

Reskilling in the Age of A.I.

Raffaella Sadun

Charles E. Wilson Professor of Business Administration

Harvard Business School

December 20 2023

Productivity ~~Reskilling~~ in the Age of A.I.

Raffaella Sadun

Charles E. Wilson Professor of Business Administration

Harvard Business School

December 20 2023

Big picture: Productivity matters

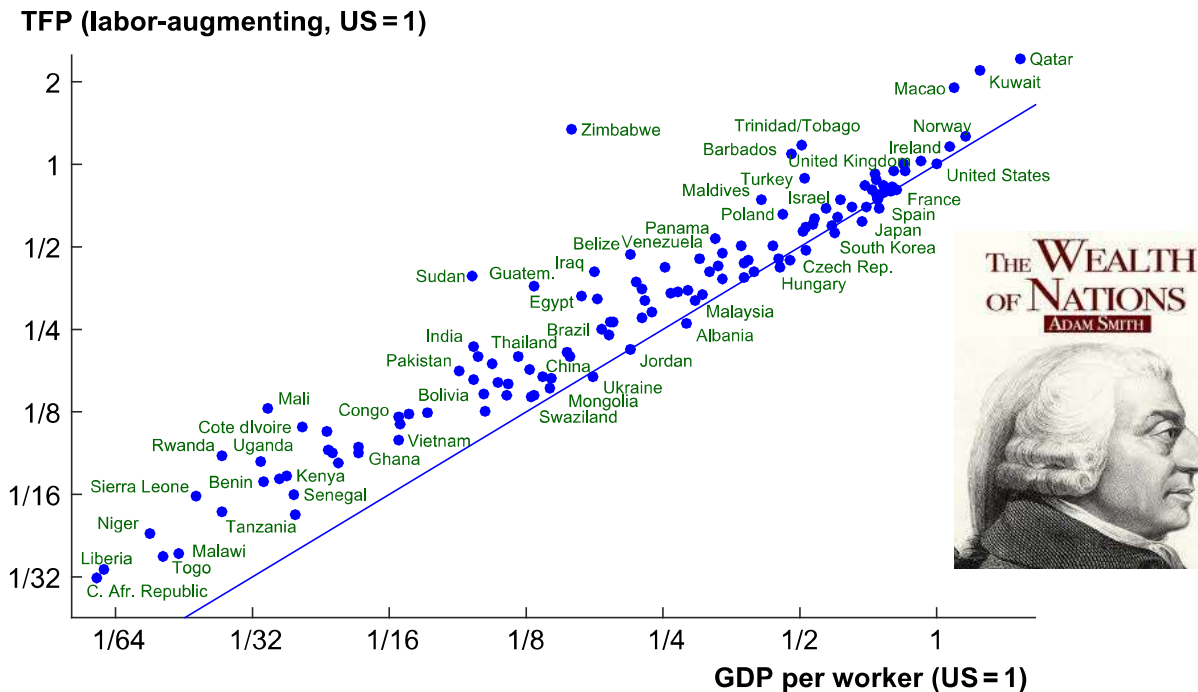
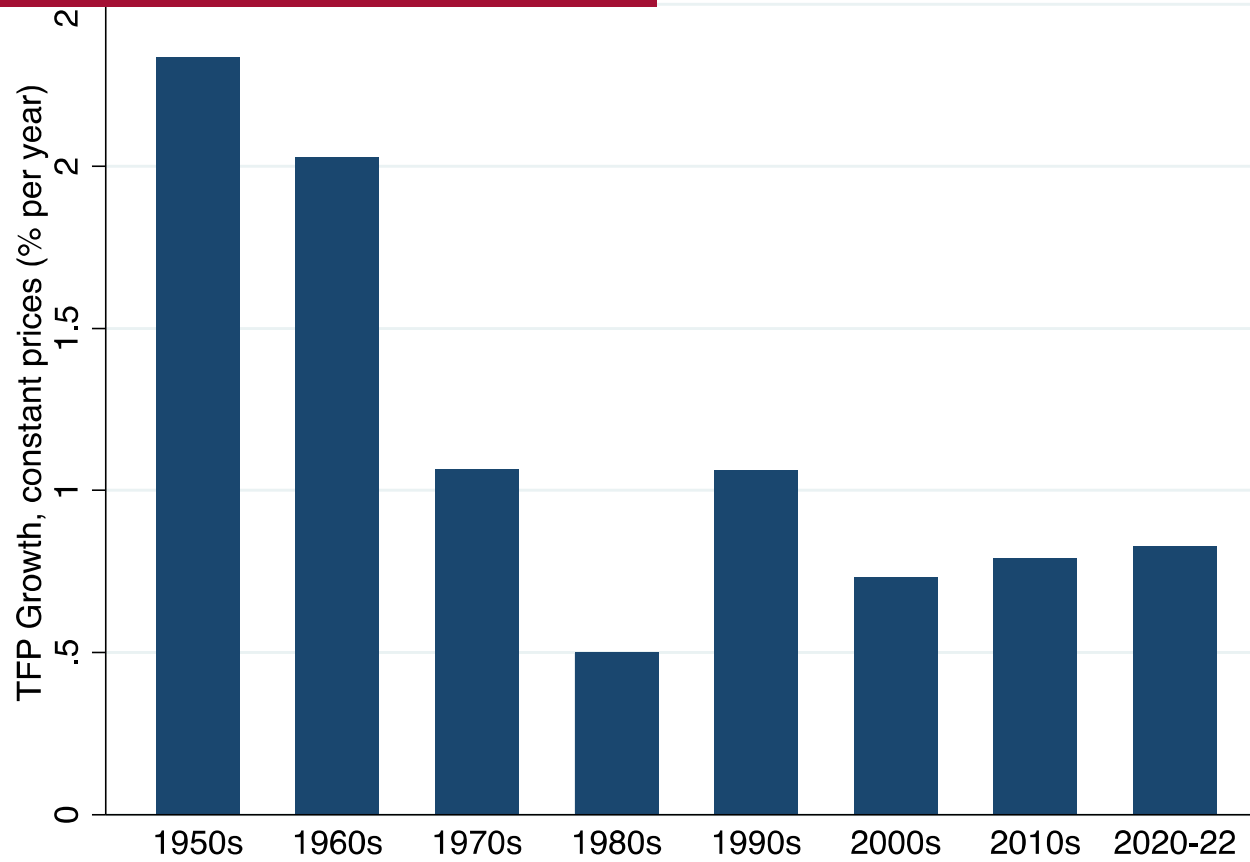
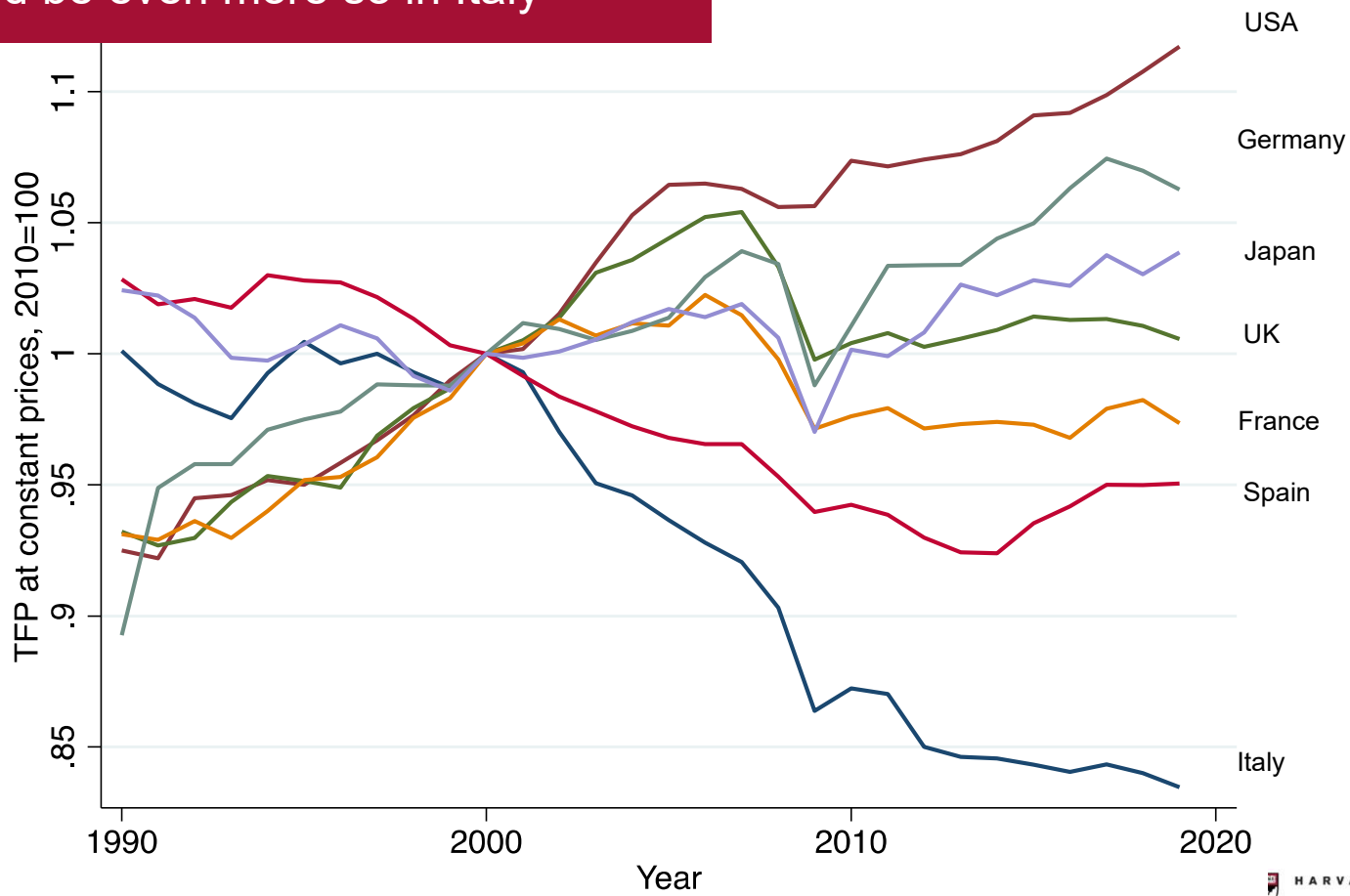


Fig. 29 Total factor productivity, 2010. Source: *Computed using the Penn World Tables 8.0 assuming a common value of $\alpha = 1/3$. Jones (2015) US=1*

Productivity growth is a source of concern in the U.S.

