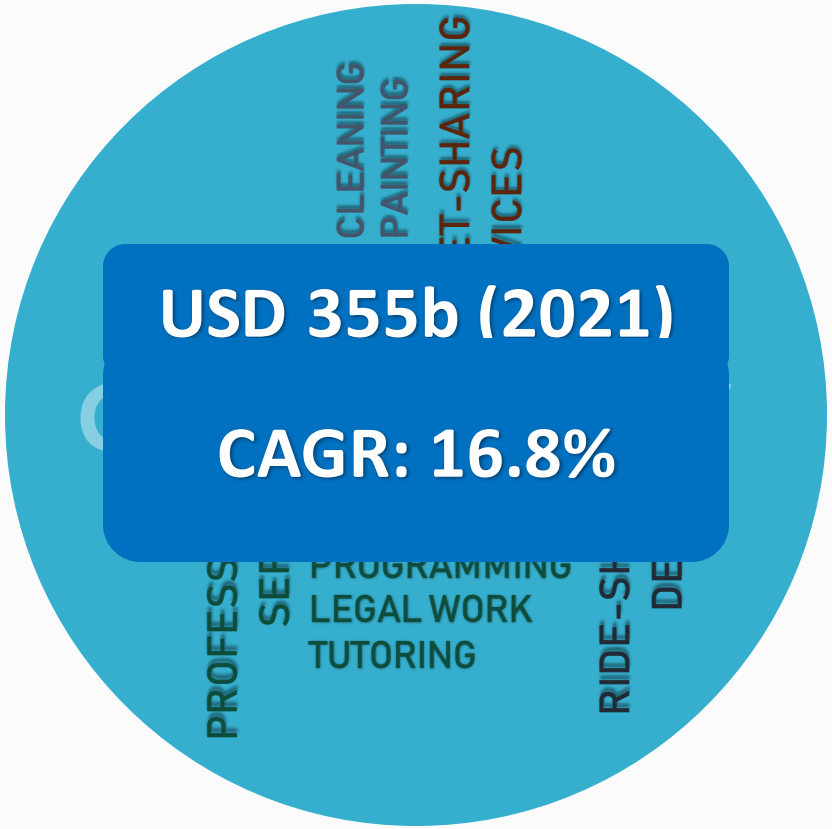
The Gig Economy

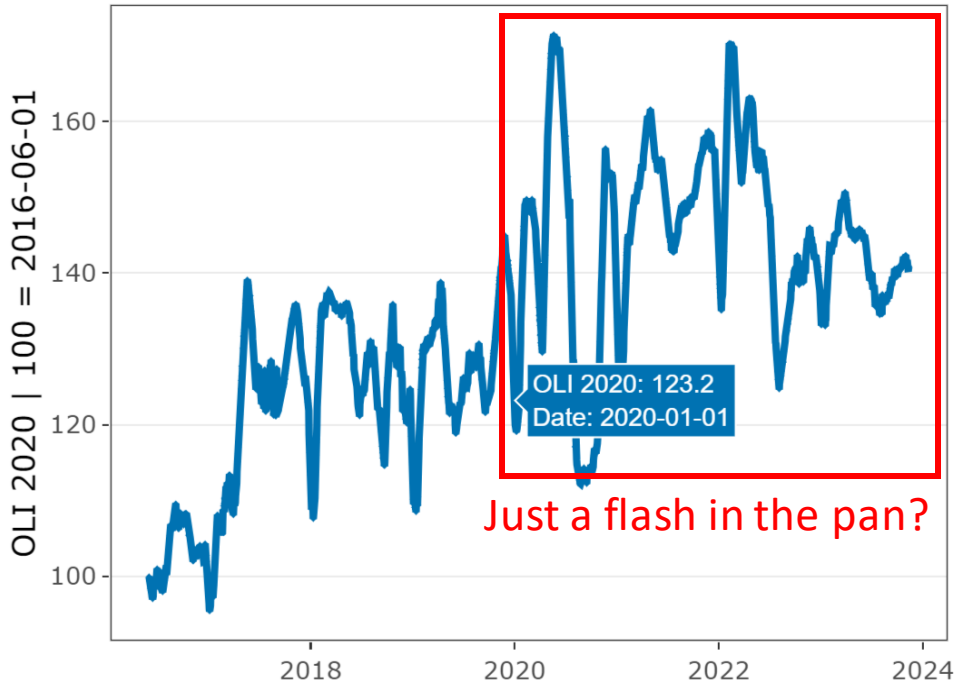
- “people take up several part-time jobs to make a living or engage in project-based or consulting work” (Brown, 2009)
- On-demand, freelancing activities, temporary employment or even the less formal segments of the labour market
- Includes on-site and off-site jobs



Trends of the Gig Economy - Increased Employment

- Online Labour Index (OLI): 40% of total jobs, 15m skilled professionals
- Attractive to unemployed (youth) / underemployed population
  - ✓ Young people: opportunity/incentive
  - ✓ Increased participation for women
  - ✓ Work opportunities in smaller towns and villages (6/10)
- A form of unemployment insurance
- Companies: Lower costs of accessing specialized workers
  - Benefits businesses — remain competitive
- An over-glorified gig economy?

The race to the bottom phenomenon



Source: OLI 2020 | onlinelabourobservatory.org

However, Gig work is not very generous to its workers.

- Lower wage among gig workers
  - In the US: 29% gig workers earn less than minimum wage
  - 20% have difficulty to fulfil daily needs
- Gig work is much more vulnerable to exogenous shocks
  - During COVID, gig economy drivers reported a 20% larger decrease in income than traditional workers (Apouey et al., 2020)
- Gig workers receive virtually zero social benefits
  - Movements and lawsuits: Uber, Lyft
- So why are gig workers so vulnerable?
  - Inelastic supply due to low wages, low investments in human capital, and a lack of worker protection

Theory of gig platforms: A two-sided market

- Gig platforms: intermediary for both the worker and the employer.
- Considerations for platforms: network effect
  - Cross-side network effect is positive while same-side network effect is negative.
- Platform commission depends on…
  - demand for tasks
  - costs of those workers
  - **elasticity of response on the other side** (Rysman, 2009)
- As mentioned: inelastic labor supply, low bargaining power for workers in platforms lead to the race to the bottom phenomenon
  - The number of gig workers has seen a record increase during Covid, possibly due to unemployment insurance effect (OLI, 2020)
- Implications: lower wage, less incentive, slower growth / increase exit

Case Study: the transportation industry

- JP Morgan: between 2013-2017, earnings from rideshare fell by 53%
  - Attributed to rapid growth in the number of drivers on the roads
- During COVID, in the US:
  - All types of workers in the transportation industry work less
  - More people joined the ride-hailing app category
  - The hourly wage of gigs were more affected compared to conventional workers

Variable	Category	Public transport	Ride-hailing apps	Delivery apps
Weekly hours worked	Pre-pandemic: mean	48.5	44.5	37.8
	Pre-pandemic: variation coefficient	26%	45%	53%
	During pandemic: mean	33.3	25.4	34.9
	During pandemic: variation coefficient	36%	86%	59%
Hourly average wage in USD	Pre-pandemic	4.9	5.1	3.6
	During pandemic	5.3	4.9	3.4
	Change	0.4	−0.2	−0.2

