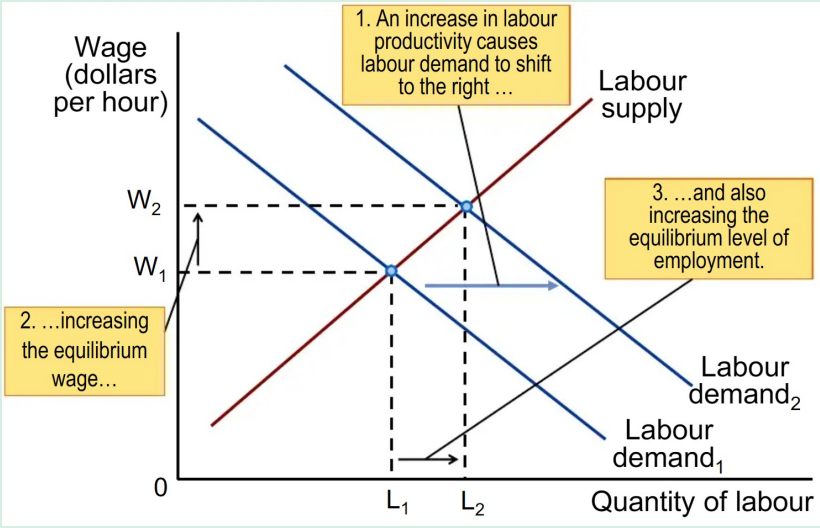
2. Benefits of SRI for The Households

Accumulating Farmers

- Invest in agriculture technology
- Overcome labor constraints by hiring
- Practice SRI on a larger scale and their absolute benefits are higher

Marginal Farmers & External Labor

- Seasonal hiring behavior increase the labor demand
- Strengthens workers' bargaining position, which increases income for workers



3.1 Experiment Design

Quantitative Analysis:

- Clustered Random Sampling
- Sample: All rice farming households from the countries where the project promoted SRI
- Stratified across region. Sampling unit: villages
- Selected households: target districts(low/high land), target crops(rise)

Qualitative Analysis

- Purposive and snowball sampling

3.2 Quantitative Analysis

Estimate the probability of adoption on SRI

- Logit Regression model: $Y_{1i}=\text{Logit}(\alpha+\beta X_i+\mu_i)$
- Y_{1i}: Probability of adopting SRI
- X_i: vector of variables determining adoption including those variables

	(1) SRI adoption
Family members helping in rice production	**0.0239***
	(0.0115)
Use of hired labour [dummy]	**0.699*****
	(0.169)
Area under rice cultivation [ha]	−0.0453
	(0.0305)
Share of rice harvest sold[a]	0.531
	(0.300)
Contact to extension [dummy]	**1.488*****
	(0.312)
Lowland production system [dummy][b]	**−0.857*****
	(0.171)
Constant	**−2.321*****
	(0.360)

Estimate the influence of SRI – Labor inputs

- OLS Regression model: $Y_{2i}=\alpha+\beta X_i+\mu_i$
- Y_{2i}: Labor input
- X_i: a vector of independent variables including SRI as well as a set of covariates

Table 4. Ordinary Least Squares regression on labour time in days per ha.

	Labour use in:					
	(2)	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	Land preparation	**Sowing/planting**	**Weeding**	**Chemical & fertilizer application**	**Pest and disease control**	**Harvest**
	[days/ha]	**[days/ha]**	**[days/ha]**	**[days/ha]**	**[days/ha]**	**[days/ha]**
SRI	−1.556	**6.954***	3.293	1.005	0.184	7.022

*Complete table in Appendix

3.2 Quantitative Analysis

Estimate the influence of SRI – Profitability

- OLS Regression model: $Y_{3i}=\alpha+\beta X_i+\mu_i$
- Y_{3i}: Profitability of SRI. Yield; Gross Margin, Productivity
- X_i: a vector of independent variables including SRI as well as a set of covariates:
  - production system
  - relevant labor-saving technologies - tractors, herbicides, combine harvesters, etc.
  - economies of scale - area under rice cultivation

Table 5. Ordinary Least Squares regression on yield, gross margin and labour productivity.

	(8)	(9)	(10)	(11)
	Yield	Gross margin [€/ha][a]		Labour productivity
	[kg/ha]	Without cost of family labour	With cost of family labour	[kg/day]
SRI	**666.2****	**263.8****	**224.3***	**96.25***
	(207.0)	(97.45)	(102.4)	(38.87)
Area under rice cultivation [ha]	**−90.46***	−35.99	−14.18	**17.54****
	(31.92)	(20.18)	(21.21)	(6.115)
Lowland production system [dummy] [c]	**−1178*****	**−962.4*****	**−1109*****	−36.85
	(204.2)	(100.4)	(105.5)	(38.45)
Tractor [dummy] [b]	−277.5	−50.86	−5.313	**140.4***
	(283.7)	(133.4)	(140.1)	(54.82)
Fertilizer [dummy]	**1011*****			
	(211.9)			
Herbicides [dummy]		55.66	−121.2	20.50
		(104.4)	(109.7)	(41.02)
Constant	**3395*****	**1512*****	**1446*****	66.44
	(239.2)	(122.5)	(128.7)	(44.25)
Observations	853	771	771	853
R-squared	0.106	0.129	0.151	0.031

