



**INAPP**

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# LAVORO E IA ANALISI REGIONALI E POLITICHE PER LA PUGLIA

## AI IMPLICATIONS IN THE APULIAN LABOUR MARKET

SIE

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# AI AND ITS IMPLICATIONS AS A TRANSFORMATIVE FORCE

AI is a transformative force with disruptive effects on work and production.

It redefines skills, roles and production models in a way that is not uniform across sectors and territories.

In established markets (manufacturing, public administration, finance), it leads to increased efficiency and reduced demand for unskilled labour.

In emerging markets (green economy, digital), it creates opportunities for new professions and training paths.

The impact of AI varies according to the entrepreneurial and productive vocation of the territories, and its future effects will be highly differentiated between regions and countries.



# RESEARCH OBJECTIVES AND METHODS

Focus on the Puglia labour market to analyse the exposure of Puglia professions to AI, assess risks and opportunities, and propose policy measures to mitigate negative effects and enhance positive ones.

- Use of the American O\*NET system adapted to the Italian context through the Sample Survey of Professions (ICP, 2013).
- Construction of the AIOE index for calculating AI exposure for each profession (Ferri, Porcelli, Fenoaltea, 2024)
- Correction for complementarity: C-AIOE index (Ferri, Porcelli, Fenoaltea, 2024)
- Econometric analysis Regression model to estimate exposure
- Regional application to highlight the specific characteristics of Puglia.
- Analysis of activations and terminations of contracts

Data sources: RCFL-ISTAT and ICP-INAPP, which enable detailed analyses of occupational exposure to AI



# OPEN ISSUES

- AI is a disruptive element, but its impact is not solely destructive: it can generate new opportunities as well as replacing existing ones.
- Key elements to consider:
  - Effects dependent on multiple variables (type of tasks, production context, technological maturity of businesses, responsiveness of the education system and labour policies)
  - Importance of the territory (regional differences influence the impact of AI; human capital and the degree of innovation are enabling factors)
  - Technology as a driver or risk (if supported by favourable conditions, AI can stimulate development; in the absence of such conditions, it can generate displacement and inequality)



# METHODS- ADAPTING AI-EXPOSURE INDICATORS TO THE ITALIAN LABOUR MARKET

## Why & How

Most indicators are built on US systems (e.g., O\*NET).

Goal: design ad hoc policies for workers by translating these indicators to Italy.

Approach: link abilities from ICP to respondents.

Use mTurk Gig Workers Survey to compute Ability-Level AI Exposure and apply AIOE to Italy.

## AI Applications (mTurk)

1. Abstract Strategy Games
2. Real-Time Video Games
3. Image Recognition
4. Visual Question Answering
5. Generating Images
6. Reading Comprehension
7. Language Modeling
8. Translation
9. Speech Recognition
10. Instrumental Track Recognition



# METHODS- FROM ABILITIES TO AI EXPOSURE (FELTEN ET AL., 2021 ADAPTED TO ICP)

The 52 abilities in the Italian Survey on Professions (ICP) correspond to the 52 O\*NET abilities used by Felten et al. (2021). Each profession is assigned an importance and complexity level for every ability. These values are used to calculate AI exposure by linking each ability to 10 AI applications identified from the mTurk survey.

- **Ability-level AI exposure (Equation 1):**  $A_{ij} = \sum_1^{10} x_{ij}$

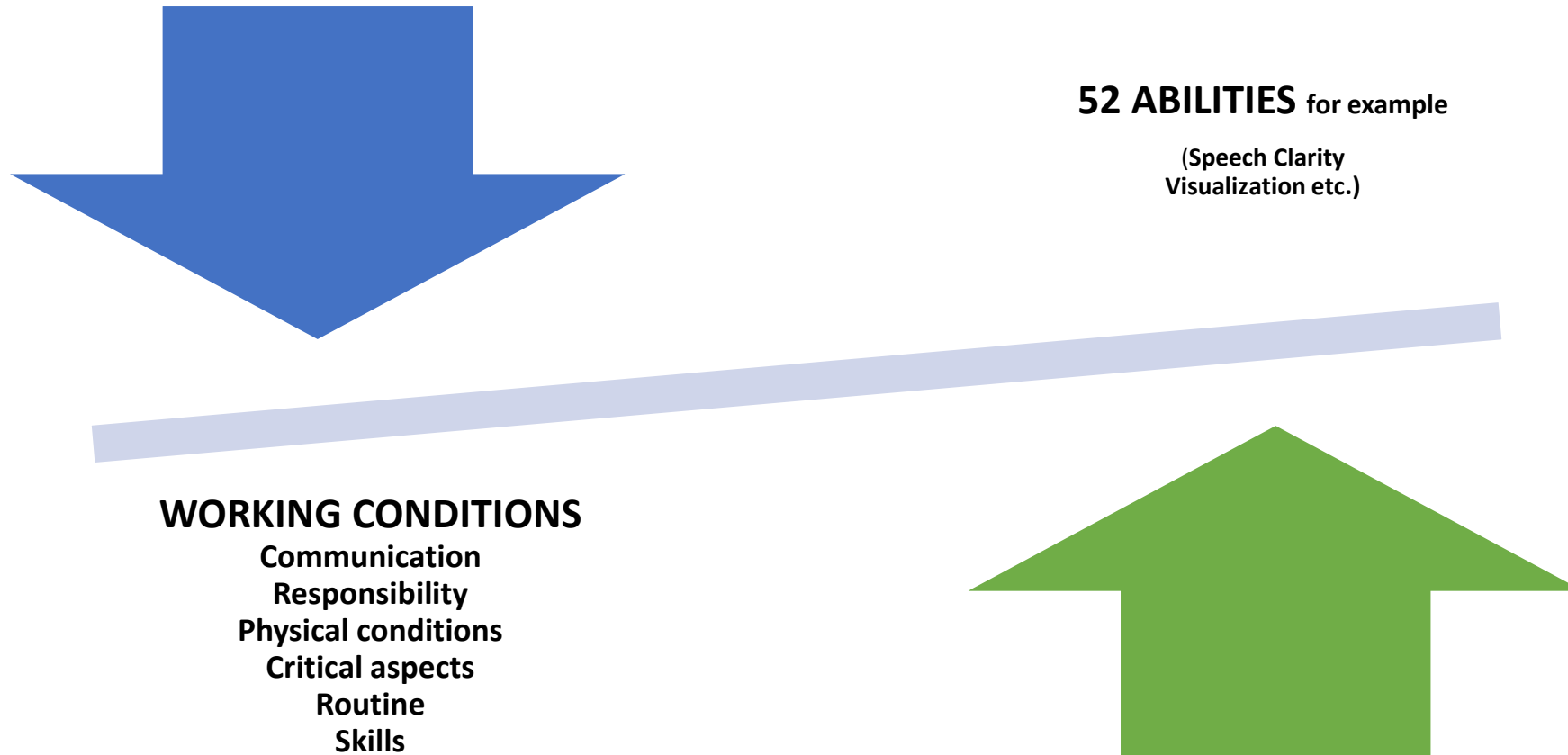
→  $A_{ij}$  = sum of relatedness scores ( $x_{ij}$ ) between AI applications (i) and abilities (j), derived from mTurk data.