Source: Abraham et al., 2021

Case Study: Amazon's Mechanical Turk Platform

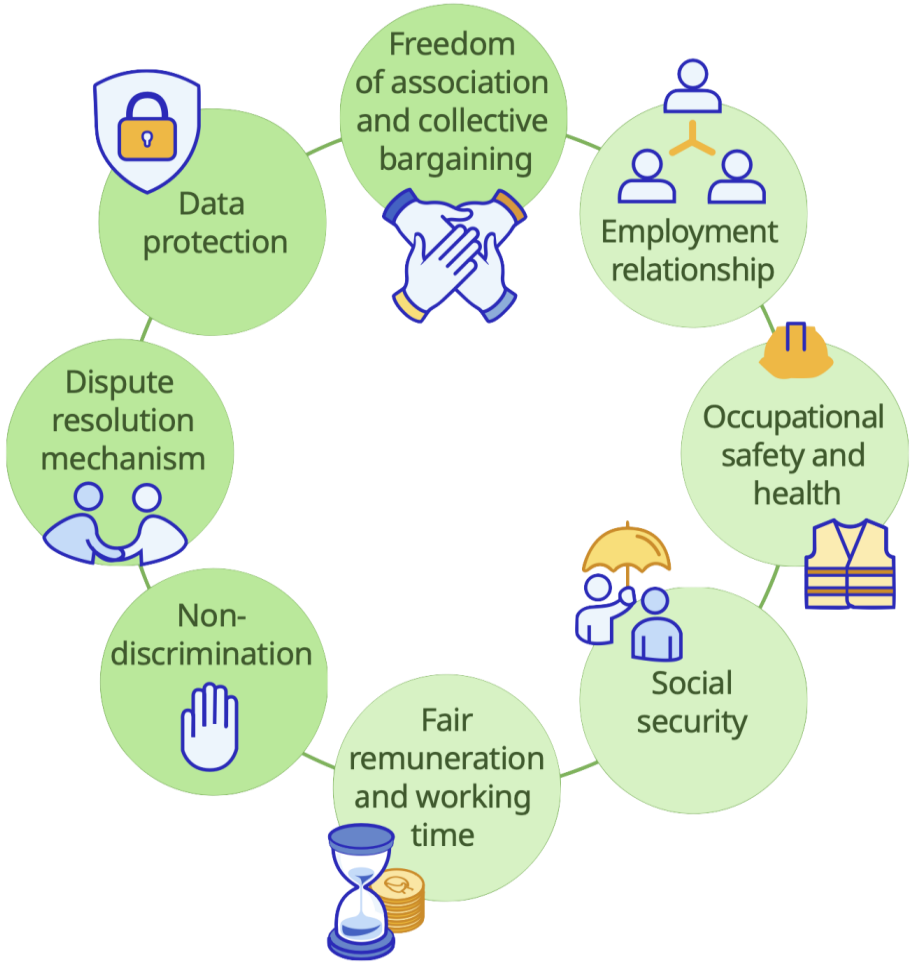
A micro-crowdsourcing platform where both industry and individual users can submit tasks (such as content creation, reviews and evaluations, information finding etc.) for "Turkers" to take up.

- Mean wage: $3.13/h
- ~4% of workers earn more than $7.25/h (US minimum wage)
- Requesters pay $11.58/h on average
  - Those who pay lower tend to post more
- Factors inducing low hourly wages
  - Searching for tasks
  - Working on rejected tasks (task spamming)
  - Working on tasks that aren't submitted

Source: Hara et al., 2018

Implications and the future of the Gig Economy

1. **Government regulation**
   - Growing trend of jurisdictions addressing digital labour working conditions
   - Classification of gig workers as employees
   - Updated labour policy and inspections
2. **Platform design and regulation**
   - Several prominent platforms signed the World Economic Forum Charter of Principles (2020)
   - The Fairwork Foundation translated a code of principles into measurable thresholds
   - Transparency of platform algorithms



Source: International Labour Organization, World Employment and Social Outlook 2021

Key Takeaways

- Gig economy: on-demand, project-based work
- Growth of the gig economy is over-estimated
- Wages of gig workers are falling/plateauing
- Sufficient regulation is crucial for the gig economy to be fully utilised

Evolution of Routine Jobs vs. Non-Routine Jobs —The Impact of Technology Advancement

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Definition & Technological Background

Routine Jobs

- **Definition:**
  - Jobs with repetitive tasks that can be easily automated or outsourced.
  - Common in manufacturing, clerical sectors.

- **Technological Background**
  - Job displacement caused by technology
  - Efficiency and productivity improvement
  - Standardization of product quality

Non-Routine Jobs

- **Definition:**
  - Irregular jobs usually requiring problem-solving, creativity, and social interaction, making them less susceptible to automation and outsourcing.
  - Common in technology and innovation related sectors.

- **Technological Background**
  - Enhancement of cognitive and analytical capabilities
  - Efficiency and productivity improvement
  - Changing skill requirements

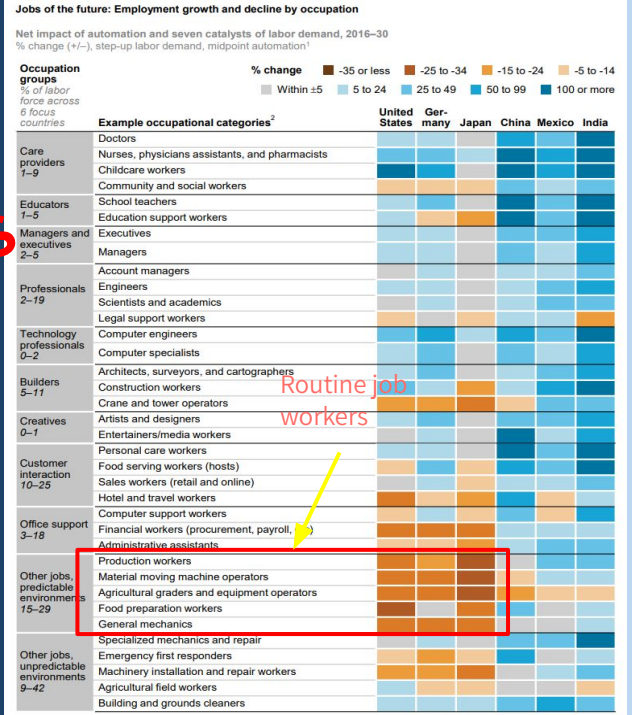
General Trend in Labor Market

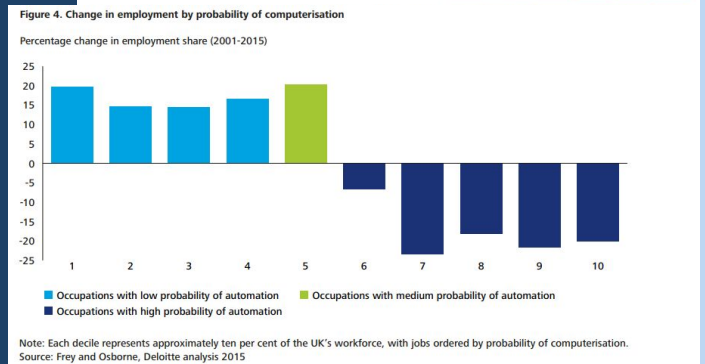
- Occupations that are most susceptible to automation:
  — office support occupations
  —some customer interaction jobs
  —jobs carried out in predictable settings

ROUTINE JOB WORKERS

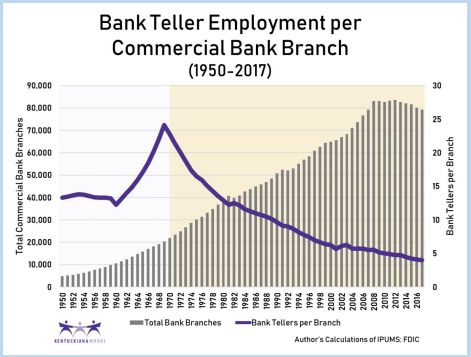
- High-skilled, non-routine jobs represent-almost exclusively- the increase in share of total UK employment since 2001, while exclusively low-skilled, routine jobs have diminished in share.

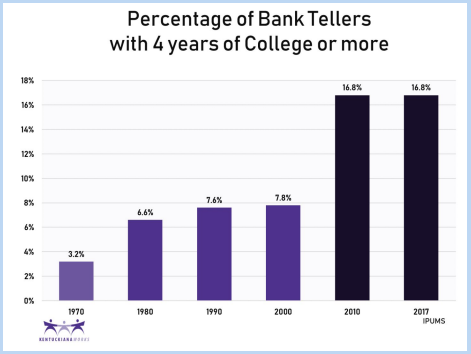
Technology-driven shift from low skill, routine jobs to higher-skill, non-routine jobs.