3.3 Qualitative Analysis

Qualitative Results :

Farmers who are able to hire labor have an advantage in adopting SRI
Many adaptations aimed to minimize scarce labor time, which likely affects yields
SRI improves productivity, and because agricultural labor is paid on an area-by-area basis, workers can work faster and manage more acreage each day, regardless of cultivation techniques, thereby increasing their daily wages
Adoption of SRI offers clear economic advantages for farmers ➢ Farmers experience a yield difference ➢ Costs for hired labor remain the same as wages are based on area, but hours worked decrease with SRI adoption

4. Summary

Highlights

- SRI increases yields, profitability, and labor use during a bottleneck
  - ➢ farmers hire more labor
- SRI benefits all: accumulating farmers who employ hired workers, as well as marginal farmers and hired laborers
- SRI can contribute to providing income-earning opportunities

Limitations

- Farming technique leads to physical upper bound
- Not an RTC, may lead to the potential confounding bias
- Impact of marginal labor is only investigated by qualitative method

Significance

- Agricultural guidance for poor areas
- Food security improvement in poor areas

References

- Filmer, D., Fox, L., 2014. Youth employment in Sub-Saharan Africa. In: Africa Development Series. *World Bank*, Washington, DC, p. 283. https://doi.org/10.1596/978-1-4648-0107-5.
- Graf, S. L., & Oya, C. (2021). Is the system of rice intensification (Sri) pro poor? labour, class and technological change in West Africa. *Agricultural Systems*, *193*. https://doi.org/10.1016/j.agsy.2021.103229
- Kurth, T., Walker, A.M., Glynn, R.J., Chan, K.A., Gaziano, J.M., Berger, K., Robins, J.M., 2006. Results of multivariable logistic regression, propensity matching, propensity adjustment, and propensity-based weighting under conditions of nonuniform effect. *Am. J. Epidemiol.* 163 (3), 262–270. https://doi.org/10.1093/aje/kwj047.
- Losch, B., 2016. Structural Transformation to Boost Youth Labour Demand in Sub-Saharan Africa: The Role of Agriculture, Rural Areas and Territorial Development. *Employment Working Paper*. International Labour Office, Geneva.
- Sass, J., Kleemann, L., Prothmann, J., Semrau, F.-O., Kreipe, L., Pizzuti, C., Dirks, S., 2018. Green Innovation Centres for the Agriculture and Food Sector Midterm Study - Global Report (GFA Consulting Group GmbH)
- SRI-Rice, 2021. Journal Articles about the System of Rice Intensification (SRI). [online] SRI International Network and Resources Center (SRI-Rice). Available at http://sricals.cornell.edu/research/JournalArticles.html

Appendix

Table 4
Ordinary Least Squares regression on labour time in days per ha.

	Labour use in:					
	(2)	(3)	(4)	(5)	(6)	(7)
	Land preparation	Sowing/ planting	Weeding	Chemical & fertilizer application	Pest and disease control	Harvest
	[days/ha]	[days/ha]	[days/ ha]	[days/ha]	[days/ha]	[days/ha]
SRI	−1.556	**6.954***	3.293	1.005	0.184	7.022
	(2.361)	(3.089)	(2.751)	(0.781)	(4.997)	(4.159)
No SRI & lowland production system [interaction term]	−3.805	2.001	3.044	0.785	−12.38	−2.275
	(3.289)	(4.294)	(3.809)	(0.995)	(6.938)	(5.729)
Area under rice cultivation [ha]	−0.491	−0.708	**−0.941****	**−0.190***	−0.536	**−1.006***
	(0.278)	(0.364)	(0.326)	(0.0769)	(0.593)	(0.489)
Lowland production system [dummy] [a]	5.305	1.146	**−6.369***	1.551	**28.14*****	6.641
	(2.745)	(3.514)	(3.116)	(0.816)	(5.674)	(4.755)
Family members helping in rice production	−0.0796	0.0112	0.240	0.0297	**−0.731****	−0.0912
	(0.113)	(0.146)	(0.130)	(0.0375)	(0.237)	(0.206)
Powertiller [dummy] [b]	−6.658					
	(4.231)					
Ploughing [dummy] [b]	**−7.482*****					
	(1.669)					
Herbicides [dummy]	**−6.562*****		**−5.852****			
	(1.732)		(2.005)			
Tractor [dummy] [b]	−1.937	−3.656	**−6.321***	0.126		
	(2.341)	(2.952)	(2.675)	(0.655)		
Fertilizer [dummy]				**2.689*****		
				(0.496)		
Combine harvester [dummy] [b]						−23.93
						(13.77)
Threshing machine [dummy] [b]						−23.44
						(38.64)
Yield [kg/ha]						0.00002
						(0.000474)
Constant	**22.22*****	**14.66*****	**20.47*****	0.569	**16.08*****	**24.35*****
	(2.379)	(2.389)	(2.452)	(0.638)	(3.804)	(3.657)
Observations	841	829	852	518	852	831
R-squared	0.073	0.019	0.040	0.098	0.079	0.027

