

XLVII CONFERENZA SCIENTIFICA ANNUALE AISRe

Session SO.63 Gender Equality in the Labour Market

Human Capital in Action

Exploring the Gender Sensitive Link Between Training and Firm
Performance in Italy Using the INAPP INDACO Survey

Authors:

Roberto **Angotti** (INAPP) - Luisa **Errichiello** (CNR-ISMed)

Greta **Falavigna** (CNR-IRCrES) - Roberto **Ippoliti** (Università del Piemonte Orientale)

June, 26 2026 – Università degli Studi di Firenze

Gender Inclusion in Training as a Strategic HR Practice

2

- Research on **gender inequality** highlights persistent disparities in access to career-enhancing opportunities, including training, skill development, mentoring, and professional advancement (Blau & Kahn, 2017).
- **Access to training** is a critical mechanism through which human capital is accumulated and career trajectories are shaped (Arulampalam et al., 2004; Bassanini et al., 2005).
- OECD reports show that **gender gaps in training participation** and **skills development** continue to characterize many labour markets with women often facing lower participation in employer-sponsored and on-the-job training (Desjardins et al., 2013; OECD, 2025).
- **Strategic HRM and diversity management research** suggest that inclusive HR practices can improve innovation, organizational learning, and firm performance by leveraging a broader pool of talent and competencies (Richard & Johnson, 2001; Armstrong et al., 2010).

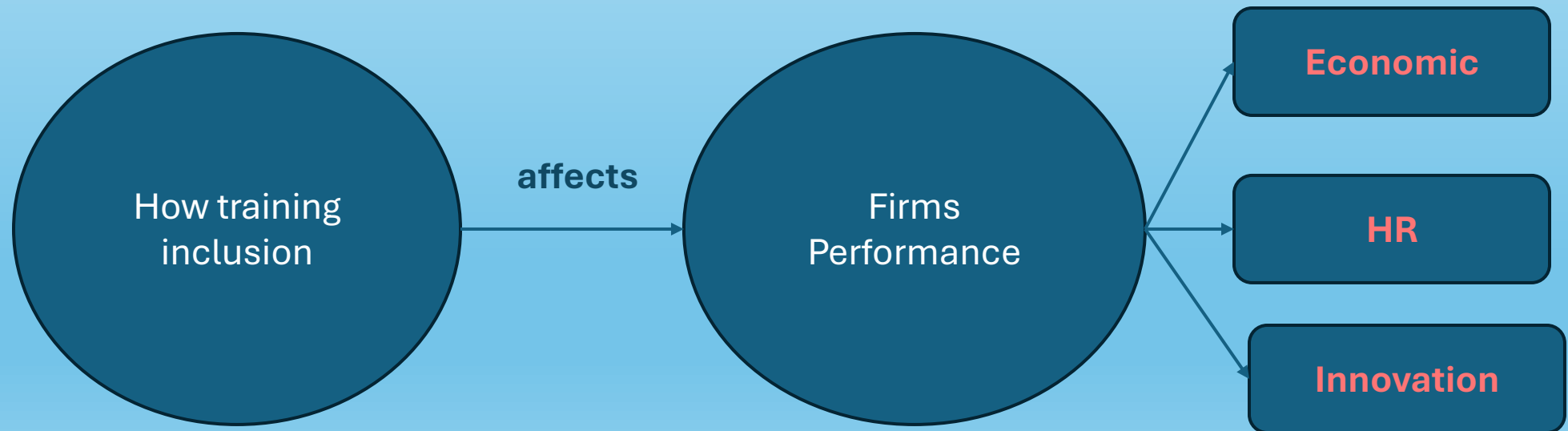
Yet, existing studies have rarely examined whether the **gender distribution of training opportunities** - rather than training volume alone - affects organizational outcomes.

Research Gap

- Training-performance literature focuses on **how much training firms provide**.
- Gender inequality literature focuses on **individual career outcomes**.
- Little is known about whether **gender-inclusive training allocation contributes to organizational performance**.

Research question

To what extent is gender-inclusive training associated with firms' economic, HR, and innovation performance?