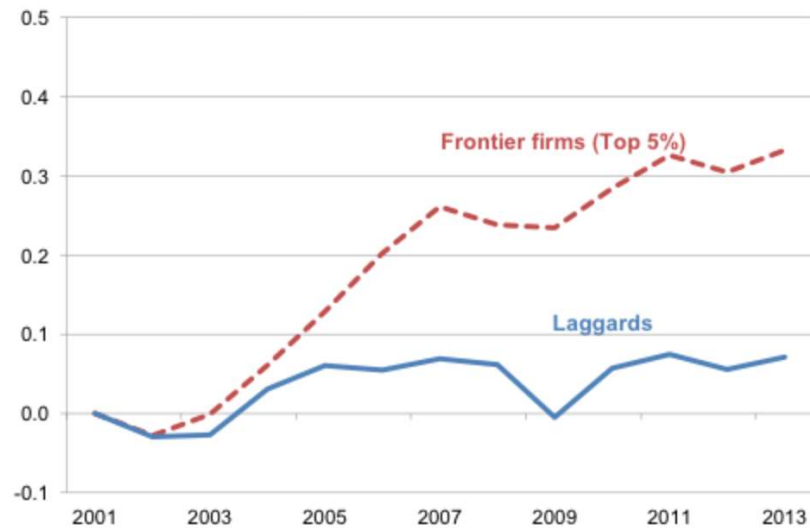


It should be even more so in Italy

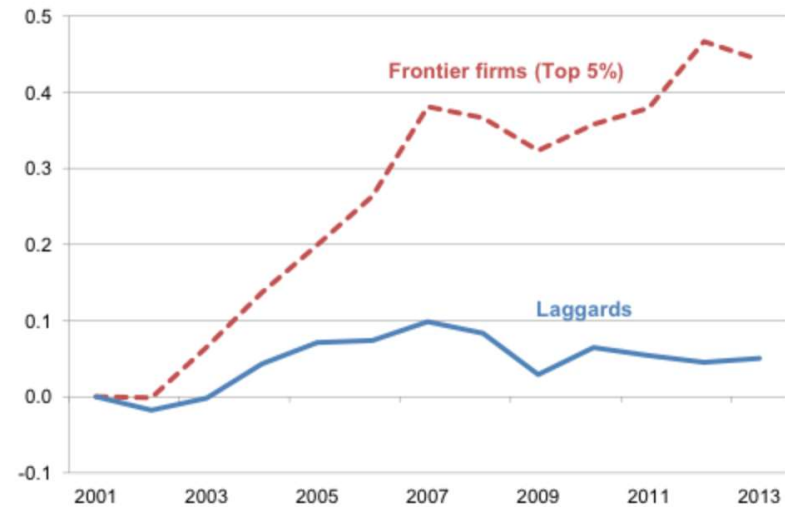


The slowdown in productivity growth reflects a **slowing process of technological diffusion** across firms

a. Manufacturing



b. Business services



“The striking feature of slow aggregate productivity growth is that a small cadre of frontier firms are experiencing robust gains, masking an increasing productivity gap between the global frontier and laggard firms.” Andrews et. 2017

This talk

How can the process of technological diffusion be accelerated in an **effective** and **equitable** way in the age of AI?

Lessons from past technological waves

Reskilling, promises and challenges

Reflections



This talk

How can the process of technological diffusion be accelerated in an **effective** and **equitable** way in the age of AI?

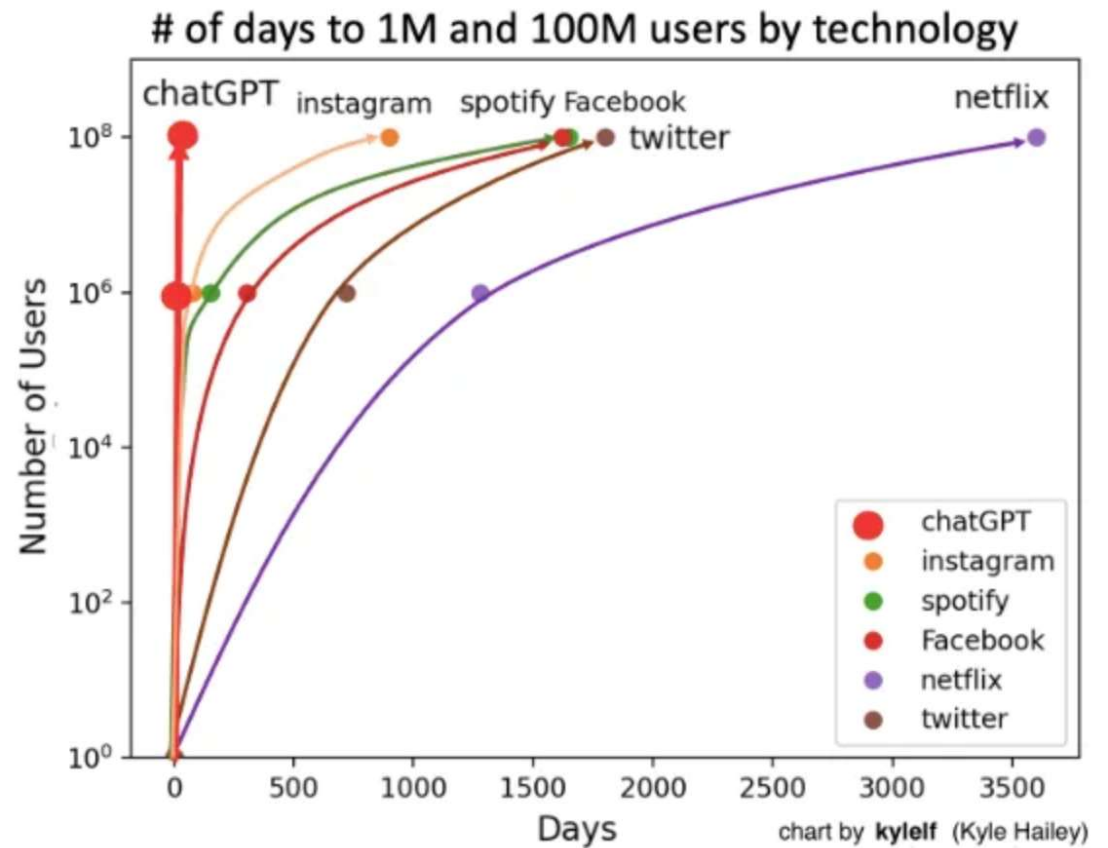
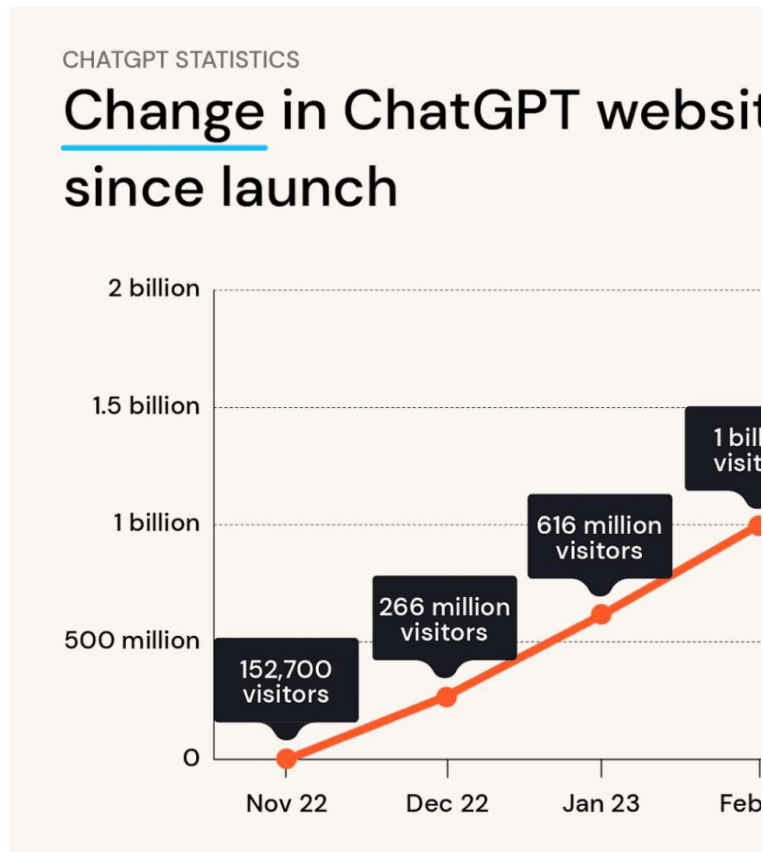
Lessons from past technological waves