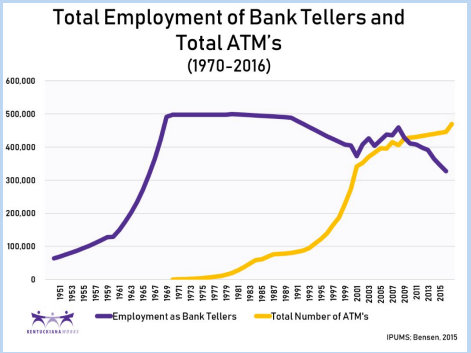




Typical Routine Job —Bank Tellers



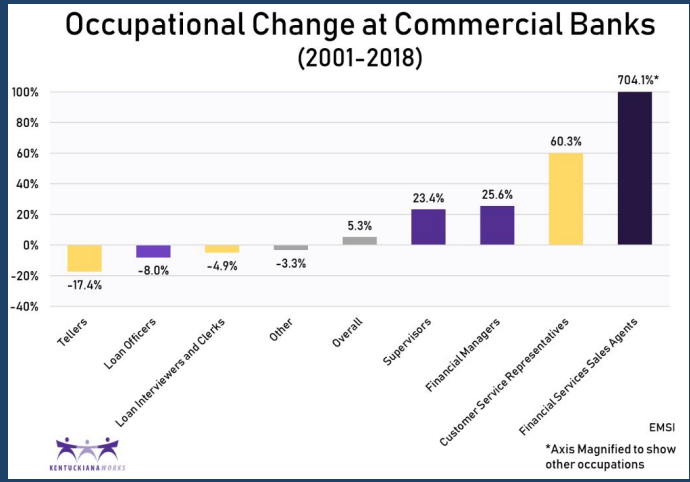




Why the introduction of ATMs didn't immediately reduce the need to hire bank tellers?
—ATM allowed banks to operate more efficiently→ more branches were opened → Hired more tellers although fewer tellers per branch.

- As ATM technology becomes more sophisticated, in the next 20 years up to **90%** of bank teller's original duties are expected to be automated by ATMs.
- Two results:

1) "skill-biased technological change"- as a result of automation, **more education is needed** for bank teller jobs.
2) **Job duties** of bank tellers have **changed**–more customer service and sales training.



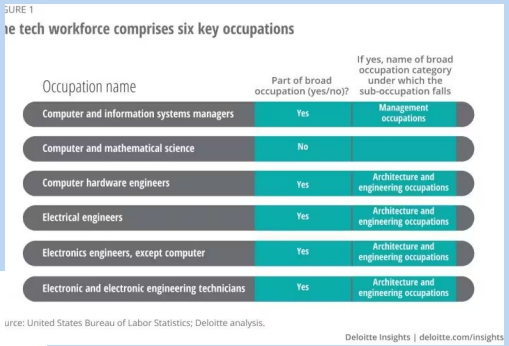
- Number of bank tellers in Commercial Banks decreased during 2001-2018 **(-17.4%)**

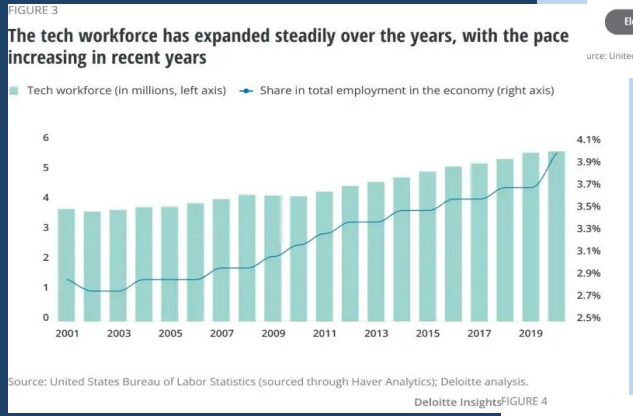
Typical Non-Routine Job —Tech Workforce

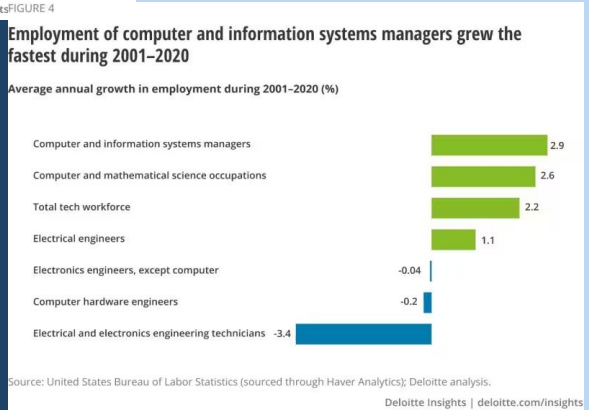
- Six occupations comprise the tech workforce. Only “Computer and Mathematical Science Occupations”, is a broad occupation category (part of the 22 broad ones)

- The tech workforce has been **growing steadily between 2001-2020**, with an average annual rate of 2.2%.
- The pace of expansion in the tech workforce increases in recent years.
- Even during the pandemic, the tech workforce continued to expand, rising by 0.7% in 2020.
  — Remote-working mode needs tech talent to support
  — The digitization of businesses and economy-wide adoption of AI and the IoT likely intensified → rising demand for talent with advanced analytical skills

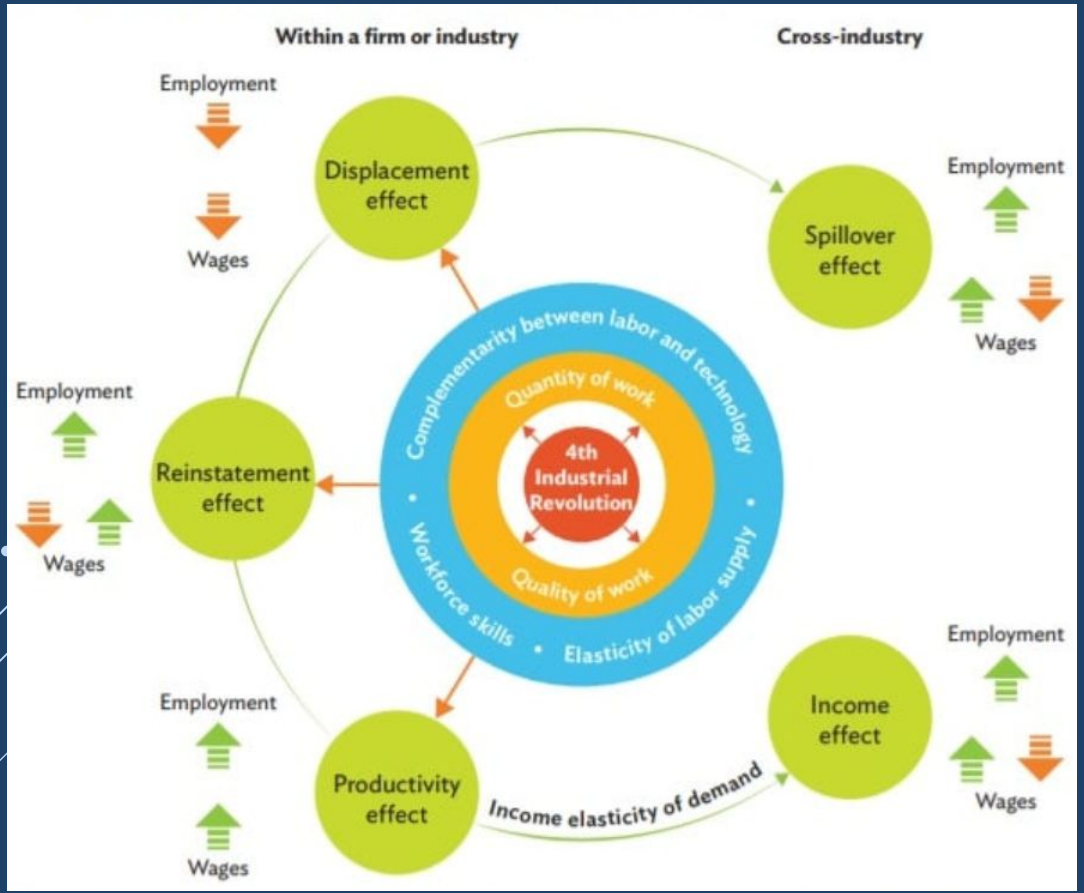
- Why demand for core engineering-related talent decreases???
  — Increased digitization and more sophisticated systems may not require a proportionate increase in the engineering and technician talent pool.