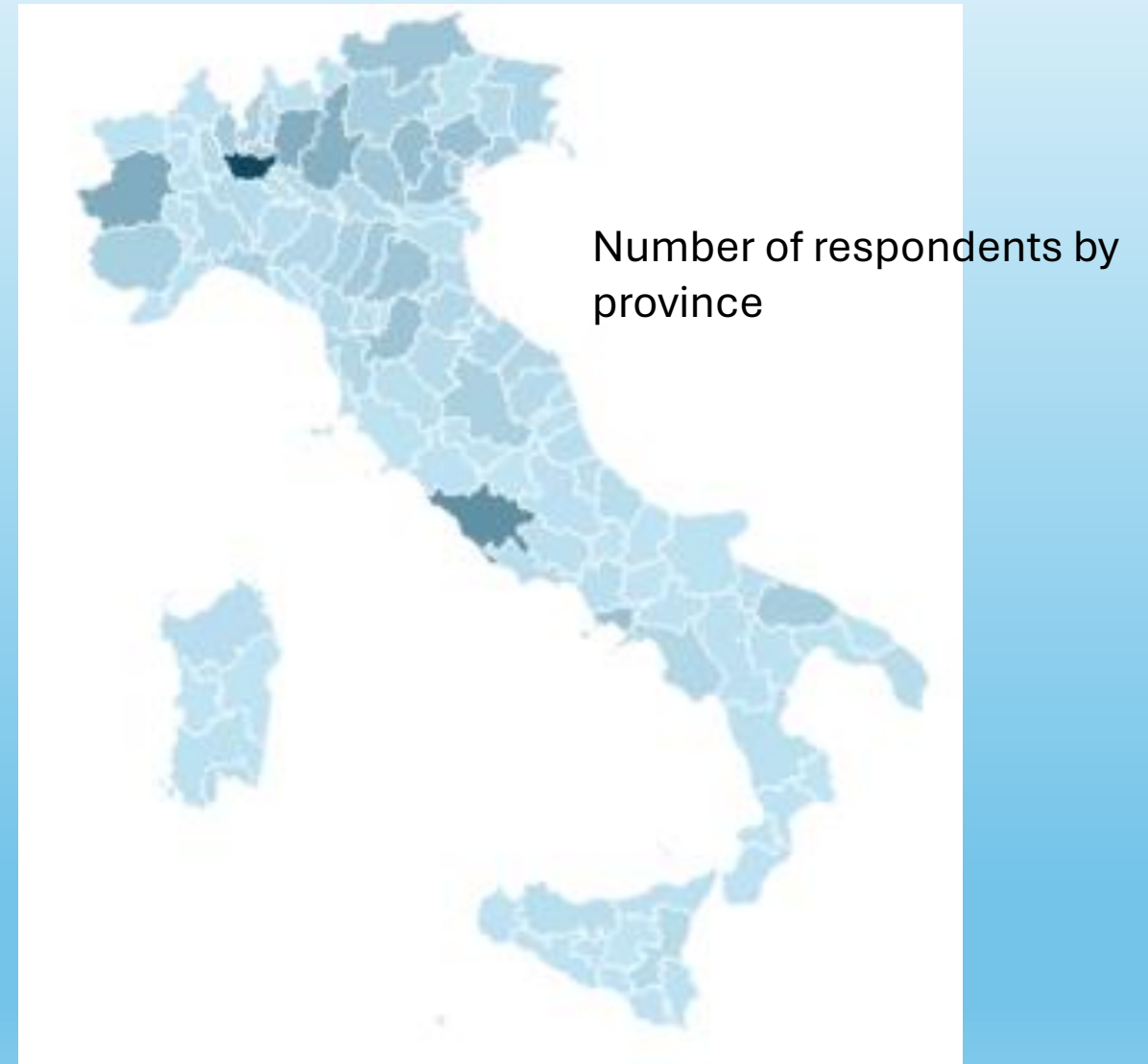


Statistics on sample

4

Macro-area	Freq.	Percent
North-West	6,920	38%
North_East	5,076	28%
Centre	3,548	19%
South and Islands	2,711	15%
Total	18,255	100%

Size class	Freq.	Percent
Small (6–49)	11,805	65%
Medium (50–249)	4,169	23%
Large (250+)	2,281	12%
Total	18,255	100%