Reskilling, promises and challenges

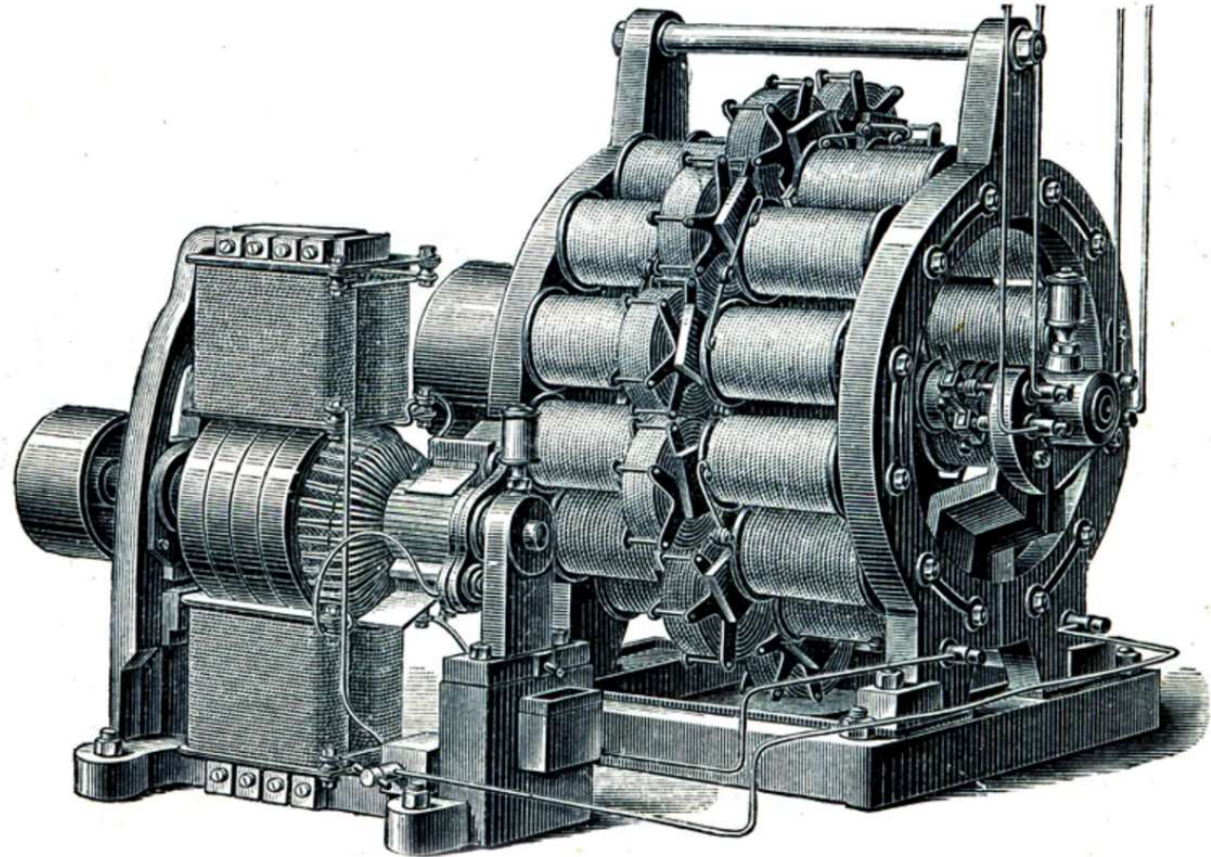
Reflections



Misleading charts



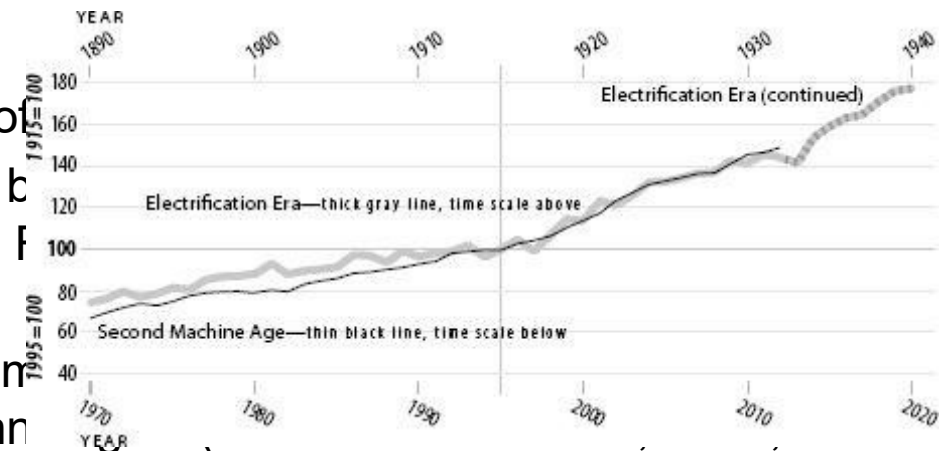
The process of technological diffusion is slow and messy because it requires **organizational adaptation**



Organizational adaptation was—and continues to be—critical in the era of ICT

- **Lag** in productivity effects of ICTs
 - From the Solow paradox of the 1980s (“You can see the computer age everywhere but the productivity statistics”) to the productivity resurgence of the 1990s in the US

- **Heterogeneity** in productivity effects of ICTs
 - Firms: Better managed firms could benefit from new technologies and processes (Bloom, Sadun and Van Reenen 2014)
 - Countries: countries with less dynamic economies were unable to reap benefits of new technologies (Pellegrino and Zingales, 2018)



Source: Brynjolffson and McAfee

This process of organizational adaptation has **profound implications for labor markets**

“Think about a job as a series of tasks. Then ask: which task can be carried out by machines and which by workers?” (Autor, 2022)

- **Changes within occupations**

- Routine and codifiable jobs: substituted by ICT=>lower demand
- Non-routine cognitive task; social: much harder to substitute and complementary to the technology=>higher demand

- **Creation of new occupations**

- New roles that can better exploit technologies
- In the US, 40% of employment growth arising from occupations that did not exist in 1940

Exhibit 10: Technological Innovation Leads to the Creation of New Occupations That Account for the Bulk of Employment Growth

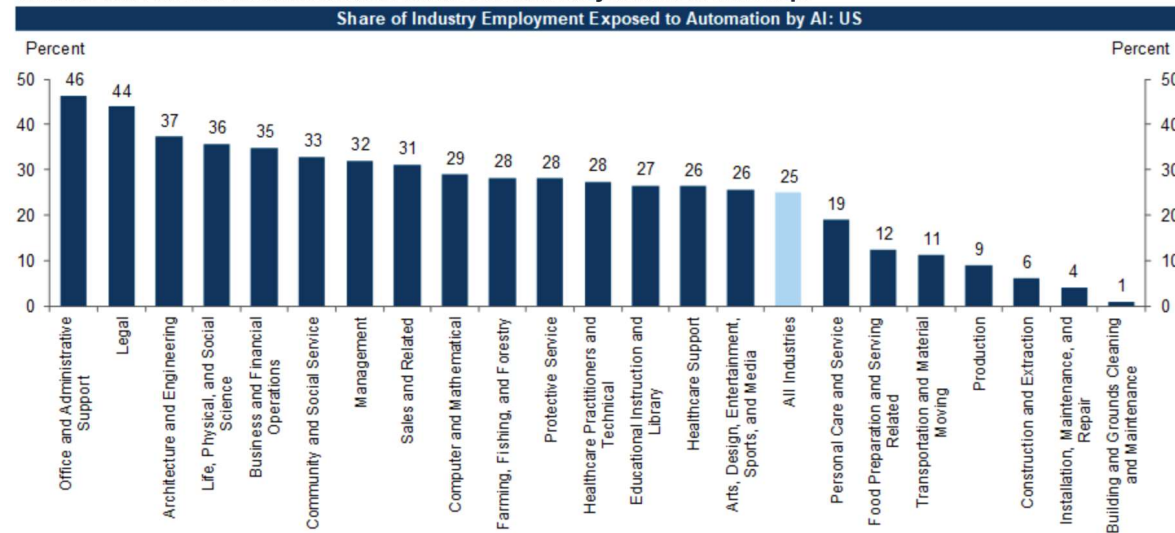


With Gen-AI, we are likely to see a **similar movie**, but played at a **faster speed**

Gen-AI may **substitute** for **more tasks**, including **cognitive ones**

- Jobs that have been traditionally benefited from past technological waves (e.g. managers, lawyers, creatives etc.) are now exposed to the **risk of being automated**