- **Occupational AI exposure (Equation 2):**  $AIOE_k = (\sum_1^{52} A_{ij} \times L_{jk} \times I_{jk}) / (\sum_1^{52} L_{jk} \times I_{jk})$

→ The numerator weights each ability's AI exposure by its level ( $L_{jk}$ ) and importance ( $I_{jk}$ ) within occupation k, as measured in the ICP.



# METHODS- FROM ABILITIES TO AI EXPOSURE (PIZZINELLI ET AL., 2023 ADAPTED TO ICP)



# THE PROFESSIONAL STRUCTURE IN PUGLIA

- **Low presence of highly qualified professionals:**

Legislators, entrepreneurs and managers: 2.14% (last place in the South).

Intellectual and scientific professions: 13.74% (below the national average of 15.11%).

- **Technical and executive professions below average:**

Technicians: 14.32% (national average 17.53%).

Office executives: 9.94% (national average 12.01%).

Skilled professions in commerce and services: 21.35% (above the national average of 18.74%).

Craftsmen, skilled workers and farmers: 17.35% (national average 14.48%).

Unskilled professions: High share: 13.19% (national average 10.34%).

- **Age of the workforce:**

Average age: 44.63 years (third place in Italy).

Young workforce → advantage in adopting AI and reducing the digital divide.



# THE PROFESSIONAL STRUCTURE IN PUGLIA

## •Sectoral distribution

Agriculture: 8.06% (among the highest in Italy).

Industry: 15.64% (lower than the North, but higher than other regions in the South).

Construction: 8.20% (above the national average).

Trade: 15% (in line with Campania and Sicilia).

Services: 53.09% (in line with Piemonte and Basilicata).



# IA EXPOSURE INDICES AND ESTIMATES

## Key indicators

AIOE: measures potential exposure to automation through AI.

CAIOE: adjusts AIOE by considering the complementarity between AI and human skills.

## Regions with the highest exposure

Lombardy:

CAIOE: 63.08

AIOE: 70.12

→ High concentration of technology companies and digital sectors.

Lazio, Liguria, Piedmont, Trentino-Alto Adige, Emilia-Romagna, Veneto:

→ High values, consistent with the presence of advanced sectors.

## Regions with lower exposure

Sardegna, Calabria, Basilicata:

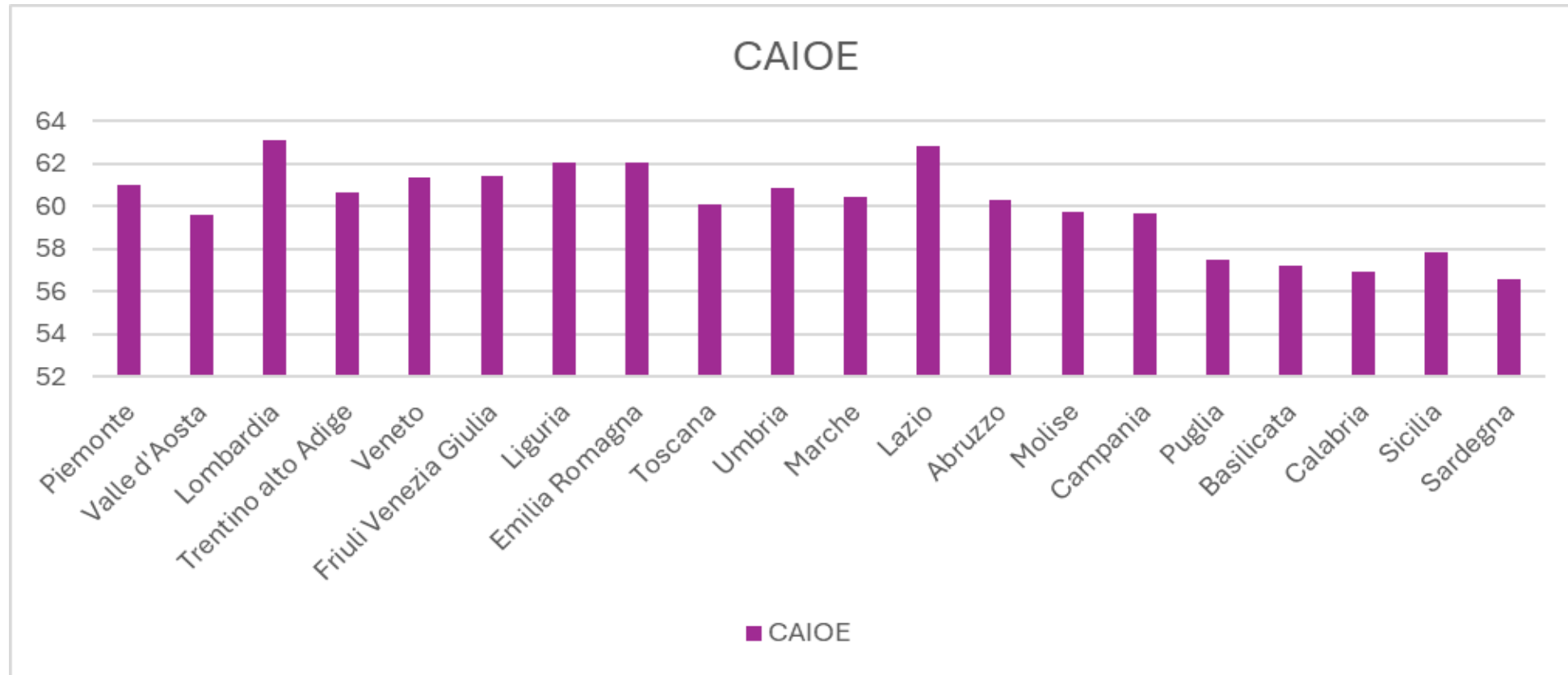
CAIOE and AIOE below 57 points

→ Lower AI penetration and risk of technological marginalisation.



# IA EXPOSURE INDICES AND ESTIMATES

Index CAIOE (0/ 100)

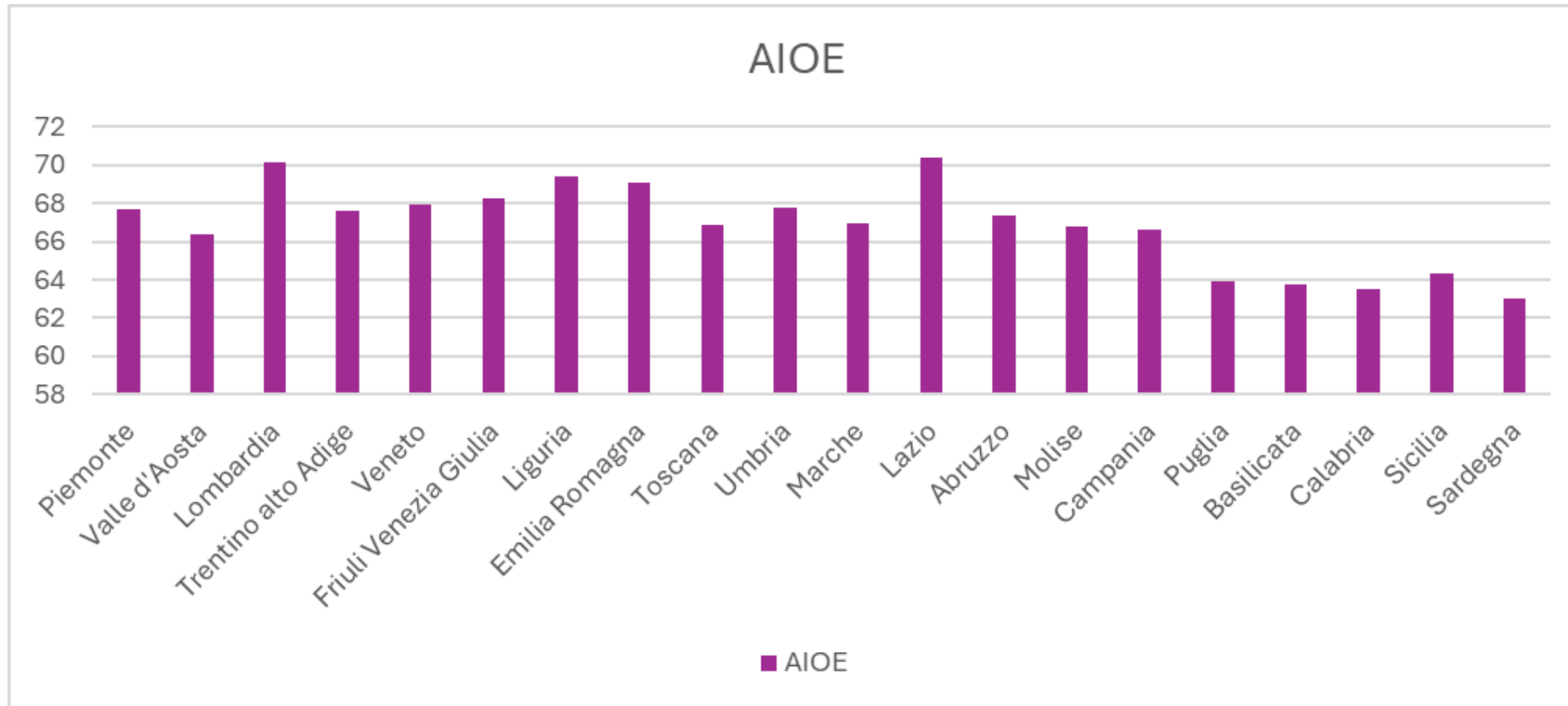


Source: Rilevazione Continua Forze di Lavoro, 2023



# IA EXPOSURE INDICES AND ESTIMATES

Index AIOE (0/ 100)