Analytic Framework



Note: Arrows indicating a rise or fall in employment or wages reflect empirical findings from existing studies, but they do not necessarily mean the result is obtained each time the effects are studies
Source: ADB based on Autor (2015) and Acemoglu and Restrepo (2018)

- **Displacement Effect**: Robots and computers are good at routine tasks, demand and wages will fall for labors doing routine tasks.
- **Reinstatement Effect**: Automation can spawn new labor-intensive tasks and jobs, raising demand for labor. The effect on wages is depends.
- **Productivity Effect**: Automation improves productivity and lowers production costs. Larger product demand increases labor demand.
- **Income Effect**: When technology complements labor, workers' higher incomes will increase their demand for goods and services.
- **Spillover Effect**:
  — Firms in downstream industries benefit from cheaper and/or better-quality inputs, while firms in upstream industries benefit if the output of the automating industry expands.
  — Other industries learn the benefits of adopting the new technology.
  — Workers with new skills move between industries, spreading technological knowledge.

Suggestions

Routine Job Workers

- Upskilling programs
- Soft skills development

Companies

- Training programs like mentorship and leadership programs
- Career pathing support

Non-Routine Job Workers

- Enhancing creative and analytical abilities
- Maintaining compatibility between skills and technology

Government

- Increasing subsidies for training programs
- Educational reform

Conclusion

- Embrace technology
- Balance technological advancement with the preservation of meaningful employment opportunities through joint efforts to boost economic development

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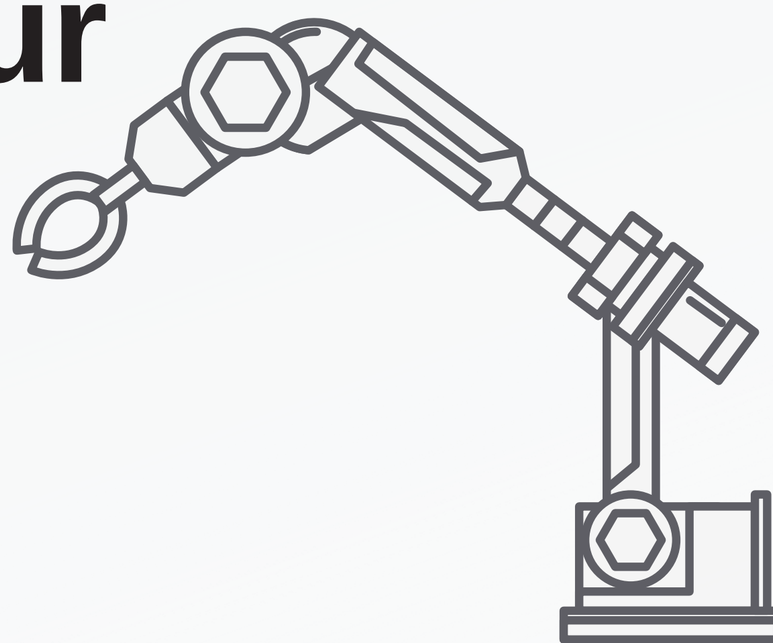
The Effects of AI & Robotic Automation on Human Labour



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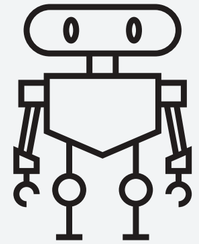
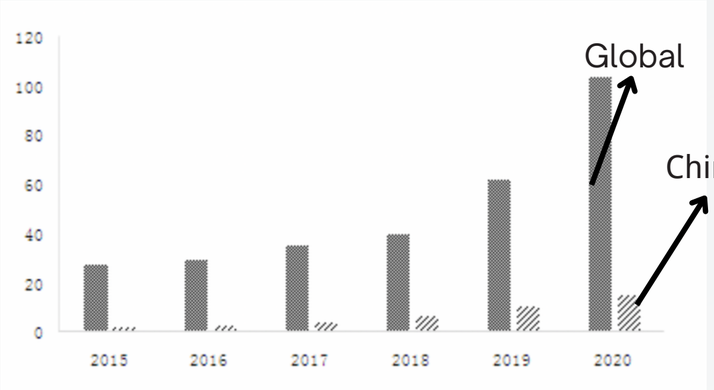
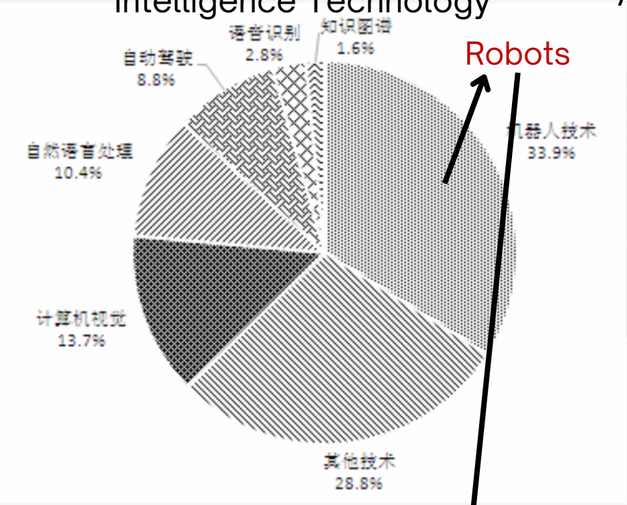


BACKGROUND——THE APPLICATION OF AI& ROBOTIC AUTOMATION

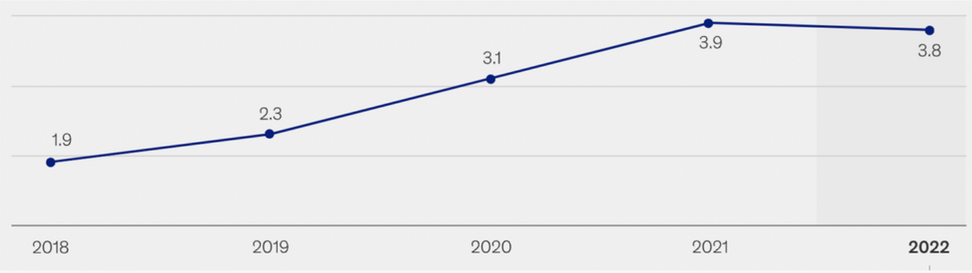
AI Market Size (in billions of dollars)



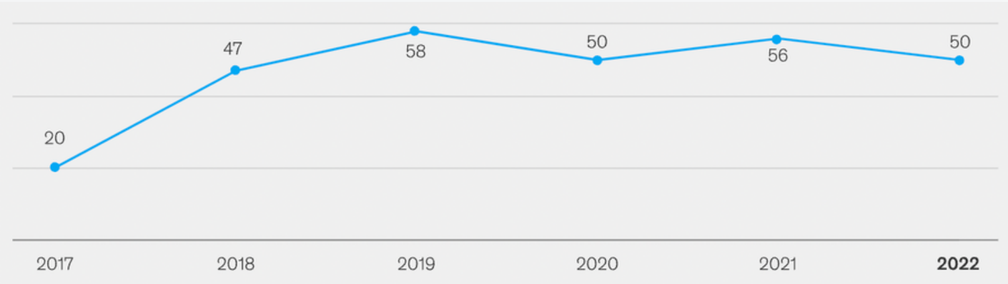
Global Funding Volume in Artificial Intelligence Technology



Average number of AI capabilities that respondents' organizations have embedded within at least one function or business unit



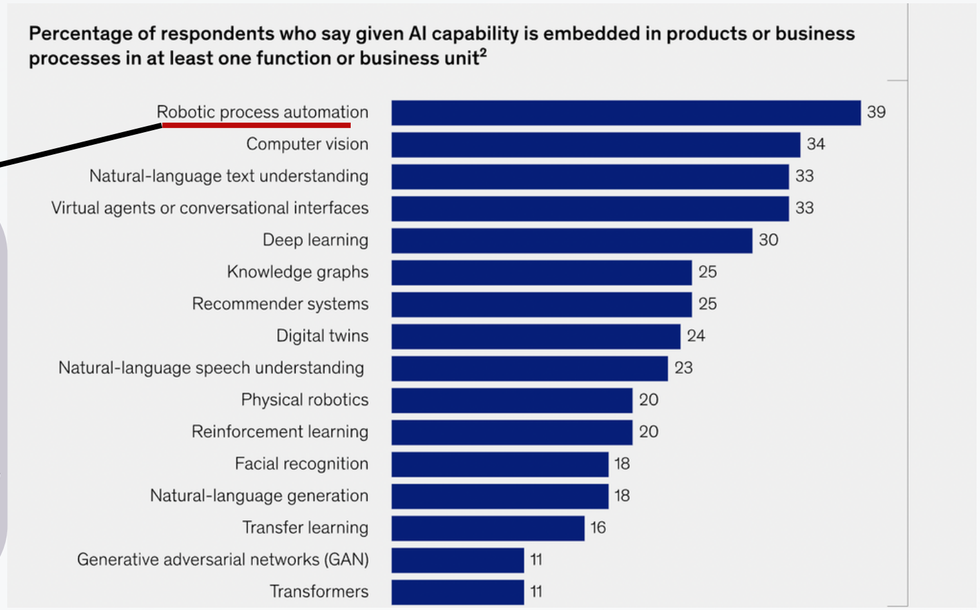
Share of respondents who say their organizations have adopted AI in at least one business unit or function, %