Exhibit 5: One-Fourth of Current Work Tasks Could Be Automated by AI in the US and Europe



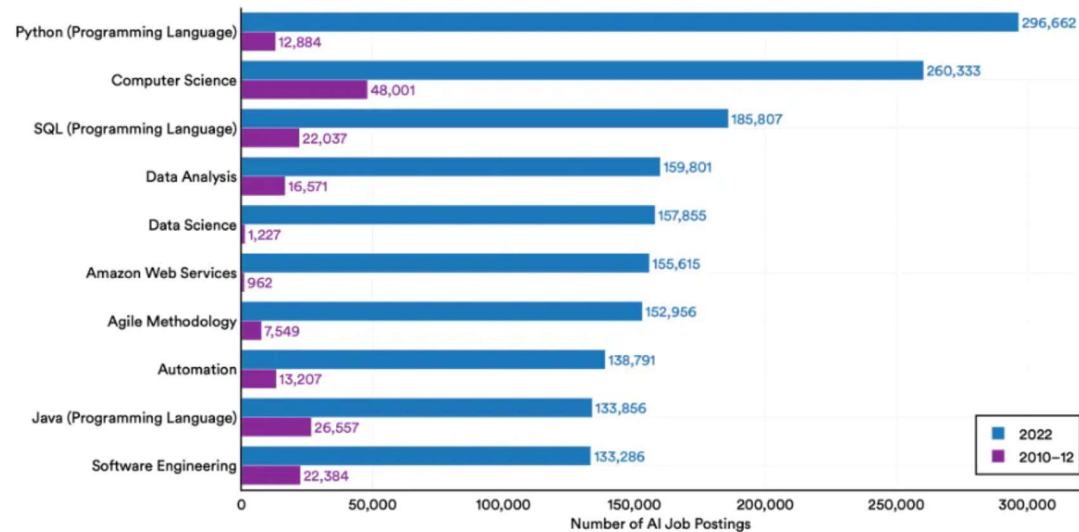
Source: Goldman Sachs, 2023

With Gen-AI, we are likely to see a **similar movie**, but played at a **faster speed**

Gen-AI may also **create new opportunities:**

- Increasing the demand for specific skills
- Creating new occupations (e.g. prompt engineers)
- Raising the value of new approaches to decision making and organizational structures (Gans et al, 2022)

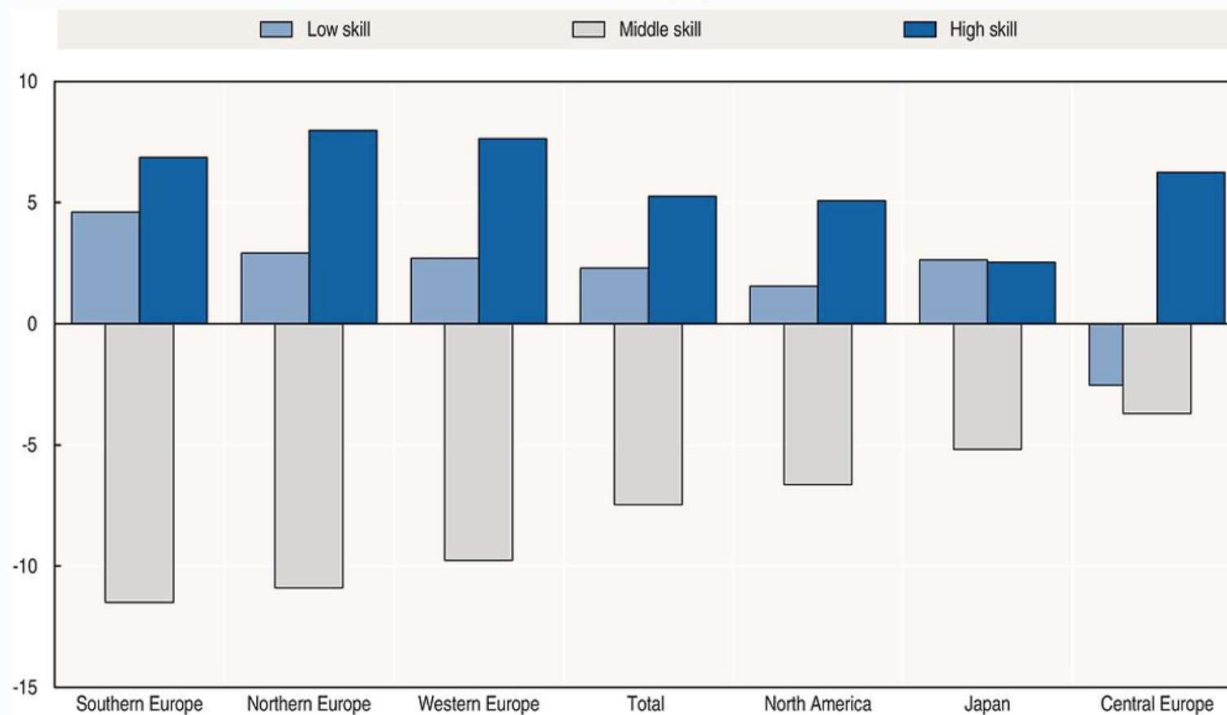
Top 10 Specialized Skills in 2022 AI Job Postings in the United States, 2010–12 Vs. 2022
Source: Lightcast, 2022 | Chart: 2023 AI Index Report



Source: Lightcast, 2023

The problem: in the past, organizational adaptation has led to a **polarization** in the labor market, which has been very **costly** for many

Heterogeneity in polarisation, selected OECD countries by region, 1995 to 2015^{a, b, c, d} Percentage point change in share of total employment



High-skill occupations: legislators, senior officials, and managers, professionals, and technicians and associate professionals.

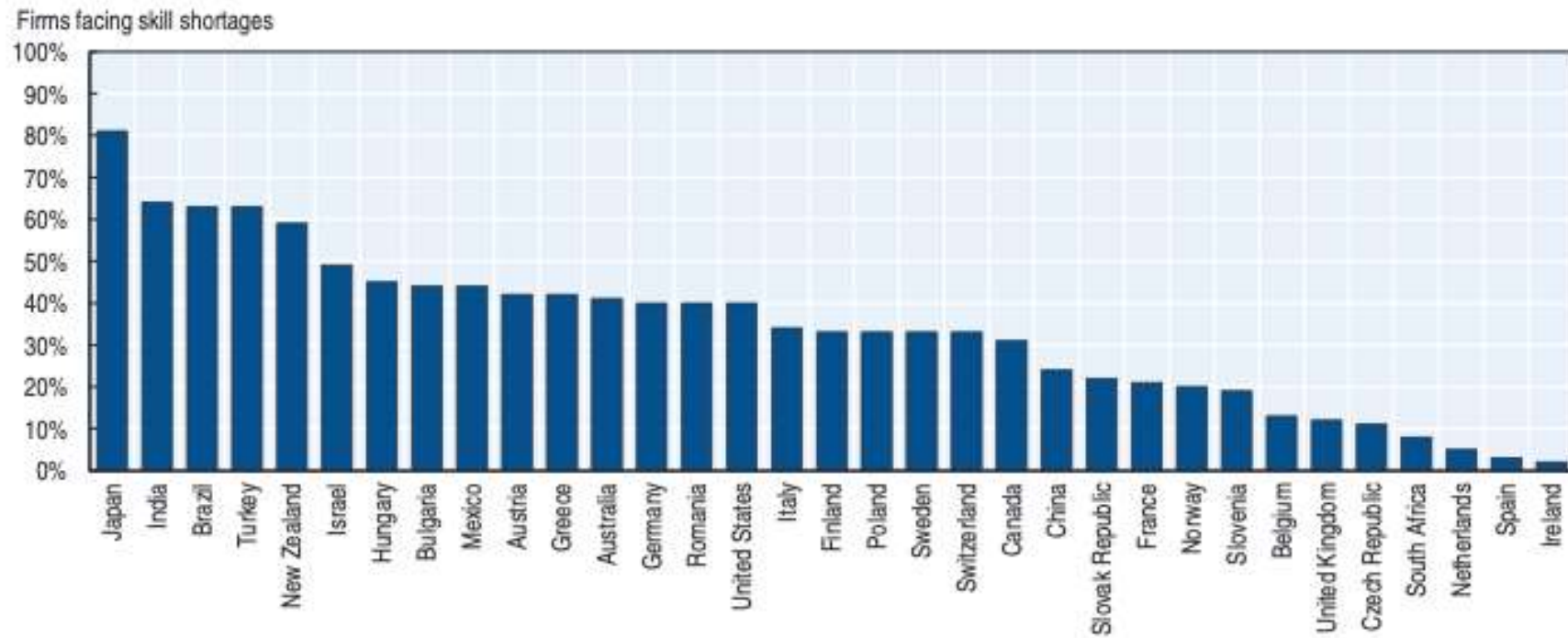
Middle-skill occupations: clerks, craft and related trades workers, and plant and machine operators and assemblers.

Low-skill occupations: service workers and shop and market sales workers, and elementary occupations

Source: OECD, 2017

Organizational adaptation has also been **imperfect**, resulting in pervasive **skill shortages** and **mismatches** *across* and *within* firms

Figure 1.4. Skill shortage in selected countries^a
As a percentage of all firms with ten or more employees



Source: OECD, 2017

What will the future hold?