A day is assumed to be 8 h, longer and shorter days were adjusted accordingly.
Standard errors in parentheses.
*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.
[a] default: irrigated production system.
[b] dummies refer to use, not ownership of equipment.

How does new technology affect the finance industry?

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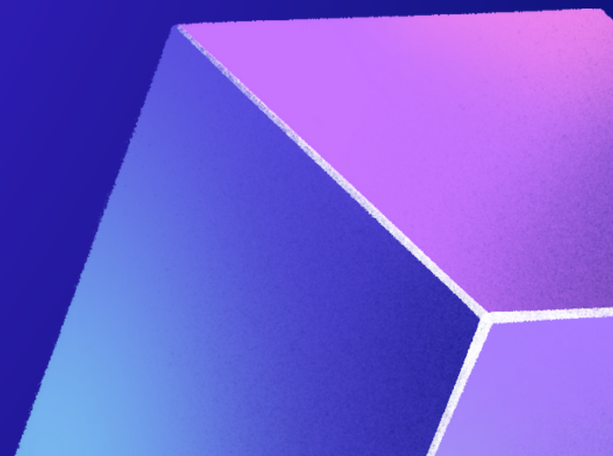


Technology Uses in Financial Jobs

TECHNOLOGY IS BEING USED IN VARIOUS AREAS OF FINANCE - BANKING, ACCOUNTING, INSURANCE, INVESTMENT

> 2.5 MILLION FINANCIAL SERVICES EMPLOYEES ARE EXPOSED TO AI TECHNOLOGIES IN THE U.S.
>
> IT IS ESTIMATED THAT 1.2 MILLION PEOPLE WORKING IN BANKING AND LENDING WILL BE REPLACED BY AI SOFTWARE BY 2030

1.FRAUD DETECTION AND RISK MANAGEMENT

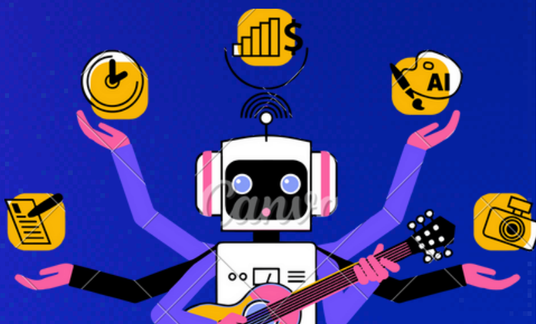
- AI recognizes patterns of individual behaviours and detect irregular patterns.
- AI platform ThetaRay is one of the platforms being used in financial institutions to identify loan frauds, ATM hacks, money laundering, cyber-attacks. (Narrative Science, 2018)

2.TECHNOLOGY USES IN AUDITING

- Reduces audit risks
- increases the security rate
- reduce audit time
- KPMG and Deloitte are using AI in their auditing process

3.CREDIT DECISIONS

- Machine Learning provides quicker and more precise evaluation, using broader data
- differentiate high-default risks candidates by analyzing past behaviours and data patterns.
- Machine is unlikely to be partial = objectivity is an advantage.



Technology Uses in Financial Jobs

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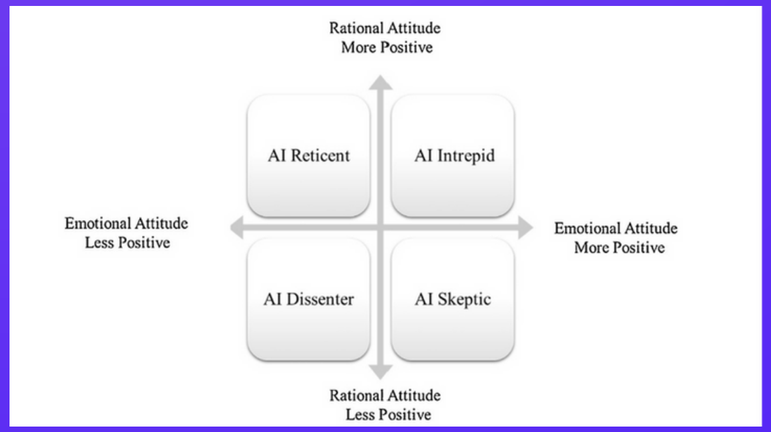
4.ALGORITHMIC TRADING