"The state of AI in 2022"——Michael Chui

- **AI adoption has grown rapidly and more than doubled over the past 5 years**

Robotic process automation remained the most commonly deployed



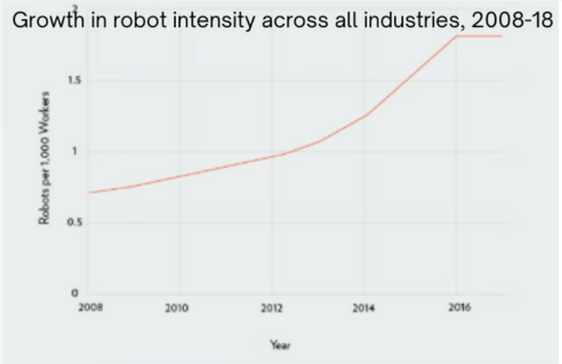
- **The average number of AI capabilities that organizations use has also doubled—from 1.9 in 2018 to 3.8 in 2022**

https://www.yicai.com/news/101088220.html
https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2022-and-a-half-decade-in-review#/

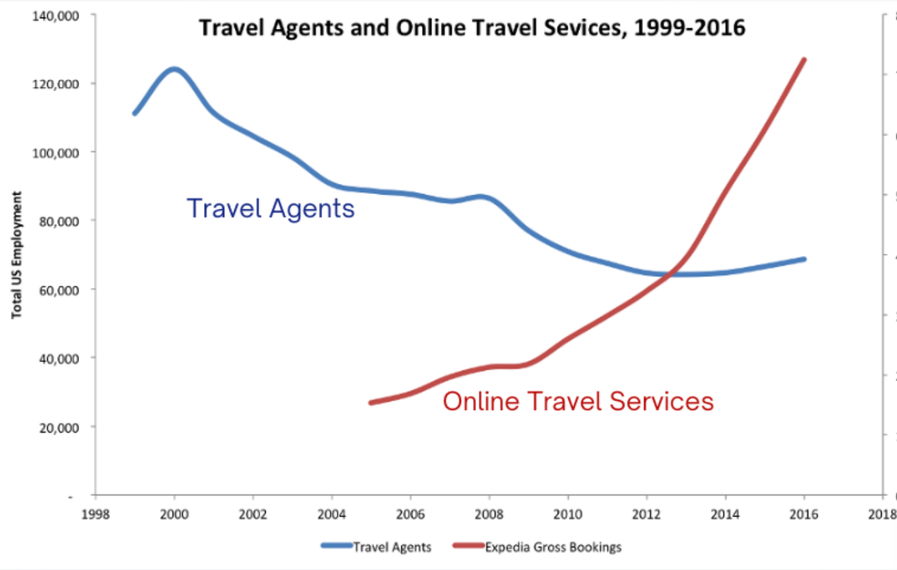
THE EFFECT OF AI & ROBOTIC AUTOMATION ON WORKERS

DISAPPEARING INDUSTRIES:

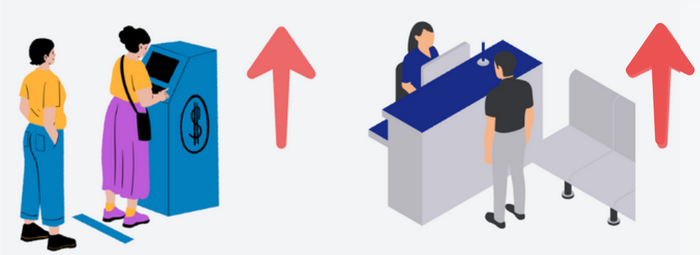
- **Manufacturing industries**
  - e.g ‘in the U.S., where researchers found a reduction in employment by 0.2 percentage points for every robot per 1,000 workers’



- **Travel agencies**
  - With the rise of online booking platforms, the need for traditional travel agents has diminished.
  - ‘At the beginning of the dot-com bubble, there were 111,130 travel agents in the U.S. In 2016, there were only 68,680, a 38 percent decrease.‘

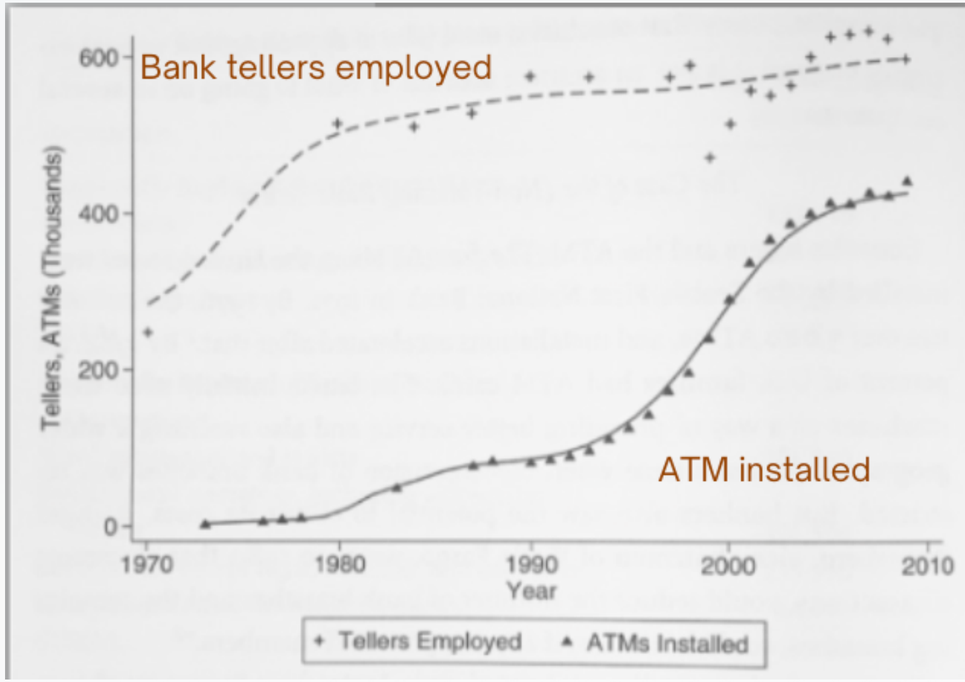


INCREASED POSITION:



- **Services industries**
  - e.g. Bank teller
  - The number of bank teller jobs actually increased after the introduction of ATMs, as the reduction in operating costs led to an increase in the number of bank branches

- Similarly, scanning technology and e-discovery software have led to an increase in related positions such as **tellers** and **paralegals**.