Still too early to know exactly who the winner and losers will be from AI-innovations: this depends on the shape and speed of organizational adaptation to these new technologies

In this uncertainty, we face alternative options

1. **Resist change** (de-growth movements, luddism, etc)
2. **Let the forces of technological adoption play out without much intervention**, even if this will be a slow and costly process for the workforce, exacerbate differences between winners and losers, and fail to realize massive productivity gains (Acemoglu and Restrepo, 2022)
3. **Shape the direction** of technological adoption, and/or **reduce the costs of adaptation** for firms and the workforce

HOW?

This talk

How can the process of technological diffusion be accelerated in an **effective** and **equitable** way in the age of AI?

Lessons from past technological waves

Reskilling, promises and challenges

Reflections



What is Reskilling?

Reskilling is a form of training that helps individuals **rapidly acquire the skills needed to move to a new, in-demand occupation**, e.g.

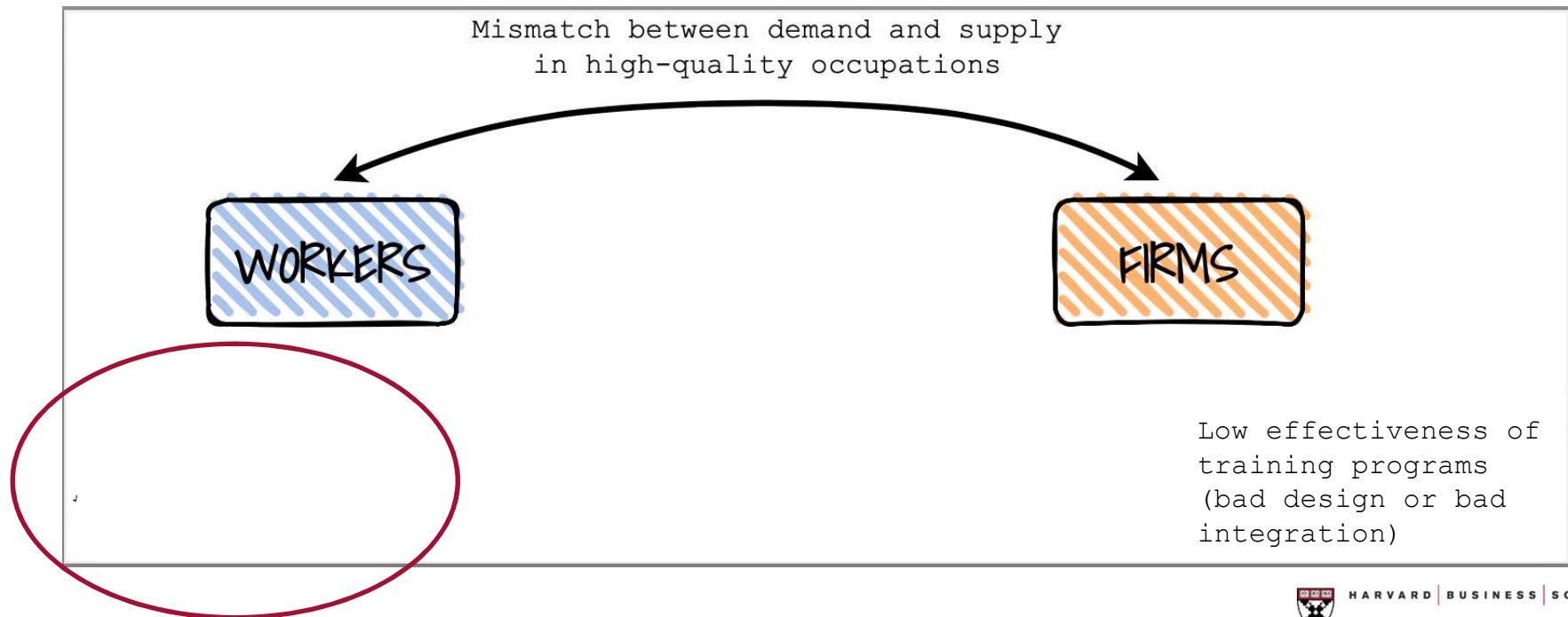
- From actuaries to cybersecurity experts
- From combustion engine mechanics to electric engine specialists

Dual potential gains

- For **firms**: closing skills gaps, facilitating adoption of new technologies
- For the **workforce**: helping individuals access new opportunities in a less costly and more targeted way

According to current estimates **1 billion people** may need to be reskilled to entirely new roles (World Economic Forum, 2021)

But making reskilling work at scale is a major challenge



Take-up rates of basic training programs are very low, especially among those that need training the most

WORKERS

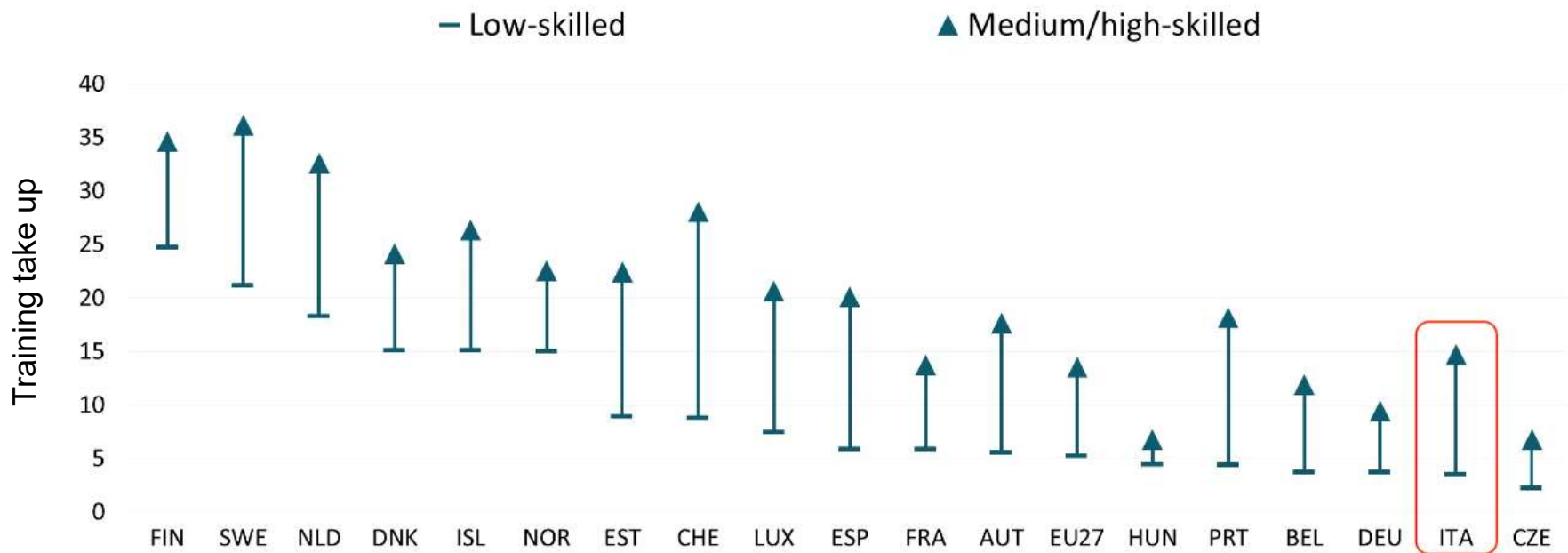


Figure: Training take-up. Source: PIAAC, 2021



We know very little about the demand for training in the workforce



How does the demand for reskilling vary among jobseekers?

1. Who wants to be reskilled?
2. Can the demand for reskilling be shaped by policy?

Evidence on these points is needed to

- Structure outreach efforts to potential participants in resourced constrained environments (both in private and public sector)
- Allocate resources towards programs with higher take-up potential
- Design of training programs and subsidies

Evidence from a recent project in Italy



Partnership with AFOL Metropolitana, largest job assistance centers in Italy
(Delfino, Garnero, Inferrera, Leonardi, Sadun, 2023)

Discrete choice experiment to understand demand for reskilling on a sample of 1200 job seekers

Three possible alternatives

- **Reskilling** conducive to a high-demand occupation with almost certain employment and high wage (entry level, non-manual positions in digital and construction industries)
- **Generic training**, unrelated to specific employment opportunities
- **Opt-out**

Example

WORKERS

	<i>Corso A</i>	<i>Corso B</i>
Argomento	Formazione intermedia in Microsoft Office	Formazione per assistente informatico
Costo	95 € (a carico del partecipante)	840 € (a carico dell'ente di formazione)
Sussidio	Assente	340 €
Struttura	Corso modulare: da completare entro 48 settimane	Corso intensivo: tempo pieno per 24 settimane
Durata	80 ore	500 ore
Modalità di svolgimento	Interamente in remoto	In presenza
Probabilità di assunzione dopo la fine del corso	23%	70%

Quale corso sceglieresti?