- Hedge fund Numerai uses AI to make trading decisions
- Aidiya, Hong Kong based fully autonomous hedge fund makes all of its stock trades using AI
- investors can be ensured that significant opportunities are not missed (Kunwar, 2019)
- minimizes risks associated with emotion (Motley, 2019)

5. CHATBOTS,VIRTUAL ASSISTANTS

- reduce interactions of customers with bankers
- new AI technology called ‘Natural Language Processing (NLP)’
- chatbot Erica in Bank of America
- JPMorgan relies on NLP to analyze numerous legal documents in seconds

Why would AI decrease employment and wages?



different feelings of AI of workers (Zhu et al., 2021))

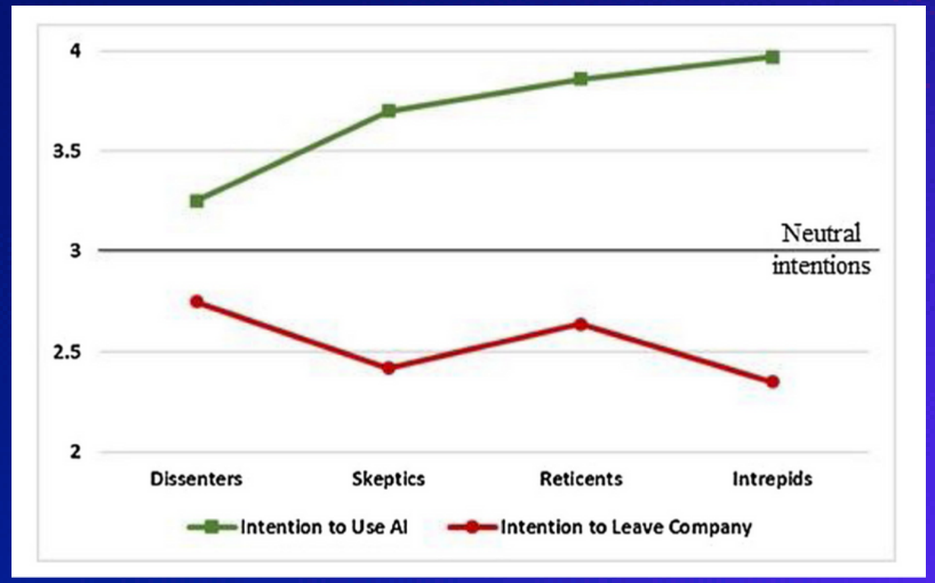
MORE TRAINING FOR WORKERS

- skills become outdated quicker with AI (Su et al., 2021)
- more training required, higher training cost
- just use AI
- people who need to learn new things because of AIs might leave the firm and work elsewhere (Zhu et al., 2021)

WORKERS WORKING WITH AI OR LEAVING

- “AI Reticents”: agree that AIs are capable but do not like them, least people belong in this group (Zhu et al., 2021, p.4)
- “AI Skeptics”: do not think the AIs are capable but like them, group size is thrid (Zhu et al., 2021, p.4)
- “AI Interpids”: agrees that AIs are capable and like them, second largest group (Zhu et al., 2021, p.4)
- “AI Dissenters”:: do not think the AIs are capable and do not like them, the group with most people (Zhu et al., 2021. p.4)
- workers who do not like the use of AI of a firm might leave (Zhu et al., 2021)

Why would AI increase employment and wages?



what workers will do with AI (Zhu et al., 2021)

TASKS THAT AI CANNOT COMPLETE

- innovative ideas, communicating with other people (Su et al, 2021)
- higher pay for these jobs (Su et al., 2021)
- countries wishing to have new organizations for these king of training (Villani et al., 2017, as cited in Su et al., 2021)

EXAMPLES IN THE FINANCE INDUSTRY

- necessary emotions, like dealing with inheritance (Crosman, 2018)
- AI Chatbot cannot understand the moods of clients (Crosman, 2018)

WHAT WORKERS WILL DO WITH AI

- the score for leaving the firms are quite low for all four groups (Zhu et al., 2021)
- workers are willing to try and use AI (Zhu et al., 2021)

New Work Opportunities with Technology in Finance

Emergence of **newer** fintech roles
+ an increase in demand of
existing fintech roles

- **AI**
  - Machine Learning
- **Blockchain**
- **Automation**
  - RPA
- **Cybersecurity**
- **Data**

New Work Opportunities with Technology in Finance

Reshaping of traditional roles to be **complimentary** to new technological landscape

- **Upskill** and **reskill** of employees → **DIGITAL SKILLS**

Upskilling

Reskilling

Will Technology replace workers in Finance Industry?

LIFESTYLE

Is the AI apocalypse actually coming? What life could look like if robots take over

From job losses to mass extinction events, experts are wa
technology risks opening a Pandora's Box of horrors if left
they right to be sounding the klaxon? Katie Strick reports

- Automated ordering machines
- Repetitive and routine work
- Data entry
- Customer support

FORBES > BUSINESS

Will AI Take Over The World? Will You Take Charge Of Your World?