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https://www.aei.org/economics/what-atms-bank-tellers-rise-robots-and-jobs/https://www.travelperk.com/blog/how-online-booking-has-changed-travel-agent-

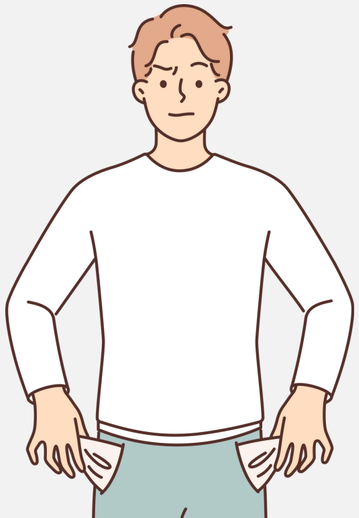
DIRECT IMPACT OF TECHNOLOGICAL PROGRESS ON WAGES

Automation replaces low educated workers → **income gap between workers increases**

- ‘Researchers estimate that since 1980, **automation** has led to an 8.8 percent decline in wages for men without a high school degree and a 2.3 percent decline for women, adjusted for inflation’

- ‘**The BLS** reported that wages in tech industries have risen substantially over the past decade‘

Industries	computer and mathematical occupation	production occupations
Median Anual Wages	$88,340	$36,000



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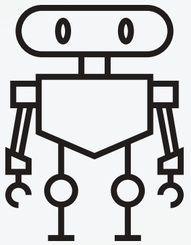
THE EFFECT OF AI & ROBOTIC AUTOMATION ON WORKING SATISFACTION



EXPERIMENTS ON SATISFACTION

Manual control

Only human workers during the task

Semi- Autonomous control

- Human workers
- Robots co-leader/ Human co-leader
- Human assistants

Autonomous control

Only robots workers during the task

Table 1 Subjective measures—post-trial questionnaire

Robot teammate traits
1. The robot was intelligent
2. The robot was trustworthy
3. The robot was committed to the task
Working alliance for human–robot teams
4. I feel uncomfortable with the robot (reverse scale)
5. The robot and I understand each other
6. I believe the robot likes me
7. The robot and I respect each other
8. I feel that the robot worker appreciates me
9. The robot worker and I trust each other
10. The robot worker perceives accurately what my goals are
11. The robot worker does not understand what I am trying to accomplish (reverse scale)
12. The robot worker and I are working towards mutually agreed upon goals
13. I find what I am doing with the robot worker confusing (reverse scale)
Additional measures of team fluency
14. I was satisfied by the team's performance
15. I would work with the robot the next time the tasks were to be completed
16. The robot increased the productivity of the team
17. The team collaborated well together
18. The team performed the tasks in the least time possible
19. The robot worker was necessary to the successful completion of the tasks
20. The human worker was necessary to the successful completion of the tasks
21. I was necessary to the successful completion of the tasks

Table 6 Differences between Likert-scale responses for the autonomous and manual conditions when working with a robot versus a human co-leader

Question	Difference	Robot co-leader versus human co-leader
1	$\Delta_R > \Delta_H$	$\chi^2 = 112.232$, $\mathbf{p < 0.001}$
2	$\Delta_R > \Delta_H$	$\chi^2 = 4.672$, $\mathbf{p < 0.031}$
5	$\Delta_R > \Delta_H$	$\chi^2 = 7.291$, $\mathbf{p = 0.007}$
6	$\Delta_R > \Delta_H$	$\chi^2 = 14.070$, $\mathbf{p < 0.001}$
8	$\Delta_R > \Delta_H$	$\chi^2 = 5.036$, $\mathbf{p = 0.025}$
9	$\Delta_R > \Delta_H$	$\chi^2 = 17.831$, $\mathbf{p < 0.001}$
10	$\Delta_R > \Delta_H$	$\chi^2 = 39.287$, $\mathbf{p < 0.001}$
11	$\Delta_R > \Delta_H$	$\chi^2 = 5.000$, $\mathbf{p = 0.025}$
12	$\Delta_R > \Delta_H$	$\chi^2 = 7.170$, $\mathbf{p = 0.007}$
13	$\Delta_R > \Delta_H$	$\chi^2 = 15.515$, $\mathbf{p < 0.001}$
14	$\Delta_R > \Delta_H$	$\chi^2 = 51.564$, $\mathbf{p < 0.001}$
15	$\Delta_R > \Delta_H$	$\chi^2 = 104.836$, $\mathbf{p < 0.001}$
16	$\Delta_R > \Delta_H$	$\chi^2 = 100.000$, $\mathbf{p < 0.001}$
17	$\Delta_R > \Delta_H$	$\chi^2 = 83.571$, $\mathbf{p < 0.001}$
18	$\Delta_R > \Delta_H$	$\chi^2 = 84.366$, $\mathbf{p < 0.001}$
19	$\Delta_R > \Delta_H$	$\chi^2 = 105.780$, $\mathbf{p < 0.001}$
22–24	$\Delta_R > \Delta_H$	$\chi^2 = 68.702$, $\mathbf{p < 0.001}$
4	$\Delta_H > \Delta_R$	$\chi^2 = 24.923$, $\mathbf{p < 0.001}$
20	$\Delta_H > \Delta_R$	$\chi^2 = 68.702$, $\mathbf{p < 0.001}$
21	$\Delta_H > \Delta_R$	$\chi^2 = 5.838$, $\mathbf{p = 0.016}$

Bold values are statistically significant ($p < 0.05$)

Results:

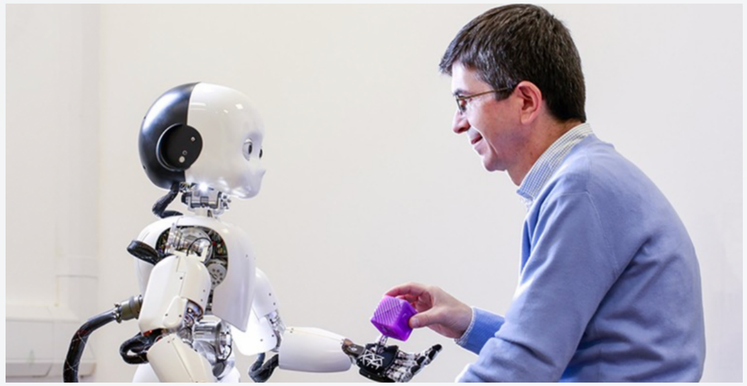
- **Question 5 6 8:** Human co-leader More liked, appreciated and better-understood workers.
- **Question 9 7:** Human co-leader understood, trusted, and respected each other.
- **Question 19 21:** Both workers and human co-worker were necessary

Finding:

More satisfied and perceive the team as more fluent when working with a HUMAN-ONLY team rather than a HUMAN-ROBOTS team.

(Gombolay et al., 2015)

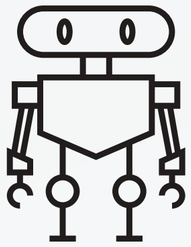
THE EFFECT OF AI & ROBOTIC AUTOMATION ON WORKERS' PRODUCTIVITY



People working with a robot co-leader tend to assign a disproportionate amount of work to themselves

↓

Planning fallacy: people underestimate the amount of time they need to complete a set of tasks while overestimate the amount of time that others need to complete the same sets of tasks



Workers perceived the human co-leader more favorably than the robotic co-leader

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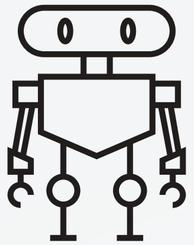
Allocate less work to themselves when working with the human in the semi-autonomous control

(Gombolay et al., 2015)

CONCLUSION



The Effects of AI & Robotic Automation on Human Labour

Current situations of AI and Robotic Automation application

1

Effects on workers' employment, wage, satisfaction and productivity

2

Promotions:

- **Creative jobs**
- **Optimal ratio of AI and human workers**

3

How Does Technology Affect Employment and Wages: Evidence from the Emergence of Digital Nomad

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What is digital nomad?

Individuals that leverage technologies to work remotely

Digital nomads' life style

- pursuit of a work-travel equilibrium
- prioritize autonomy and adaptability

How do digital nomads earn?

- Engaging in diverse professions:
  freelance writing, software development, graphic design

01

Technology’s role

ubiquity of high-speed internet

providing digital nomads with constant connectivity essential for remote work

collaborative tools and communication platforms

to interact with global teams, and ensuring the fluidity of project

Cloud-based storage solutions

enabling the secure and accessible storage of files and resources

powerful and portable computing devices

make sure that digital nomad can work anywhere (remotely)

02 Impact on Current Employment

1. **Breaking geographical barriers**

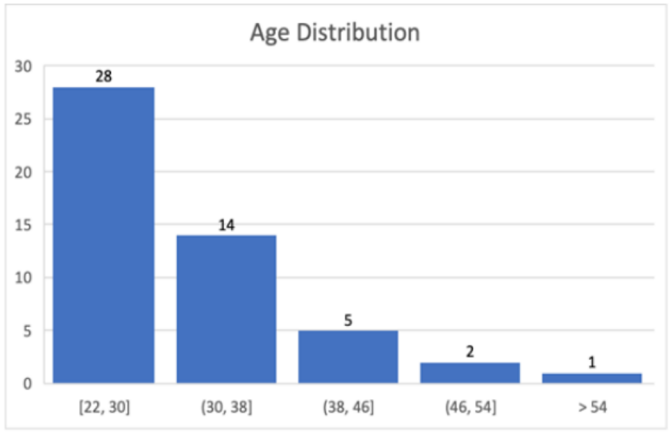
2. **Flexible and independent employment**