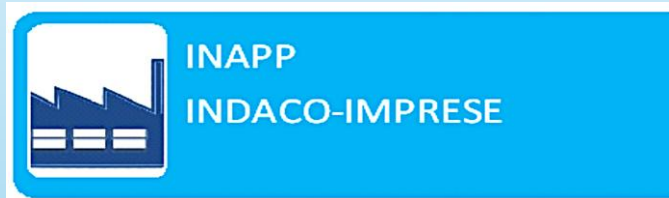


Statistics on sample

Industry	Freq.	Percent
Mining and quarrying	184	1%
Food, beverages and tobacco	663	4%
Textiles and apparel	768	4%
Paper, printing and publishing	495	3%
Chemicals, pharmaceuticals and rubber	835	5%
Basic metals and fabricated metal products	1,227	7%
Machinery and electrical equipment	1,452	8%
Transport equipment	374	2%
Wood, furniture and other manufacturing	650	4%
Electricity, gas, water supply and waste management	497	3%
Construction	1,856	10%
Wholesale and retail trade	3,394	19%
Transport, storage and logistics	1,086	6%
Accommodation and food services	1,098	6%
Information and communication (ICT)	812	4%
Financial and insurance activities	371	2%
Professional, scientific and technical activities	2,102	12%
Other service activities	391	2%
Total	18,255	100%

Industry (49%) and
Services (51%)

INAPP INDACO SURVEYS



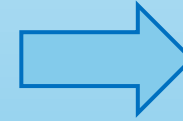
Objective	Adult Learning participation		Training supply and demand in the private sector		Training supply and demand in the public sector
Statistical Unit	Individuals aged 18 to 64		Enterprises with more than 6 employees		Public Administration (PA) Institutional Units
Sample	40k + 10k individuals representative by gender, age, educational attainment, and region		20k + 4k enterprises representative by sector, size, and region		Census-based / sample-based on municipalities with less than 50 employees
Focus	Training participation (formal, non-formal, informal)		Training in enterprises (micro, small, medium, large)		Training in Public Administration
	Socio-demographic, cultural, and professional gaps in access to training Benefits of training, skills acquired, obstacles Impact of COVID and remote working / smart working Intergenerational learning		Incidence, participation, intensity, and costs of training Training strategies, required skills, and training needs Obstacles Evaluation of the training provided Seniority Management and intergenerational knowledge transfer		

THE KNOWLEDGE SURVEY IN ENTERPRISES (INDACO – IMPRESE)

7

A periodic statistical survey on training activities carried out by Italian enterprises with at least 6 employees

It enables the processing of several key indicators on the diffusion of training activities



Designed by INAPP, it provides data on training in enterprises that serve as intermediate data for the European **CVTS** (*Continuing Vocational Training Survey*), managed by ISTAT.

The CVTS is conducted every five years, and INDACO–Imprese is methodologically harmonized with it.

CVTS Key Indicators

INCIDENCE: training enterprises as a share of total enterprises.

PARTICIPATION: course participants / total employees across all companies

ACCESS: course participants / employees in training enterprises

INTENSITY: average training hours per participating employee

COSTS: training expenditure incurred by the enterprise per employee



THE KNOWLEDGE SURVEY IN ENTERPRISES (INDACO – IMPRESE)

8

5th Edition in 2025

Sample: 18,000 enterprises

Standard Areas

- Enterprise characteristics
- Trained employees and training
- Training strategies
- Required skills and obstacles
- Apprentice training

Thematic Areas

- Microlearning
- Artificial Intelligence (AI)
- Strategies for skill mismatch
- New Skills Fund (Fondo Nuove Competenze)
- Age management and intergenerational knowledge transfer

Included in:

The SISTAN National Statistical Program (PSN) 2023-2025 (code IAP-00006), under the name “Survey on Knowledge in Enterprises (INDACO - CVTS)”. It entails a mandatory response by private entities (in accordance with Art. 7 of Legislative Decree no. 322 of September 6, 1989).



Gender Inclusion Index: which components?

9

The Training and Inclusion capture how training opportunities are distributed within firms, going beyond overall investment to assess whether women have equal access to and benefit from training activities. It is operationalized through the construction of a composite Gender Inclusion Index (GII), which combines multiple dimensions of access, intensity, and participation in training.