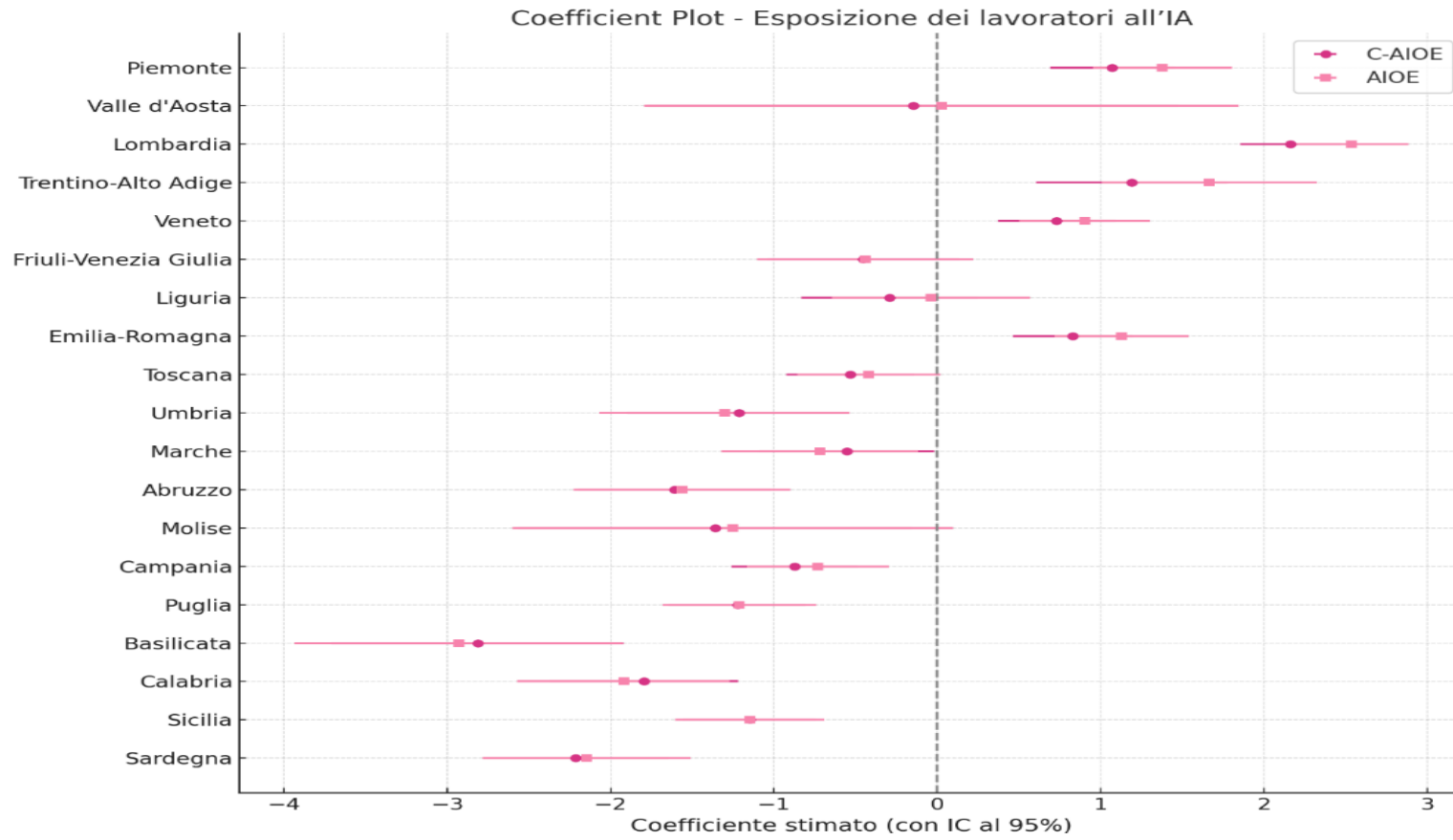


Source: Rilevazione Continua Forze di Lavoro, 2023



# IA EXPOSURE INDICES AND ESTIMATES

## Probability of increased exposure of workers to AI



Northern Italy: high exposure → need for upskilling and reskilling policies.

Southern Italy: low exposure → risk of exclusion from the benefits of AI.

Puglia: intermediate position, with growth potential, but still limited diffusion of AI-intensive occupations.



# TREND IN ACTIVATIONS AND TERMINATIONS CAIOE

- Vulnerable Apulian employment structure: High concentration of routine tasks.
- Terminations/activations ratio  $>1$  → signs of net replacement.
- Urgent need for reskilling policies: digital skills, mobility, self-entrepreneurship.
- Professions most exposed to AI: Secretarial work, accounting, call centres, cashiers, protocol → repetitive and automatable tasks.