Corso A

Corso B

*Nessun
Corso*

Findings

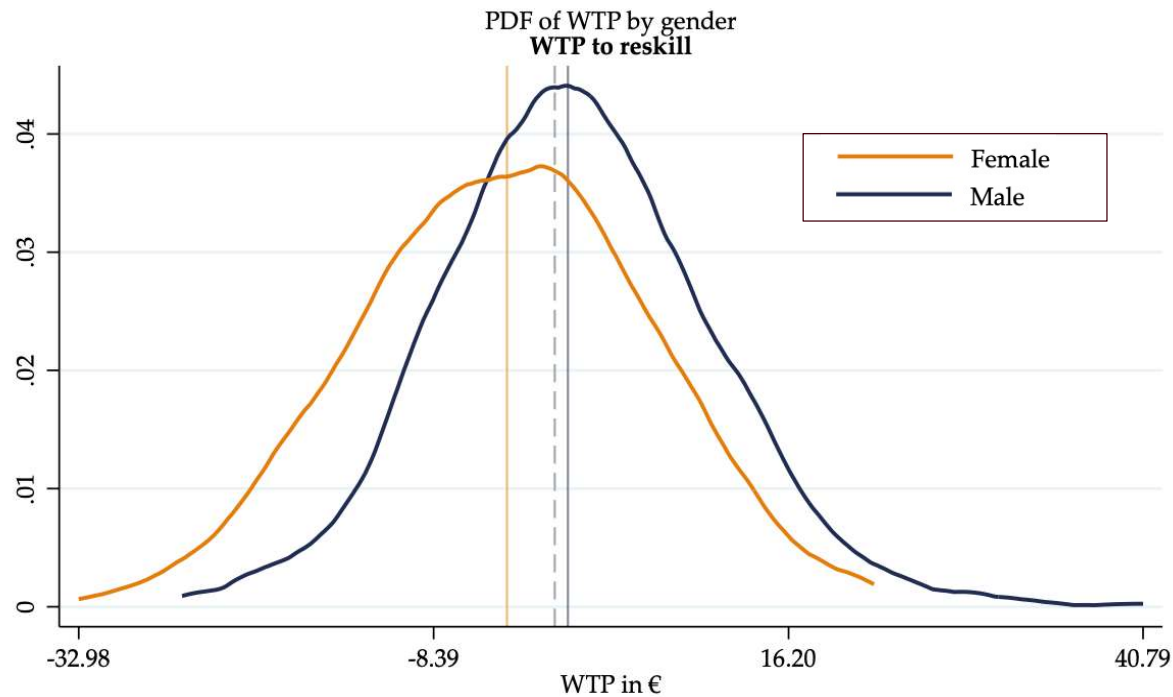


The demand for reskilling is low: 1 out of 3 times, respondents prefer not to train at all, and respondents do not value reskilling more than generic training

The demand for reskilling is very heterogeneous and hard to pin down based on simple observables: Demand varies along some predictable measurable factors (past occupation, interest in job, skills), but there is a lot of unexplained heterogeneity in choices

Example: WTP for reskilling between men and women

WORKERS



Women have a lower demand for reskilling on average, but there is wide variation in preferences *within* genders

WTP estimated through a mixed logit model. The dashed line is set at 0 WTP. Colored vertical solid lines are Median WTP for male is 0.91; median WTP for female is -3.31.

Findings



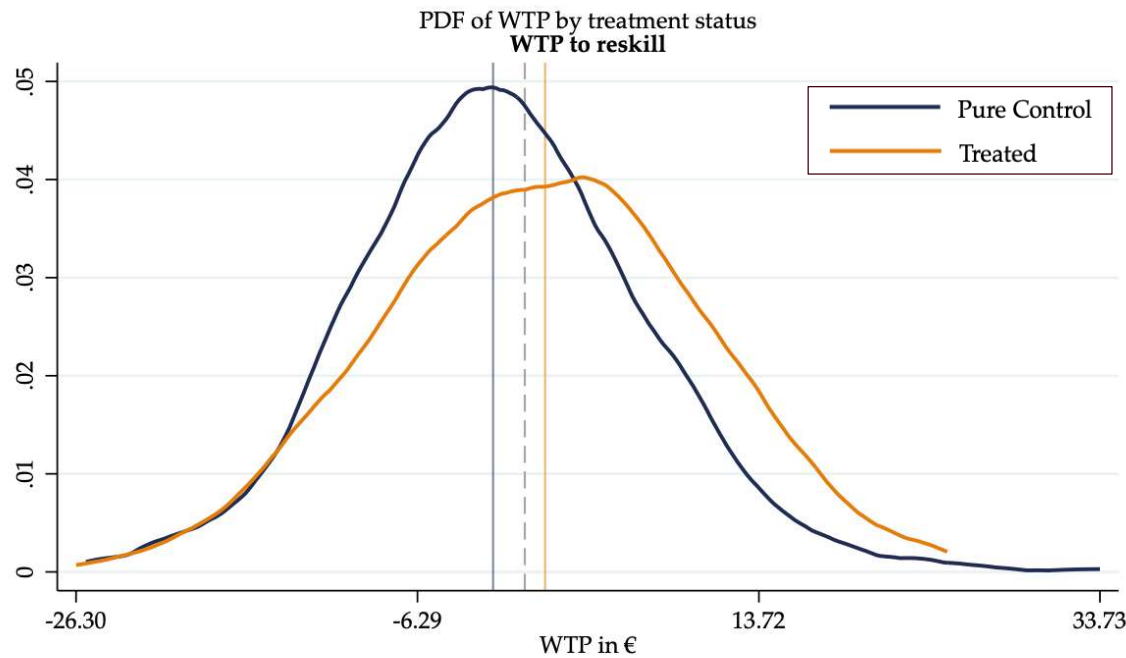
The demand for reskilling is low: 1 out of 3 times, respondents prefer not to train at all, and respondents do not value reskilling more than generic training

The demand for reskilling is very heterogeneous and hard to pin down based on simple observables: Demand varies along some predictable measurable factors (past occupation, interest in job, skills), but there is a lot of unexplained heterogeneity in choices

Information matters: A light-touch informational treatment showing details on prospective wages and job finding rates in high-demand occupations increases demand for reskilling by 10%, especially for those with already some interest in the targeted occupation

Information matters

WORKERS



WTP estimated through a mixed logit model. The dashed line is set at 0 WTP. Colored vertical solid lines are Median WTP for control is -1.86; median WTP for treated is 1.19.

Providing information on prospective wages and job finding rates of occupations raises the demand for reskilling by 10%

Findings



The demand for reskilling is low: 1 out of 3 times, respondents prefer not to train at all, and respondents do not value reskilling more than generic training

The demand for reskilling is very heterogeneous and hard to pin down based on simple observables: Demand varies along some predictable measurable factors (past occupation, interest in job, skills), but there is a lot of unexplained heterogeneity in choices

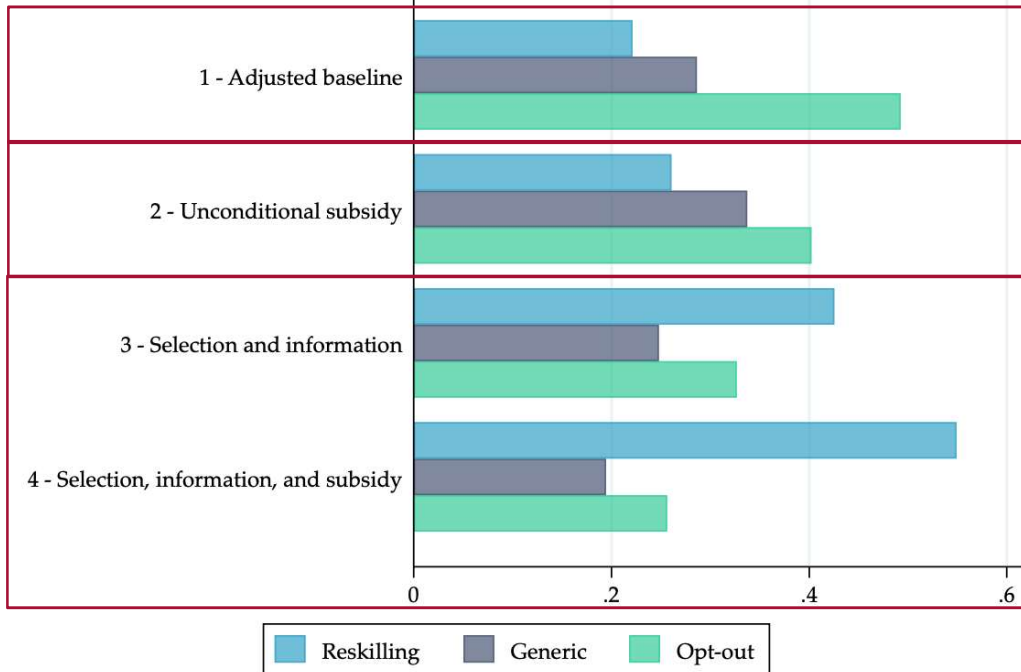
Information matters: A light-touch informational treatment showing details on prospective wages and job finding rates in high-demand occupations increases demand for reskilling by 10%, especially for those with already some interest in the targeted occupation

Policy design is key: Untargeted training subsidies not enough to boost reskilling. Necessary to work on incentives, program screening and communication to see shifts in market shares

Policy design is key



Market shares for different courses



Status quo: most jobseekers do not train

Unconditional training subsidy: jobseekers move to generic training

Training curation (restricting choice to high job finding rate courses) and **providing information on job finding rate after training** programs: reskilling now dominant, even more so with a **subsidy**