The GII is a composite indicator formed by different components:

$$1) \text{ Training Intensity ratio (gender)} = \frac{\frac{\text{Training hours per employee (female)}}{\text{Total number of employee (female)}}}{\frac{\text{Training hours per employee (male)}}{\text{Total number of employee (male)}}} = \frac{b3c/a6_c1}{b3b/a6_b1}$$

$$2) \text{ Access gap} = \frac{\text{Female participation at training courses}}{\text{Total training}} - \frac{\text{Total number of employee (female)}}{\text{Total number of employee}} = \frac{b2_c1}{b2_a2} - \frac{a6_c1}{a6_a1}$$

$$3) \text{ Relative training intensity} = \frac{\frac{\text{Training hours per employee (female)}}{\text{Total number of employee (female)}}}{\frac{\text{Training hours per employee}}{\text{Total number of employee}}} = \frac{b3c/a6_c1}{b3a/a6_a1}$$

$$4) \text{ Female participation rate} = \frac{\text{Number of courses followed by female}}{\text{Number of courses}} = \frac{b2_a1}{b2_c1}$$

GII components: explanation and interpretation

10

Components	Explanation	How to interpret results
Training intensity ratio (gender)	Captures the relative intensity of training received by women compared to men. Values below 1 indicate that women receive fewer training hours per capita than men.	A value of 1 indicates parity. Values below 1 reveal gender bias in training intensity; values above 1 indicate stronger investment in women.
Access Gap	Measures whether women participate in training proportionally to their presence in the workforce. A negative value indicates under-representation of women in training, while a positive value indicates over-representation.	Values close to 0 indicate equity in access. Negative values suggest barriers for women; positive values indicate preferential inclusion.
Relative training intensity	Indicates whether women receive more or less training compared to the firm's average. Values below 1 indicate that women receive less than the average employee.	Values below 1 indicate women receive less than the firm average; values above 1 indicate above-average investment in women.
Female participation rate	Measures the overall presence of women among training participants, regardless of their share in total employment. Higher values indicate a stronger representation of women in training activities.	Higher values indicate greater female presence in training, but should be interpreted together with employment share.

GII components: descriptive statistics

Components	How to interpret results	2023	2024	Comment
Training intensity ratio (gender)	= 1 parity	1.120	1.149	Women receive slightly more training than men on average (ratio > 1), and this advantage increases in 2024, suggesting a mild shift towards greater gender equity (or even slight overcompensation)
Access Gap	=0 parity	-0.021	-0.029	Access to training is nearly balanced but slightly unfavorable to women (negative values), with a small deterioration in 2024, indicating persistent barriers in participation relative to their employment share
Relative training intensity	= 1 average	0.310	0.303	Women receive substantially less training compared to the firm average (values far below 1), and this gap remains stable (or slightly worsens) in 2024, pointing to a structural disadvantage in training allocation
Female participation rate	Share women	0.963	0.963	Women are highly represented among training participants, and this share remains stable over time; however, this result should be interpreted together with their employment share.

Notice that total number of employees is available only for 2024; values are not standardized