# TREND IN ACTIVATIONS AND TERMINATIONS

<p><b>Call centres:</b></p> <p>Activations: -65.9%</p> <p>Terminations: -61.3%</p> <p>→ Strong impact from chatbots and AI, structural decline in the sector.</p> <p>Highly vulnerable and subject to technological replacement.</p>	<p><b>Secretariat:</b></p> <p>New members: +6.2%</p> <p>Terminations: +28%</p> <p>Terminations/new members ratio: 0.91</p> <p>→ High turnover, risk of instability.</p> <p>Still stable, but in need of digital retraining.</p>
<p><b>Document protocol and sorting:</b></p> <p>Activations: +11.9%</p> <p>Terminations: +25.3%</p> <p>Ratio: 0.98</p> <p>→ Significant replacement, but no net loss.</p>	<p><b>Accounting:</b></p> <p>Activations: -5.4%</p> <p>Terminations: +10.3%</p> <p>Ratio: 0.86</p> <p>→ Declining demand, risk of obsolescence.</p>



# TREND IN ACTIVATIONS AND TERMINATIONS

<p><b>Payroll:</b></p> <p>New hires: +93% Terminations: +140.9% Ratio: 0.85</p> <p>→ Growth interrupted, high turnover.</p>	<p><b>Switchboard operators:</b></p> <p>Activations: -69.6% Terminations: -79.3% Ratio: 1.10</p> <p>→ Net replacement, risk of structural reduction.</p>
<p><b>Ushers:</b></p> <p>Activations: +79.6% Terminations: +10.3% Ratio: 1.14</p> <p>→ High net replacement.</p>	<p><b>Distance sellers:</b></p> <p>Activations: -8.0% Terminations: -12.2%</p> <p>→ Significant decline compared to the peak in 2017.</p>



# PROFESSIONS WITH HIGH EXPOSURE TO AI IN PUGLIA

## 1) Administrative staff

Change in activations 2015–2024: +6.21%

Annual average: +0.67%

Terminations/activations ratio: 0.91

Permanent contracts: initial decline, partial recovery post-2020 → increasing fragility

## 2) General affairs staff

Change in activations 2015–2024: +14.71%

Annual average: +1.54%

Terminations/activations ratio: 0.91

Permanent contracts: over 7,000 stabilised → resilient role

## 3) Call centre information officers (no sales)

Change in activations 2015–2024: –65.95%

Annual average: –11.28%

Terminations/new hires ratio: 0.97, with terminations exceeding new hires in some years

Permanent contracts: from 1,800 (2015) to 400 (2024) → structural collapse



# TERRITORIAL EVOLUTION AND TECHNOLOGICAL EXPOSURE IN PUGLIA

## Exposure to AI in the Puglia provinces (CAIOE 2015–2024)

General increase in the CAIOE index in all provinces between 2015 and 2024.

### Provinces most exposed in 2024:

Lecce: from 0.215 to 0.236 → the most exposed.

Bari: from 0.197 to 0.203.

Brindisi: from 0.149 to 0.180 → significant increase.

### Least exposed provinces:

Foggia: from 0.082 to 0.112.

Barletta-Andria-Trani: from 0.092 to 0.107.

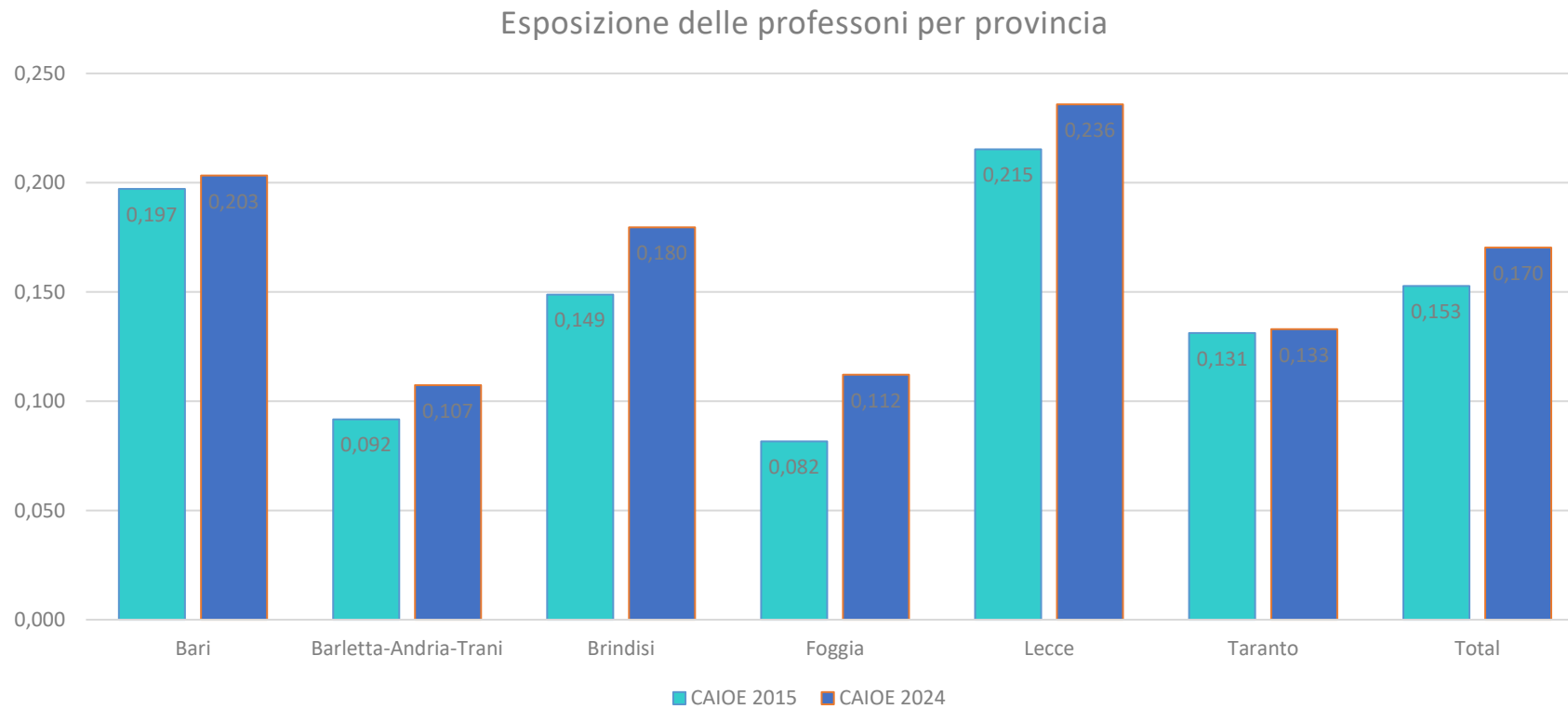
Taranto: from 0.131 to 0.133 → minimal increase.