Implications



The decision to reskill is a **highly personal one**, which **cannot be easily captured by simple demographics** (age, gender, education)



Need to develop more effective and scalable ways to **measure personal motivation and aspirations among jobseekers**, and improve targeting

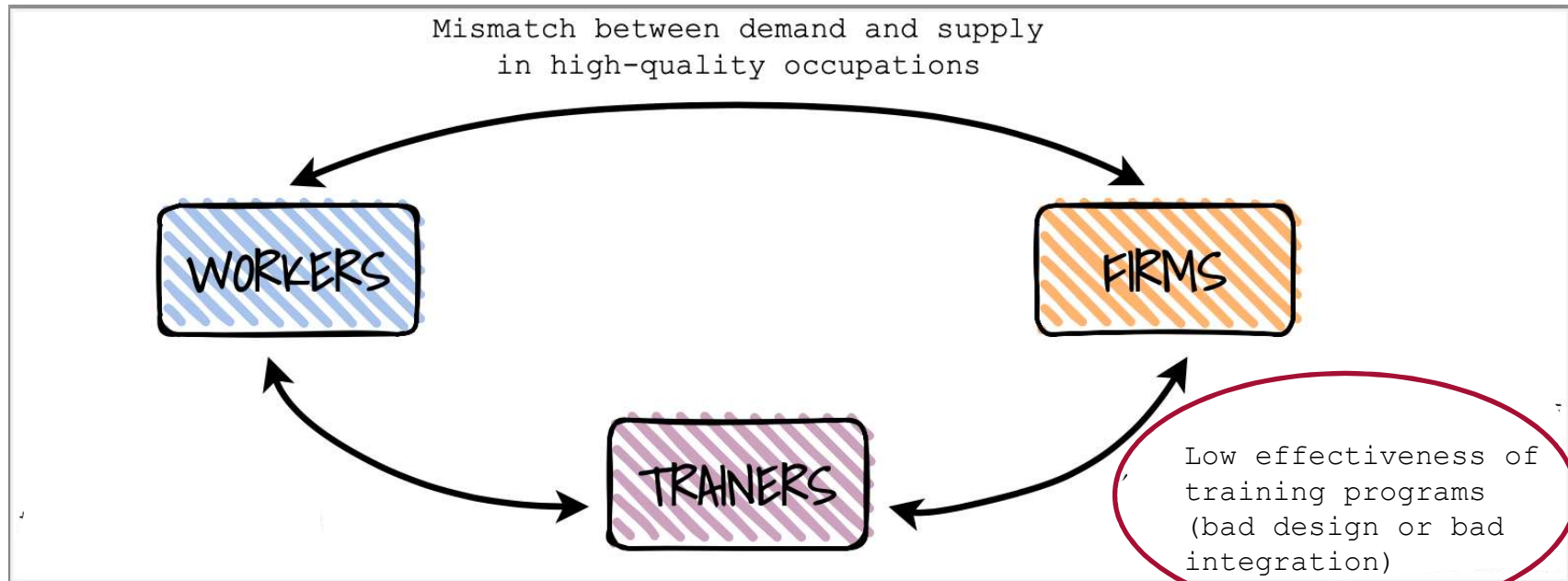
Generic training subsidies are ineffective in increasing take-up of reskilling programs



Need to act on **complementary levers** to improve take up: targeted subsidies, curation of the supply of training and better information for jobseekers (active labor market policies)



Firms also play a crucial role for reskilling



Reskilling inside the firm is hard



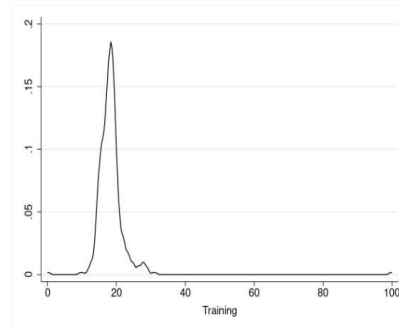
Firms make significant investments in training, which are often met with disappointing results

- **Low take up** rates among employees, especially among those that need training most (Sadvick et al, 2021)
- **Uneven internal support: middle managers'** buy-in critical for the success of reskilling initiatives (design, selection, motivation, coaching), but often missing due to information and behavioral frictions (Heagele, 2021)

100,000 employees, 5 years of data, 3mn observations

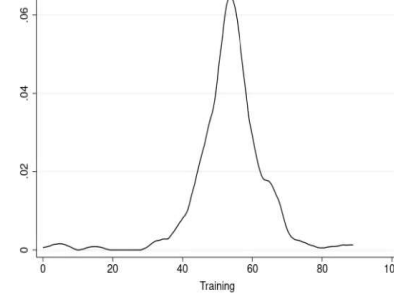
Within each firm, we found large differences in training value-added across managers

Low and high training managers exist within the same firm

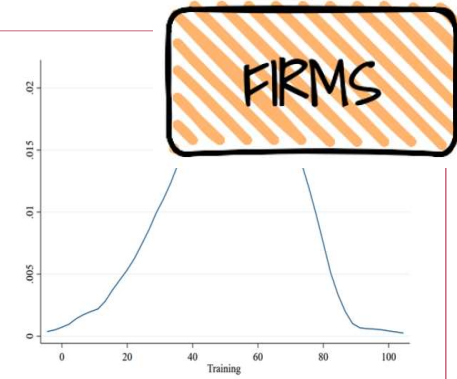


(a) Car Company

Manager "Training Value-Added"



(b) Fast Food Company

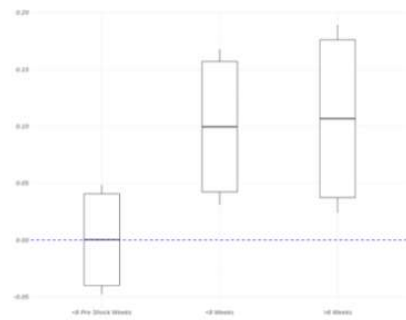


(c) Retail Company

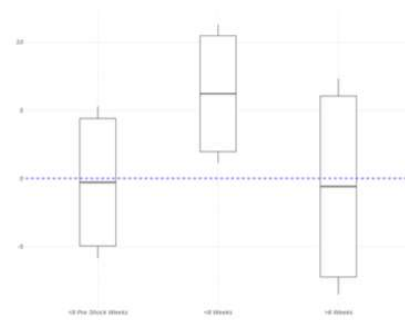
The arrival of a high training manager in a team is followed by a significant increase in training among their employees

Magnitude of the effects range between 2% to 45% relative to the mean

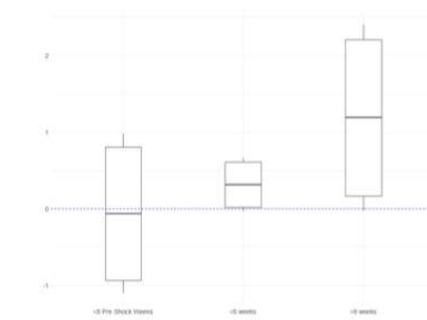
Changes in Training Take Up among Employees



(a) Car Company



(b) Fast Food Company



(c) Retail Company

Source: Sadun and Tamayo, 2023

Reskilling requires shifting to a “new training paradigm”...



Old Training Paradigm

Reskilling is a CSR initiative to support displaced workers

Reskilling is an HR responsibility

Reskilling is a training initiative

Employees need to be convinced to reskill

Reskilling is an individual firm problem

New Training Paradigm

Reskilling is a strategic imperative

Reskilling is the responsibility of every leader and manager

Reskilling goes beyond training – it is a holistic change management initiative

Employees want to reskill - when it makes sense

Reskilling takes a village

In-depth interviews with Chief Human Resource Officers of global firms publicly committed to reskilling a large fraction of their workforce (Tamayo et al, 2023)

- 35 firms, 11 industries, 4 continents



...But adoption of these training practices is still very low

Survey of 1200 Chief Human Resource Officers of US firms with 100+ employees

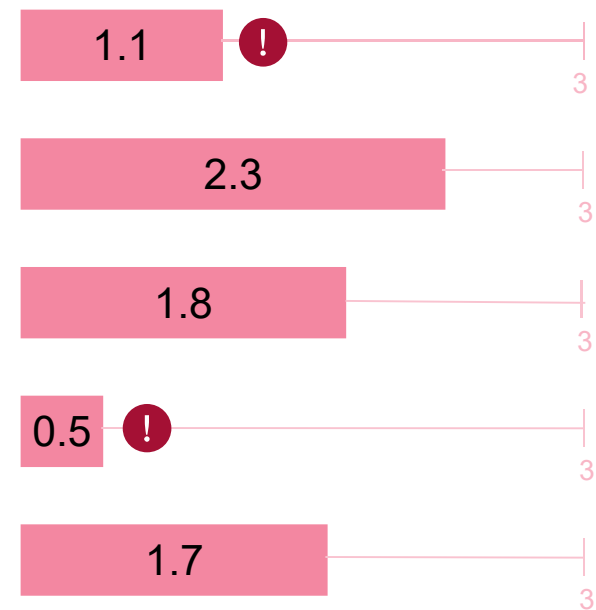


New Training Paradigm

To what extent do surveyed companies follow best practice?