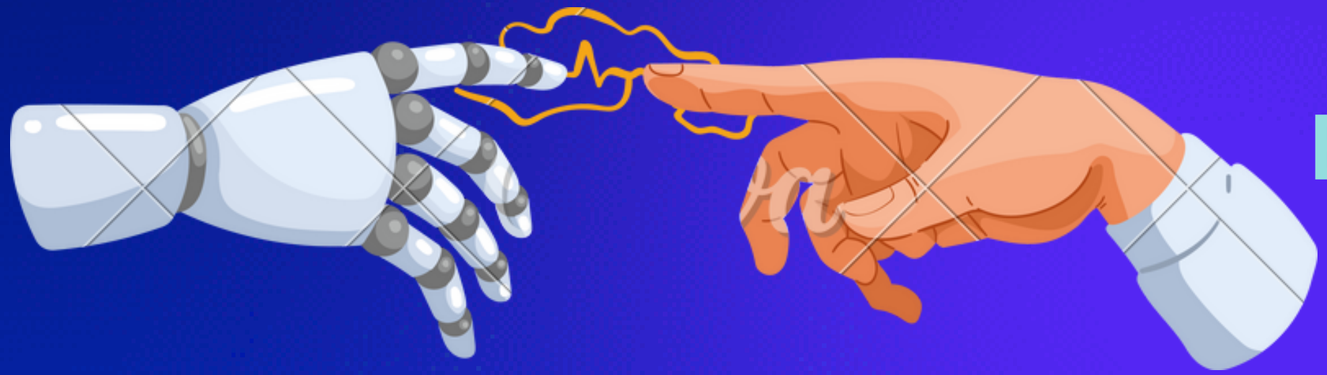
FB

Bhopi Dhall and Saurajit Kanungo Forbes Books Author

Forbes Books AUTHOR POST | Paid Program

- Finance Advisors
- Risk Managers
- Compliance Officer
- Traders
- Investment Bankers
- Portfolio Managers
- Fianncial AUditors
- Finance Lawyers

Human trust, understanding, empathising, ethical decisions



Enhancement rather than replacement

References

Bandi, S., & Kothari, A. (2022). Artificial Intelligence: An Asset for the Financial Sector. Impact of Artificial Intelligence on Organizational Transformation, 259-287.

Boustani, N. M. (2022). Artificial intelligence impact on banks clients and employees in an Asian developing country. Journal of Asia Business Studies, 16(2), 267-278.

Crosman, P. (2018). How artificial intelligence is reshaping jobs in banking. American Banker, 183(88), 1.

Gustafsson, V. (2018). Artificial intelligence effect on jobs in the financial sector. Mid Sweden University, 9-10.

Kanokkorn, M. (2020). Artificial Intelligence: An analysis of perceptions of the impact of AI on the financial labour market. Arcada University of Applied Sciences, 34-35.

Kunwar, M. (2019). Artificial Intelligence in Finance, Understanding how automation and machine learning is transforming the financial industry. Centra University of Applied Science, 23-29.