**Regional CAIOE average:** from 0.153 to 0.170 → growth in contractual exposure to AI technologies.



# TERRITORIAL EVOLUTION AND TECHNOLOGICAL EXPOSURE IN PUGLIA

## Professional exposure by province



# TERRITORIAL EVOLUTION AND TECHNOLOGICAL EXPOSURE IN PUGLIA

## Regional and sectoral trends

**Services:** sector most exposed to AI due to its intangible and digitizable nature.

**Manufacturing and SMEs:** slower adoption of AI → structural constraints and lack of investment.

**Regional disparities:** risk of amplification between more and less digitized areas.

## Municipalities most exposed in 2024 (CAIOE)

Bitritto (BA) stands out clearly as the municipality with the highest exposure. Other municipalities with high exposure are concentrated in the provinces of Bari and Lecce.

## Municipalities with the highest growth in exposure (2015–2024)

Small municipalities with a specific sectoral focus.

Growth in the index linked to the low presence of less exposed professions.



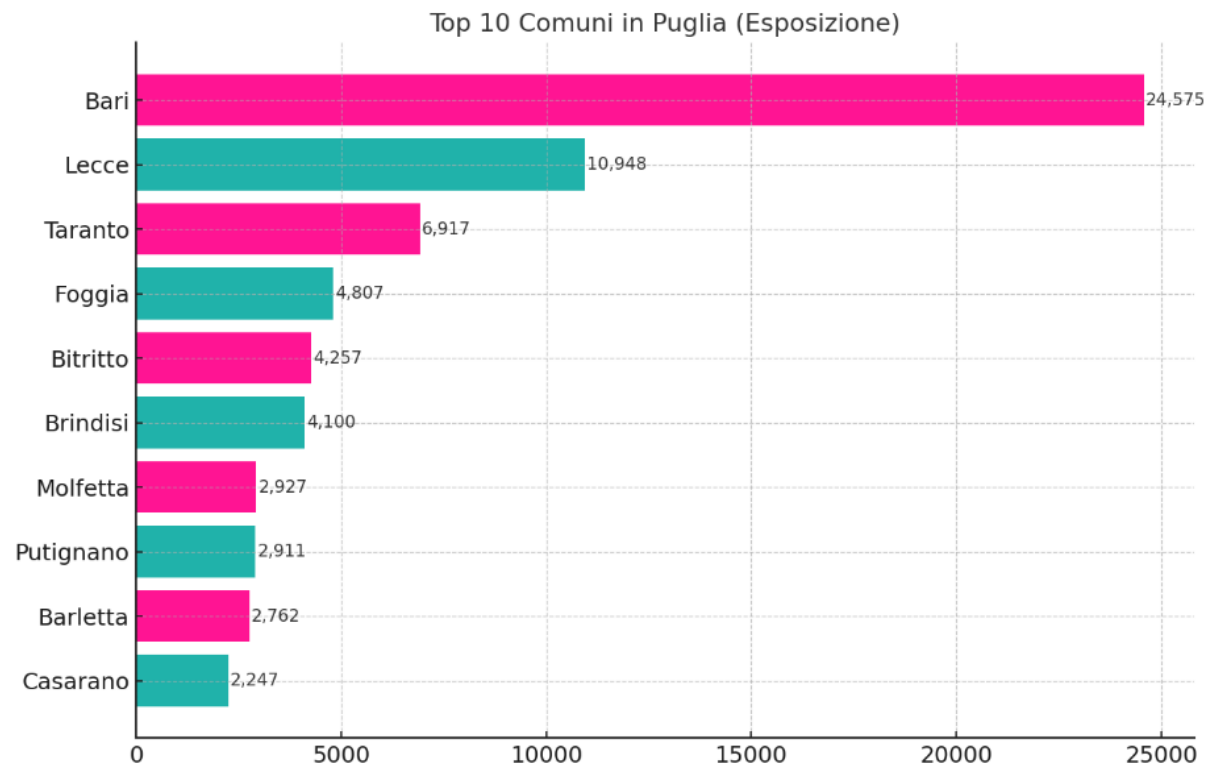
## QUARTILES ANALYSIS OF THE MOST EXPOSED PROFESSIONS

- **Territorial polarisation:** Bari and Lecce account for the majority of vulnerable workers.
- **Growing professions:** technical and specialist roles linked to digital transformation.
- **Declining professions:** repetitive and standardised roles that are highly automatable.



# QUARTILES ANALYSIS OF THE MOST EXPOSED PROFESSIONS

Top 10 municipalities for exposure to AI (CAIOE), number of activations most exposed



# HOW SIGNIFICANT ARE THE PROFESSIONS MOST VULNERABLE TO AI AMONG NEW CONTRACTS?

## 1. Provinces with the highest average quotas

Bari and Lecce: over 10% of contracts activated in vulnerable professions. Territorial polarisation: small to medium-sized municipalities account for the highest percentages.

## 2. Focus on the province of Bari

Bitritto: 72.86% of contracts activated in exposed professions. 77% concern distance sellers (5.1.2.5.2) → possible presence of call centres or e-commerce.