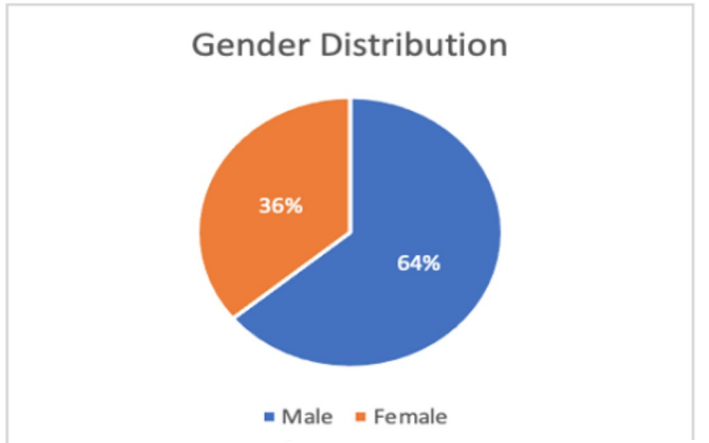
3. **Global Job opportunities**

4. **Changing skill requirements**

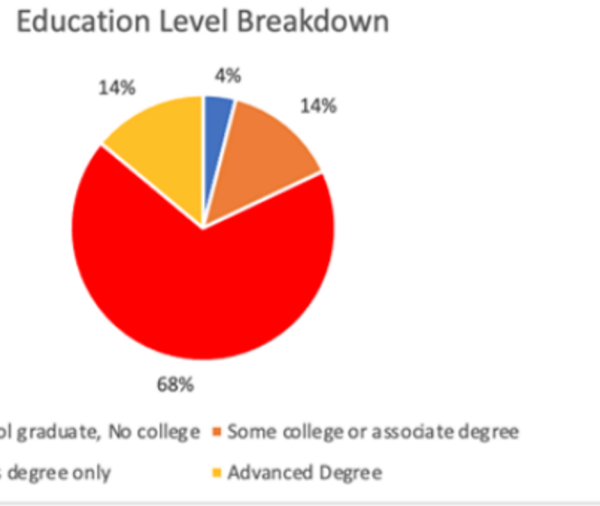
02 Factors affect the employment of Digital Nomads