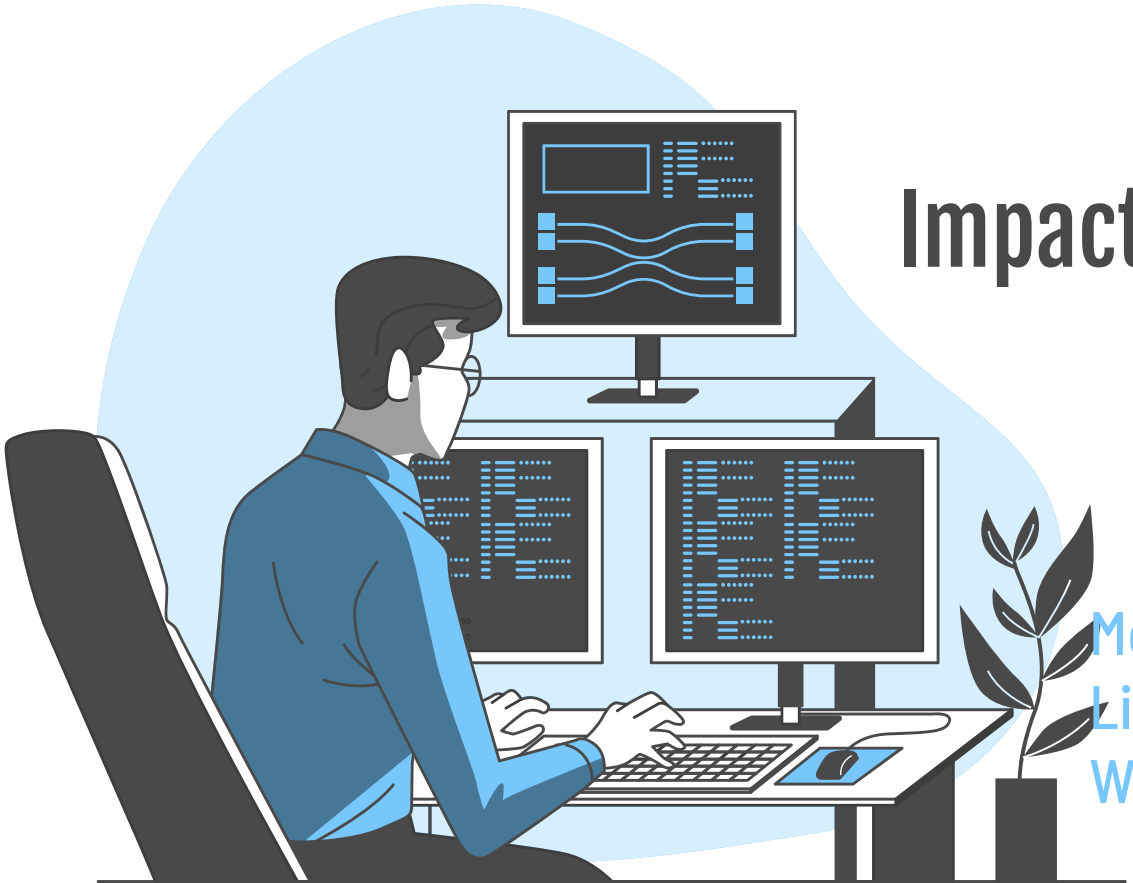
Lavrynenko, A., & Shmatko, N. (2019). Twenty-first century skills in finance: Prospects for a profound job transformation. Foresight and STI Governance, 13(2), 42–51. https://doi.org/10.17323/2500-2597.2019.2.42.51

Mosteanu, N. R. (2020). Finance digitalization and its impact on labour market. Technium Social Sciences Journal, 8, 598–605. https://doi.org/10.47577/tssj.v8i1.804

Skillfine. (2023). 10 Finance Jobs that AI Can’t Replace in the Next Decade. Skilfine. https://docs.google.com/document/d/11D_rw32_eQBym0Cohavm58h6y0pMGT6VGoLT5UshafU/edit

Su, Z., Togay, G., & Côté, A.-M. (2021). Artificial Intelligence: A destructive and yet creative force in the skilled labour market. Human Resource Development International, 24(3), 341–352. https://doi.org/10.1080/13678868.2020.1818513

Zhu, Y.-Q., Corbett, J. ueline, & Chiu, Y.-T. (2021). Understanding employees’ responses to Artificial Intelligence. Organizational Dynamics, 50, 1–10. https://doi.org/10.1016/j.orgdyn.2020.100786



Impact of new technology on labour market: History and Future

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01
Introduction

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Introduction

- New technology enables higher efficiency in decision and production process.
- As machines are more precise and efficient in repetitive work, more and more low skilled workers are substitute.
- AI gathers information from data storage and helps to make decision which weaken the position of high-skilled workers

02
History

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How technology affect labor in the past

Table C.1: How technology and skills at work interact

		Skill complementarity	
		High	**Low**
Ease of automation	**High**	Routine cognitive	Routine manual
	Low	Non-routine cognitive	Non-routine manual

Source: World Bank (2016).

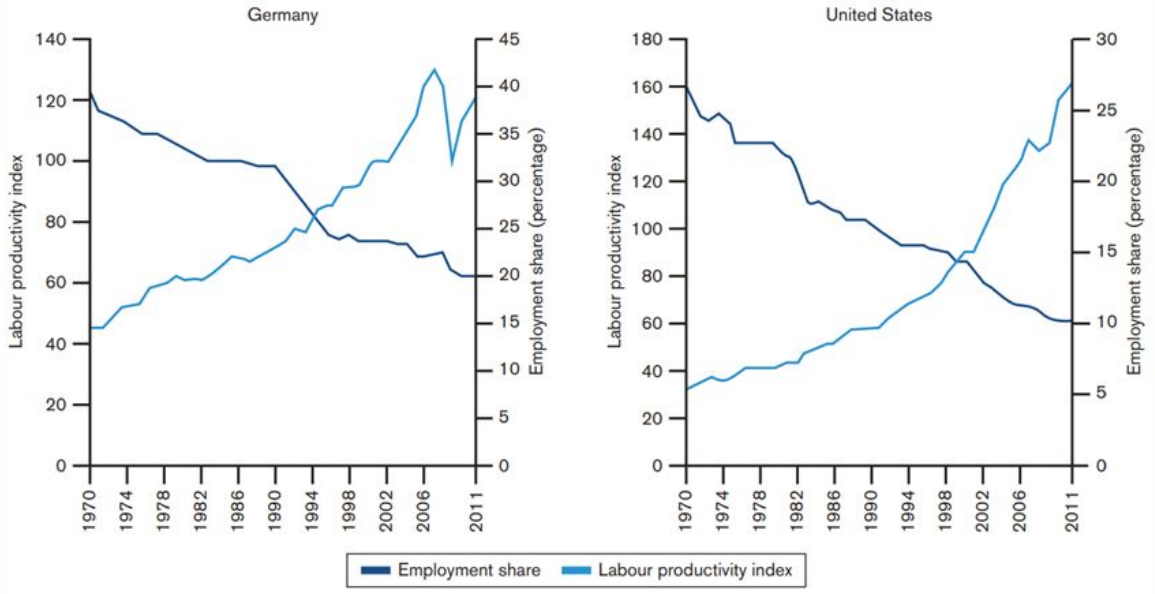
Table C.2: Expected effects of technology on employment and earnings by types of occupation