Putignano: 34.98% of activations displayed.

Bari stands out for its absolute values and significant percentages.



## HOW SIGNIFICANT ARE THE PROFESSIONS MOST VULNERABLE TO AI AMONG NEW CONTRACTS?

### 3. Province of Barletta-Andria-Trani

Average rates.

Municipality with the highest rate: Barletta (9.53%).

### 4. Province of Brindisi

Capital: 16.67% of exposures activated.

Several municipalities exceed 10%.

### 5. Province of Foggia

Celenza Valfortore: 17.78% (small municipality).

Capital: 10.91%.

In small municipalities, even with low absolute numbers, the impact can be significant, especially in areas at risk of depopulation.



## HOW SIGNIFICANT ARE THE PROFESSIONS MOST VULNERABLE TO AI AMONG NEW CONTRACTS?

### 6. Province of Lecce

Casarano: 39.65% of vulnerable activations.

Lecce (County town): 26.81%.

### 7. Province of Taranto

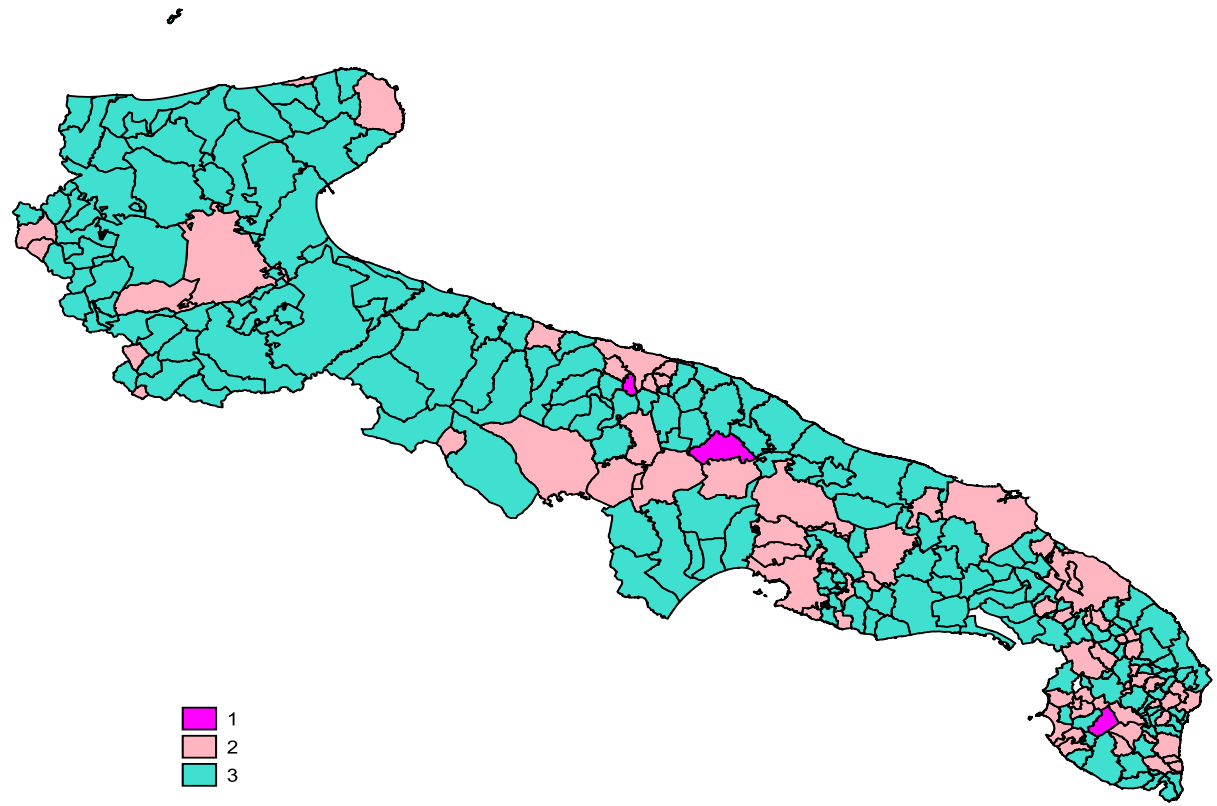
Leporano: 18.58%.

Taranto (County town): 16.99%.



# HOW SIGNIFICANT ARE THE PROFESSIONS MOST VULNERABLE TO AI AMONG NEW CONTRACTS?

## Territorial risk cartogram bands in Puglia



# COULD AI HAVE AN IMPACT ON THE PRECARIOUSNESS AND FRAGMENTATION OF CONTRACTS IN PUGLIA?

## General trend

- Increasing job precariousness in professions exposed to automation.
- Contract fragmentation and reduction in the average duration of contracts.
- Decrease in employment demand in terms of both contracts and individuals involved.

## Professions most affected

### - Distance sellers (CP 51252):

Average contract duration: from 66 days (2015) to 56 days (2024).

### - Call centre operators (CP 42240):

Peak in 2020: 133 days, falling to 88 days in 2024 → post-pandemic restructuring.

### - Data entry clerks (CP 41220):

Drastic decline: from 130 days (2020) to 54 days (2024) → effect of technological replacement.

### - General affairs clerks (CP 41120):

Stable until 2023, then decline to 87 days in 2024 → delayed effect of automation.

### - Switchboard operators (CP 42230):

Fluctuations, but downward trend → vulnerability of repetitive tasks.



## Implications and recommendations

AI is redefining contractual conditions, not only replacing jobs but also increasing precariousness. A polarisation of the labour market can be observed.