1 Age & gender

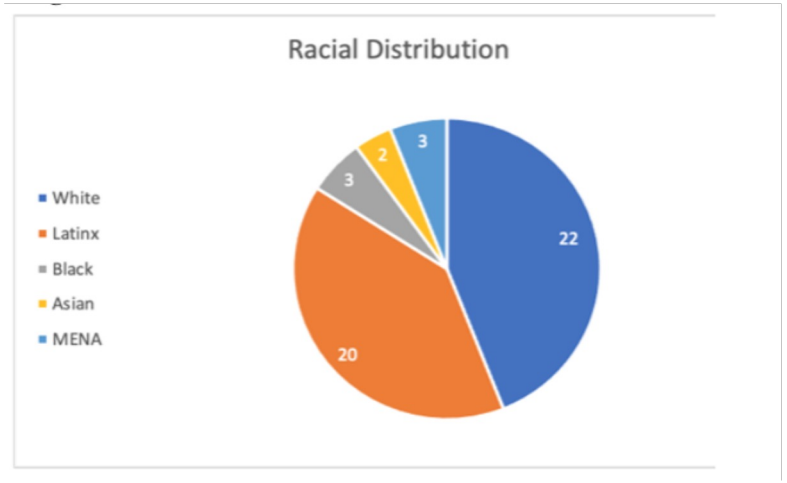


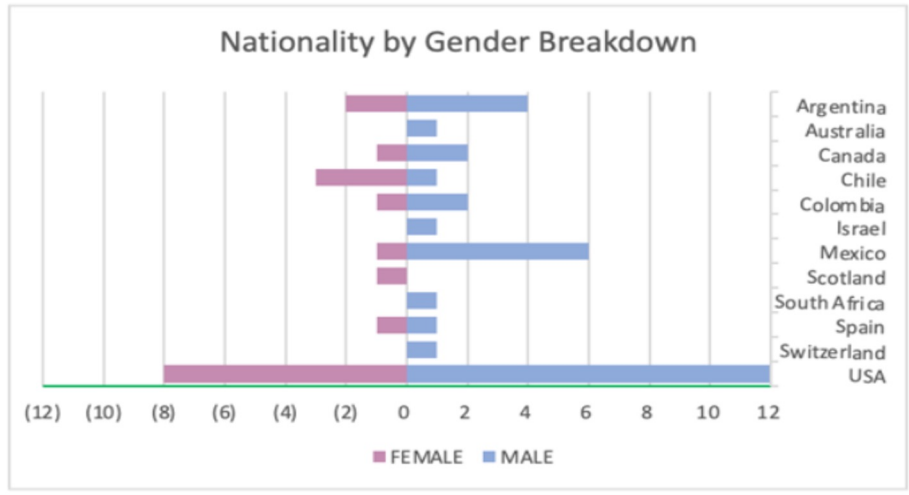


2 Education Level



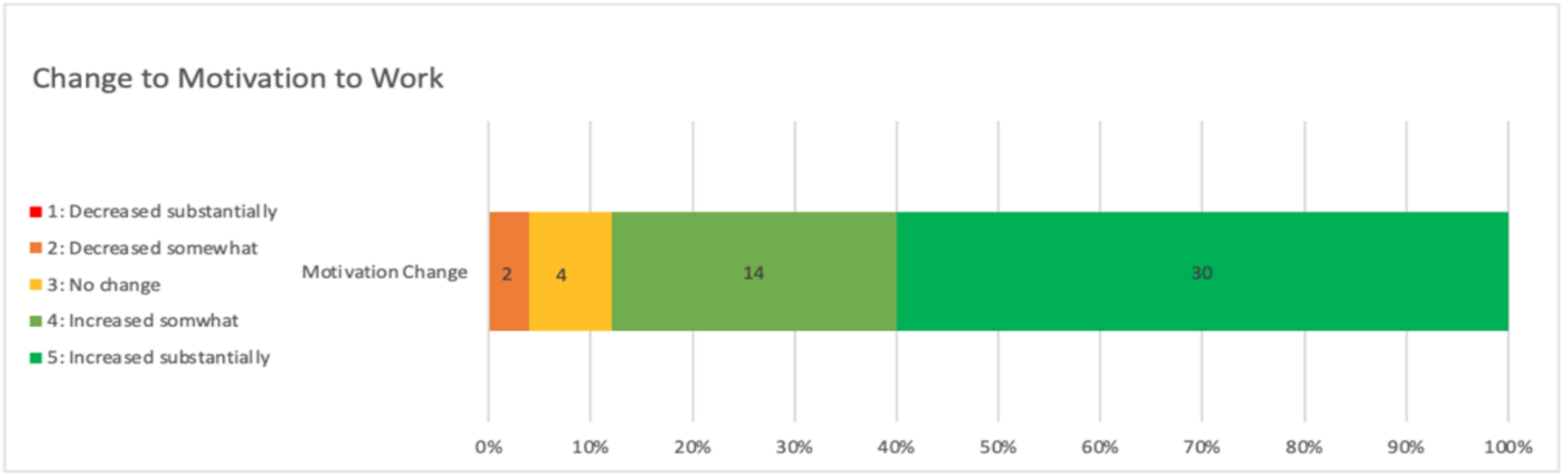
3 Nationality & Racial

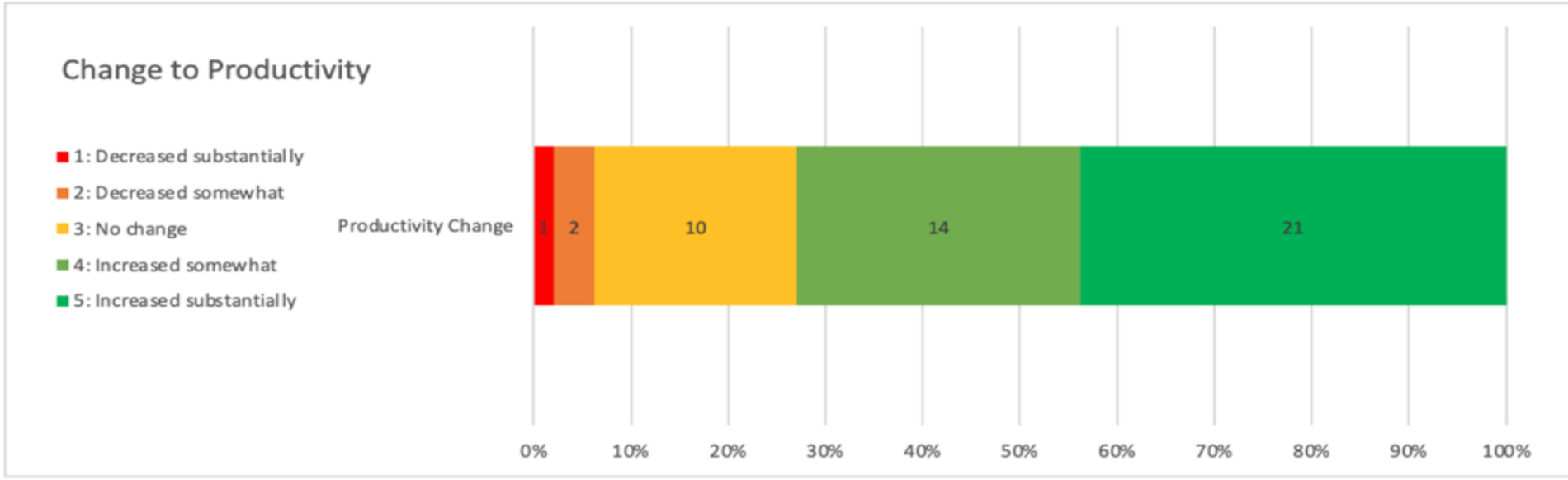




02

Factors affect the employment of Digital Nomads





03 Work Incentive as DN: Difference in Living Cost

1. Nationality

US (51%)
UK
Russia
Canada
Germany

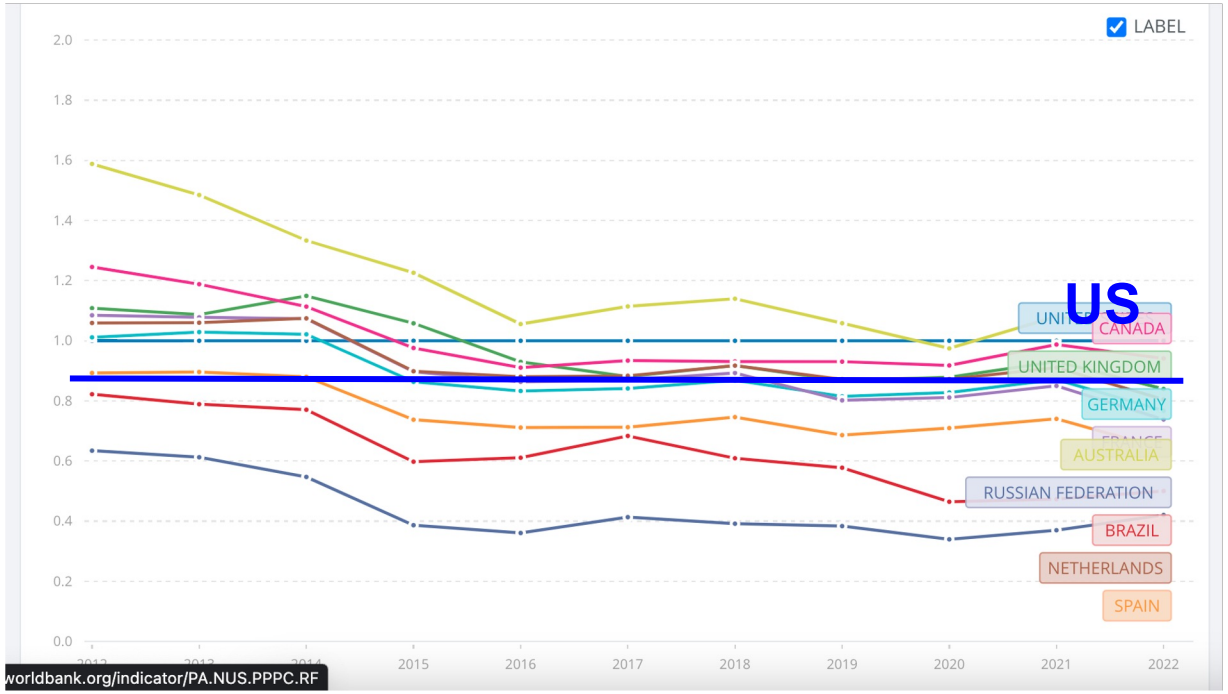
France
Australia
Brazil
Netherlands
Spain

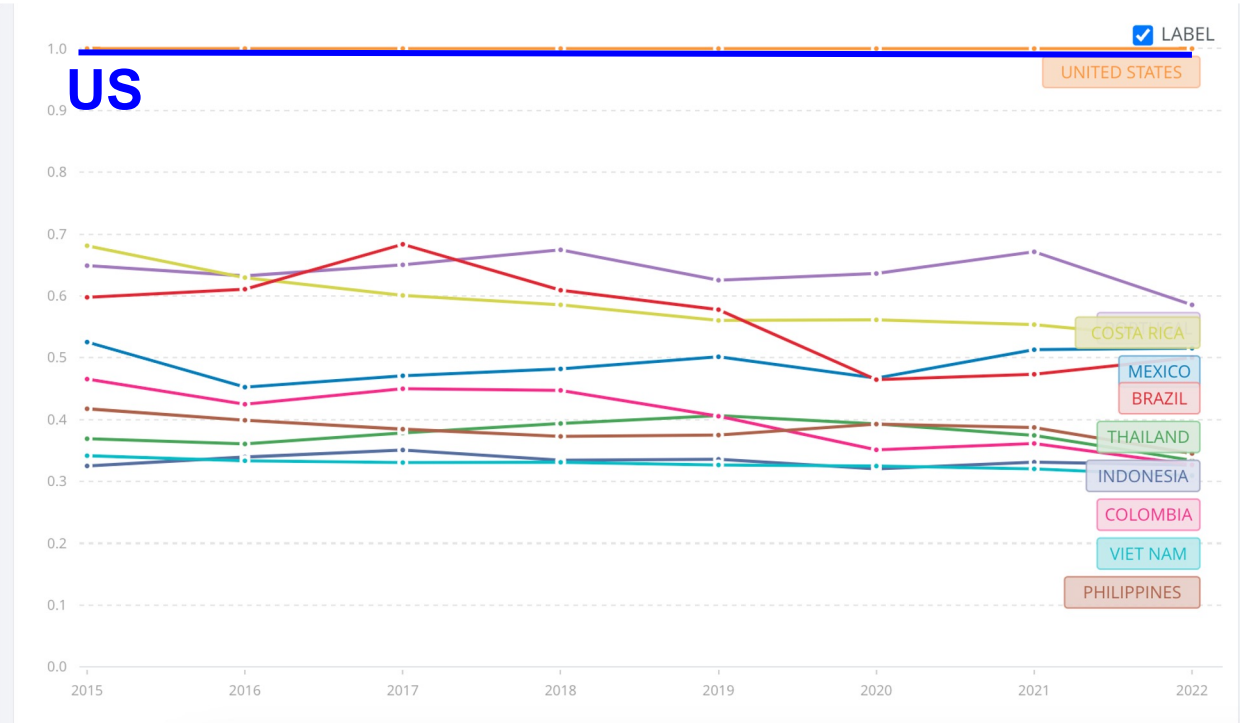
2. Destination

Mexico
Thailand
Indonesia
Colombia
Vietnam

Portugal
Turkiye
Costa Rica
Brazil
Philippines

Price Level Ratio of PPP conversion factor (GDP) to market exchange rate





03 Choice of DN: Labor-Leisure Choice Model

Consider a DN from US:

1. Baseline model of Labor-Leisure Choice
2. Model in the context of DN
   a. Uneared income ⬆️: flexibility, beautiful working environment, travel while working etc
   b. P ⬇️: living cost is lower in destination countries
   c. Still get wage in the US level
   d. Implication: a
      i. higher level of leisure and utility
      ii. Part-time: reserved wage increase

$$PC + WL = WT + y0$$

$$C = -\frac{W}{P}L + \frac{WT + y_0}{P}$$