Type of occupation (by skill intensity)	Expected impact on employment	Expected impact on earnings
Non-routine cognitive	Positive	Positive
Routine cognitive and manual	Negative	Negative
Non-routine manual	Positive	Negative

Source: World Bank (2016).

Real Cases: USA and Germany (1970-2011)

Figure C.2: Evolution of employment and output per worker in manufacturing of selected industrial countries (1970 to 2011)

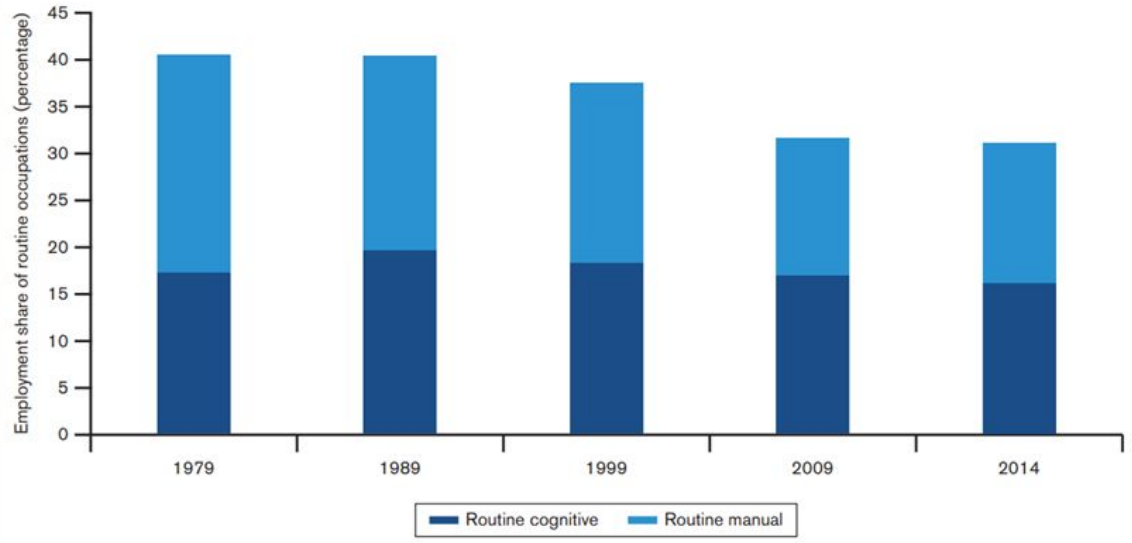


Source: US Department of Labor Bureau of Labor Statistics (BLS) International Labor Comparisons (ILC) data.

Notes: Labour productivity measured as output per employed person (index, 2002 = 100 and percentage).

Real Cases: USA (1979 - 2014)

Figure C.4: Evolution of employment shares of routine occupations in the United States (1979 to 2014)

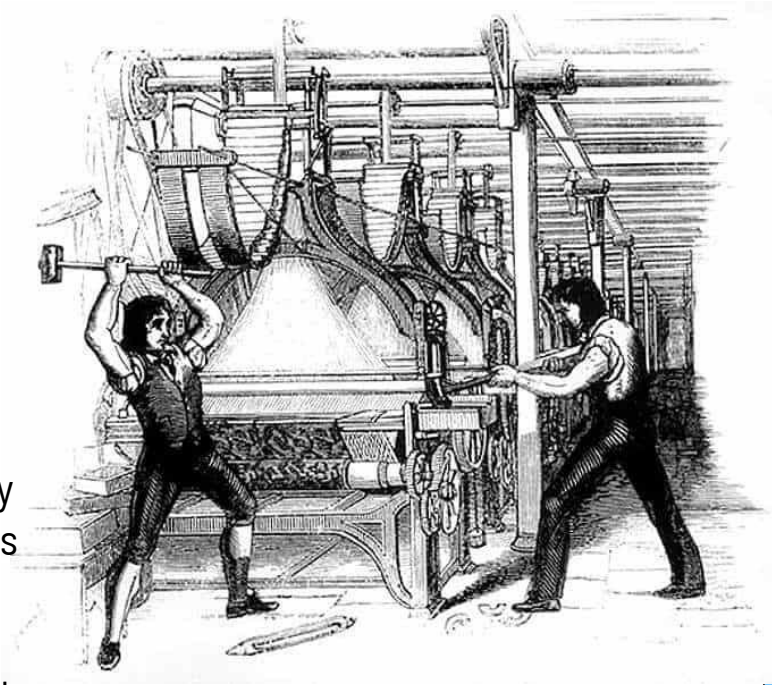


Source: Cortes et al. (2016).