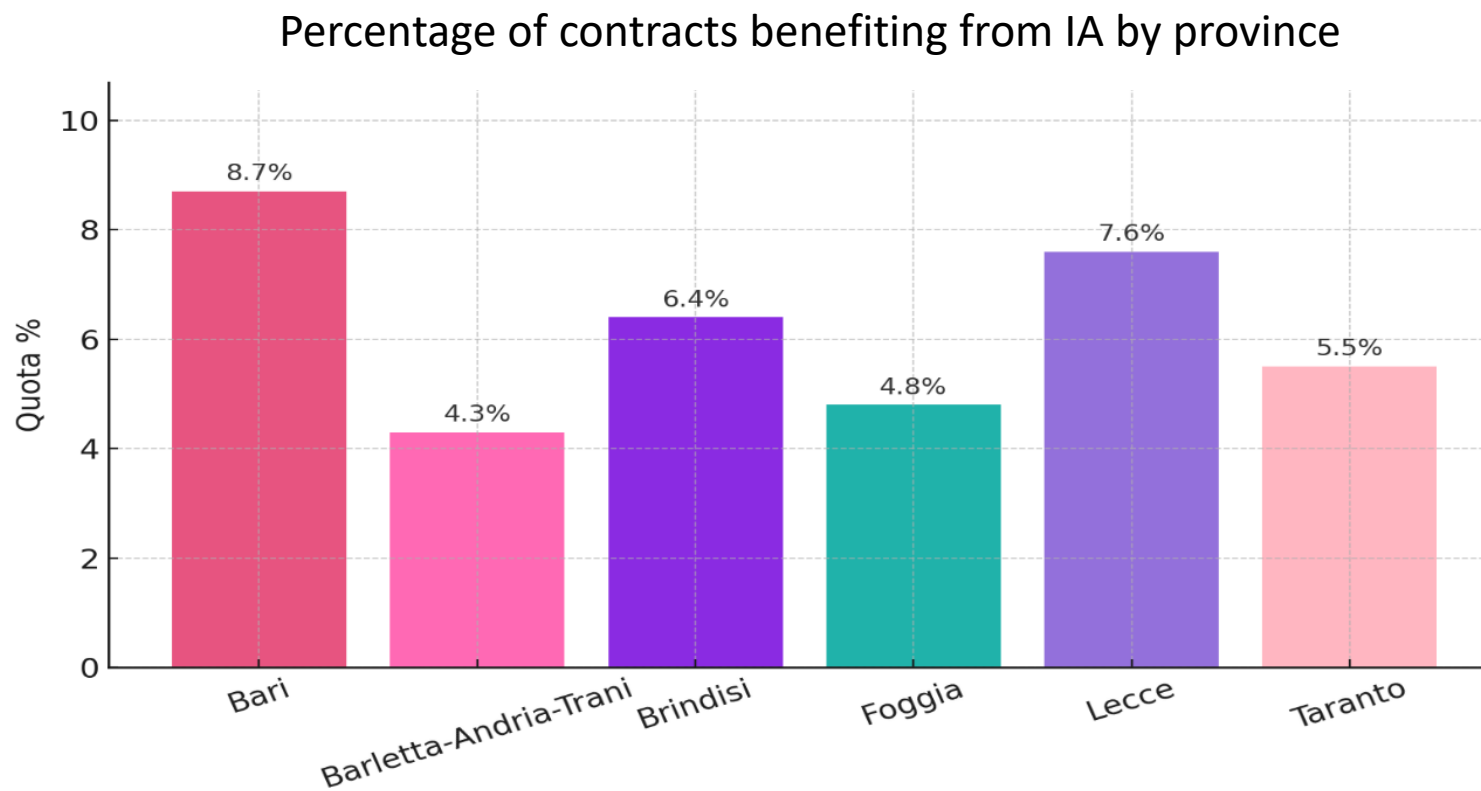
Necessary:

- Continuous monitoring of exposed professions.
- Active labour policies.
- Promotion of quality contracts, including through incentives for businesses.
- Integration with regional development strategies.



# ANALYSIS OF THE PROFESSIONS THAT BENEFIT MOST FROM AI IN PUGLIA

The provinces with the highest percentages of contracts in professional categories that will benefit from AI are Bari (8.7%) and Lecce (7.6%), confirming the centrality of these areas in services and activities. Percentage of contracts benefiting from IA by provinces where there is greater complementarity between humans and technology.



# CONCLUSIONS

- The Puglia region shows less exposure to AI than central and northern Italy, but this is not necessarily an advantage: it can lead to delays in technological adoption and risks of productive marginalisation.
- Repetitive and low-cognitive professions (e.g. call centre agents, switchboard operators, statistical operators) are experiencing sharp declines in contract activations (up to -65%), confirming their vulnerability to automation.
- Some professions (e.g. HR specialists +613%, marketing technicians +249%) show expansive dynamics, where AI acts as an enabling technology, enhancing skills and productivity.
- Only 6.6% of contracts activated in Puglia concern professions that are highly complementary to AI, with significant regional differences (e.g. Bari 8.7%, BAT 4.3%), risking a concentration of opportunities.



# CONCLUSIONS

- A multi-level strategy is needed:
  - Investment in targeted upskilling and reskilling.
  - Incentives and technical support for the responsible adoption of AI in SMEs.
  - Development of soft skills and advanced skills.
  - - Regional ecosystems for inclusive innovation.
- 
- Proposal for permanent observation tools to monitor the impact of AI on work, anticipate needs and coordinate active policies. Without targeted interventions, innovation risks widening territorial inequalities.



Osservatorio del Mercato del Lavoro Puglia



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