On a scale of 0-3 based on empirical proxies created from answers to questions relevant to each paradigm

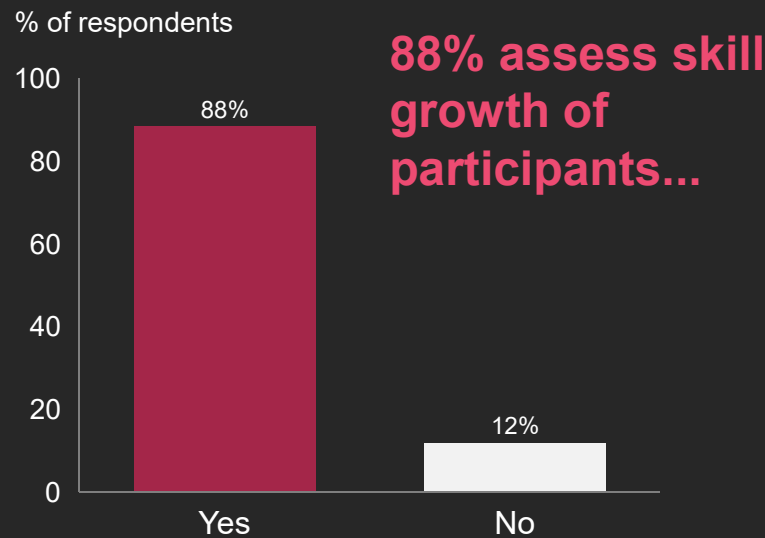
- Reskilling Is a strategic imperative
- Reskilling is the responsibility of every leader and manager
- Reskilling goes beyond training – it is a holistic change management initiative
- Employees want to reskill - when it makes sense
- Reskilling takes a village



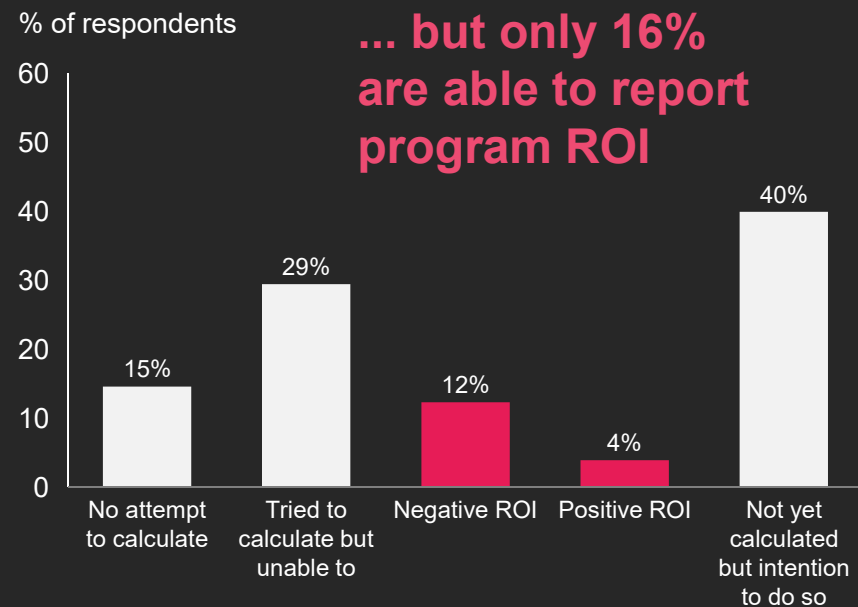
Reskilling programs usually assess individual skill change—but most do not assess overall program ROI and effectiveness



Final assessment post program



Return on investment (ROI) achieved by reskilling



Source: Reskilling survey, 2023, including 1,200 companies, deep dive on 670 companies who implement reskilling programs



Implications

FIRMS

Firms can play a major role in reskilling their own workers, old and new recruits. But doing so effectively requires a **different organizational approach**, which is still rare



Incremental and/or **idiosyncratic investments** in training **unlikely to be effective**

While many firms are currently investing in training and reskilling initiatives, the systematic evaluation of these investments is often missing, resulting in little learning



Need to **generate robust and comparable evidence** on internal training programs **to accelerate spread of reskilling “best practices”**



This talk

How can the process of technological diffusion be accelerated in an **effective** and **equitable** way in the age of AI?

Lessons from past technological waves

Reskilling, promises and challenges

Reflections



Reflections

Having an appropriately skilled workforce is necessary to accelerate the process of technological diffusion—hence, productivity growth

Investments in reskilling have great potential, as they can help firms and workers adapt and realize the opportunities offered by new technologies in a targeted, efficient and more equitable way

But their effective implementation at scale presents formidable challenges, which are often ignored in the public discourse

- Demand for reskilling among workers is low and heterogeneous
- Firms often lack the organizational and managerial capabilities needed to support the effective deployment of reskilling programs

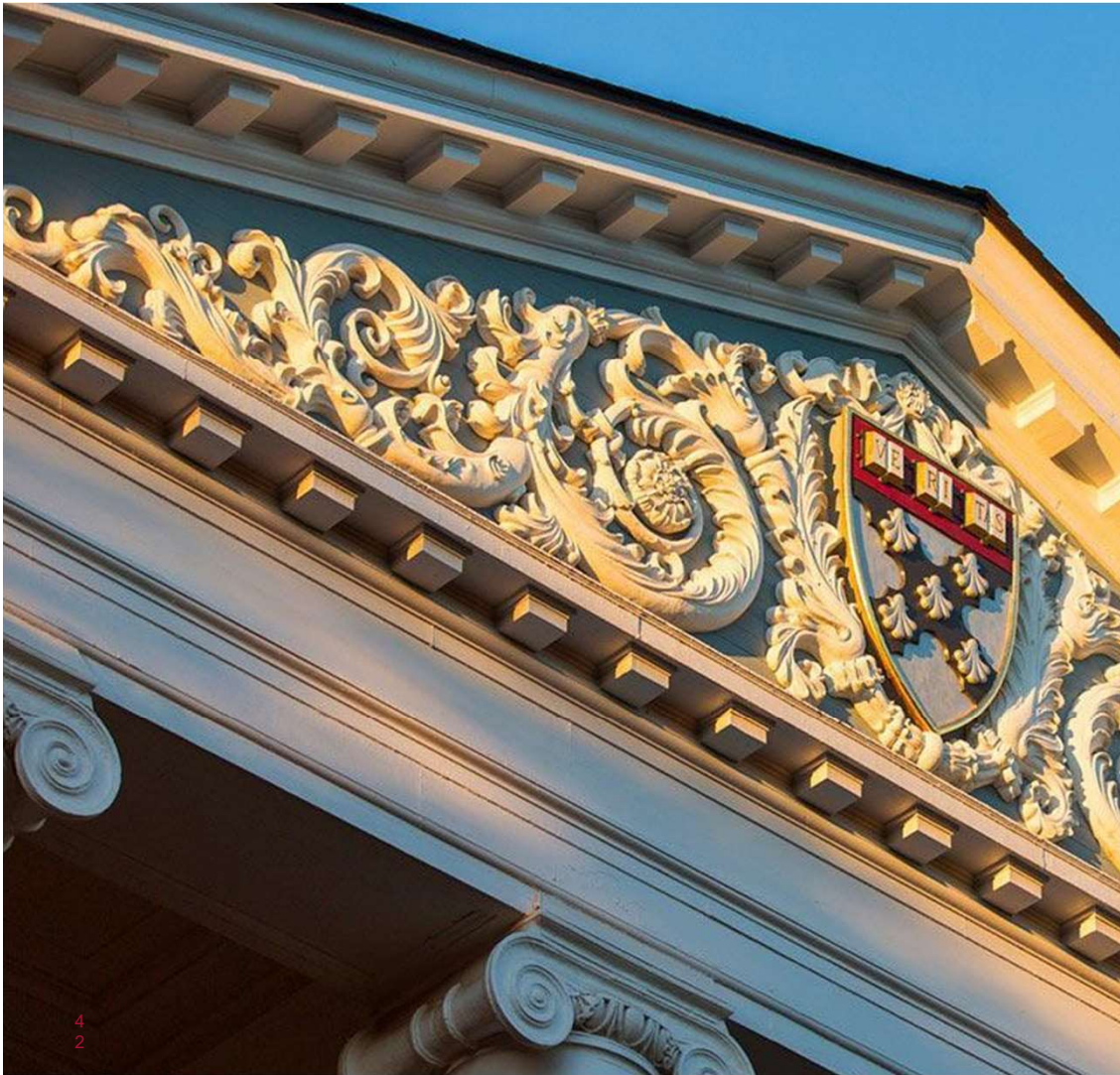
The Role of Policy

To make progress, we need to recognize the **systemic nature** of the obstacles rather than look for a silver bullet

We also need to **continue experimenting** and **learn** from ongoing investments

Policy makers have an important role to play

- **Aligning stakeholders** (workers, firms and training providers) around concrete and tangible objectives
- **Curating the market for training**, which is now marred by informational asymmetry
- **Committing to an evidence-based approach** to identify, scale and reward the most promising experiments



HARVARD BUSINESS SCHOOL

Reskilling in the age of AI

Raffaella Sadun

Dec 20, 2023