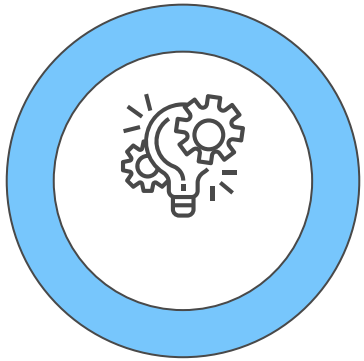
Notes: Employment shares based on individuals aged 20-64 from the monthly Current Population Survey (US Bureau of Labor Statistics), excluding those employed in agriculture and resource occupations.

Side effect: England (1811 – 1816)

- A group of workers (The Luddites) destroyed machinery
- They feared it was a threat to their jobs, particularly in cotton and woolen mills
- Economists (John M. Keynes and Wassily Leontief) expressed worry that machines will replace more and more workers.
- May lead to technological unemployment



03
Future



AI Generation

Before the Machine Learning and AI becomes developed, industrial robots have already taken on those routine tasks in manufacturing, now with the help of new technology, computers can even do those Non-routine tasks.

Technology Bottlenecks

Perception & Manipulation

Finger Dexterity
Manual Dexterity

...

Creative Intelligence

Originality
Fine Arts

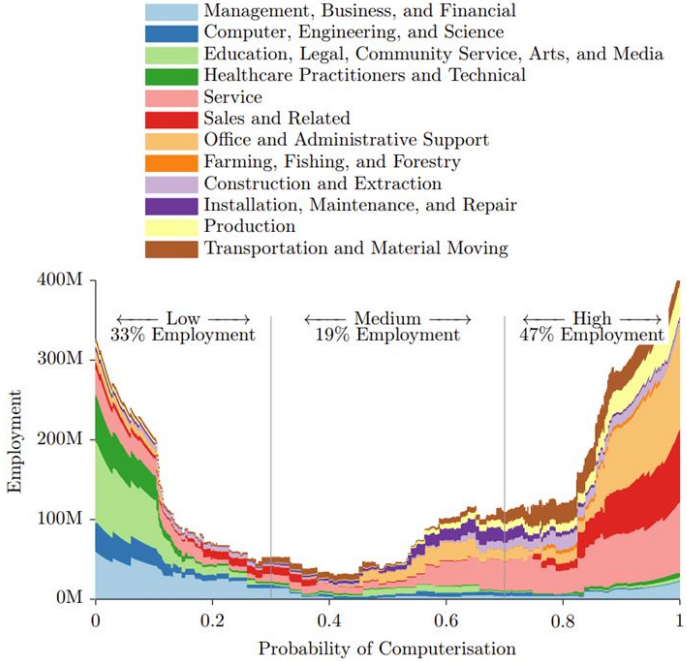
...

Social Intelligence

Social Perceptiveness
Negotiation
Persuasion

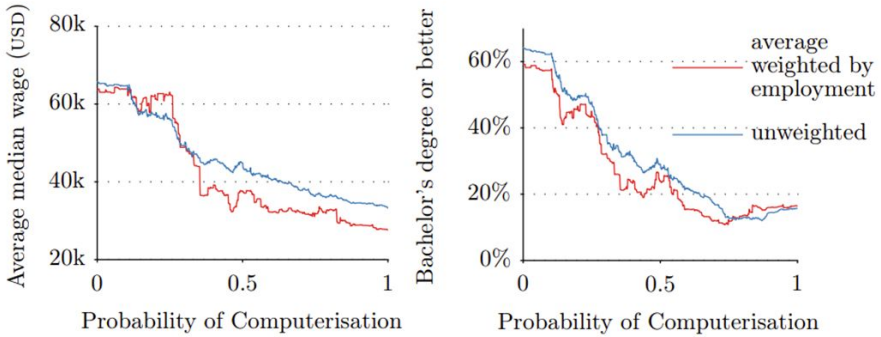
...

Predication



- 47% of total US employment have high probability of computerization
- Transportation and Logistic
- Office and Administrative Job
- Service and Sales with low social intelligence requirement

Education and Income Level



1.strong negative relationship with the probability of computerization

2.Polarize jobs into

•Creativity and Problem Solving

•Manual tasks that are difficult to automate

3. Different from 19th century where high skill labor is substitute by the simplification of work

04
Conclusion

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