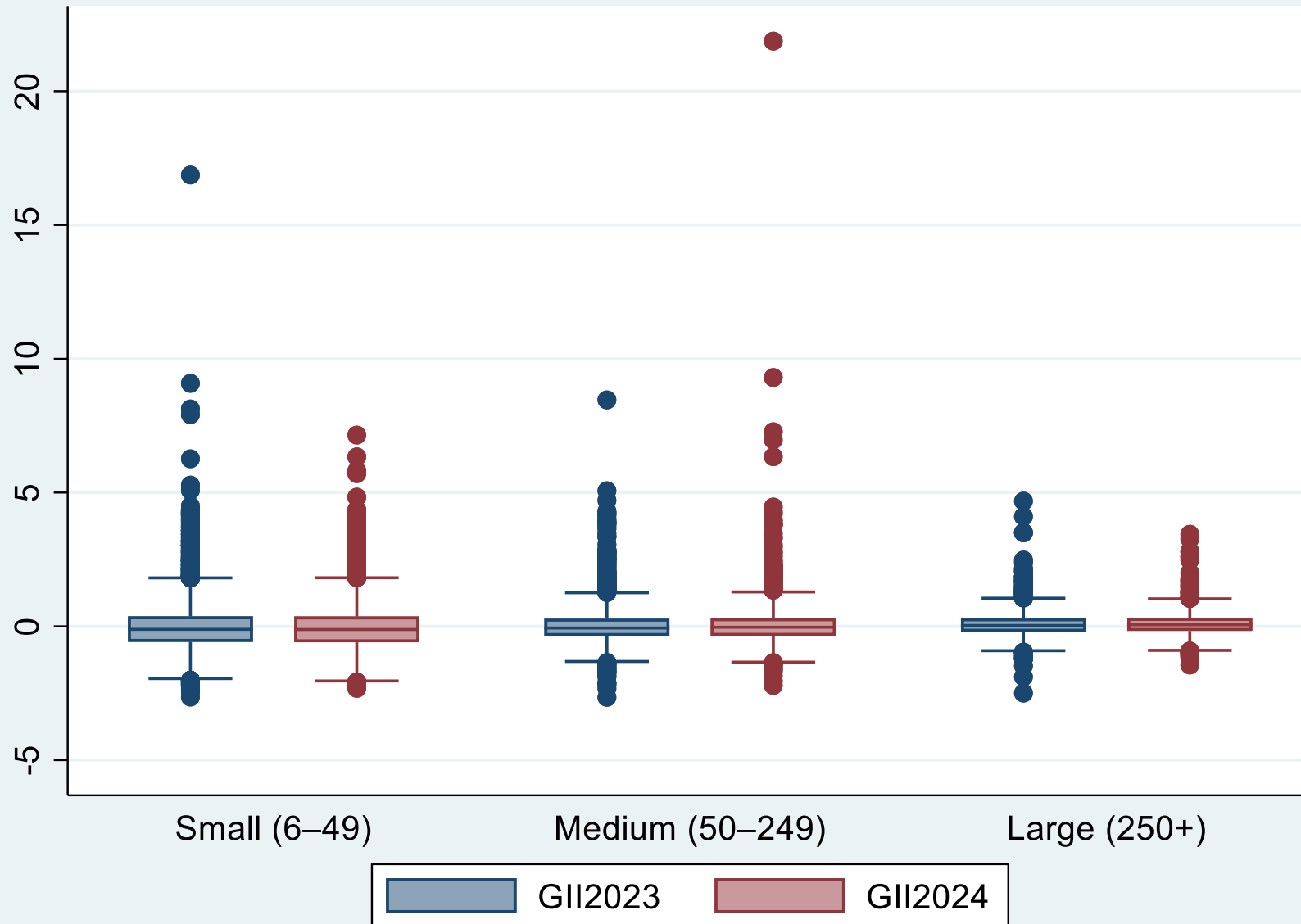
Overall, the results suggest a mixed pattern: while women appear well represented in training and even receive slightly higher training intensity than men, they still face mild disadvantages in access and remain below the firm average in terms of training allocation.

Gender Inclusion Index (GII)

- The Gender Inclusion Index (GII) measures the degree of gender equity in firm-level training by combining multiple dimensions of access (2), participation (4), and intensity (1) of training across women and men.
- The index is constructed as the average of standardized components (mean 0, variance 1), ensuring comparability across indicators.
- Higher values of the GII indicate a greater degree of gender inclusion in training activities, while lower values signal relative disadvantage for women.
- The indicator of relative training intensity (3) is not included in the index due to its high correlation with the gender training intensity ratio, in order to avoid redundancy.
- The GII is a standardized index (z-score), where positive values indicate above-average gender inclusion in training, values around zero correspond to average inclusion, and negative values indicate below-average inclusion.

Index	2023	2024	Comment
GII	0.018	0.021	The GII remains close to zero in both years, as expected given standardization, but shows a slight increase from 2023 to 2024, suggesting a marginal improvement in gender inclusion in training across firms.

GII by size



Gender inclusion in training shows **strong heterogeneity** across firms, especially among **small and medium enterprises**, while **large firms** appear more **homogeneous**.

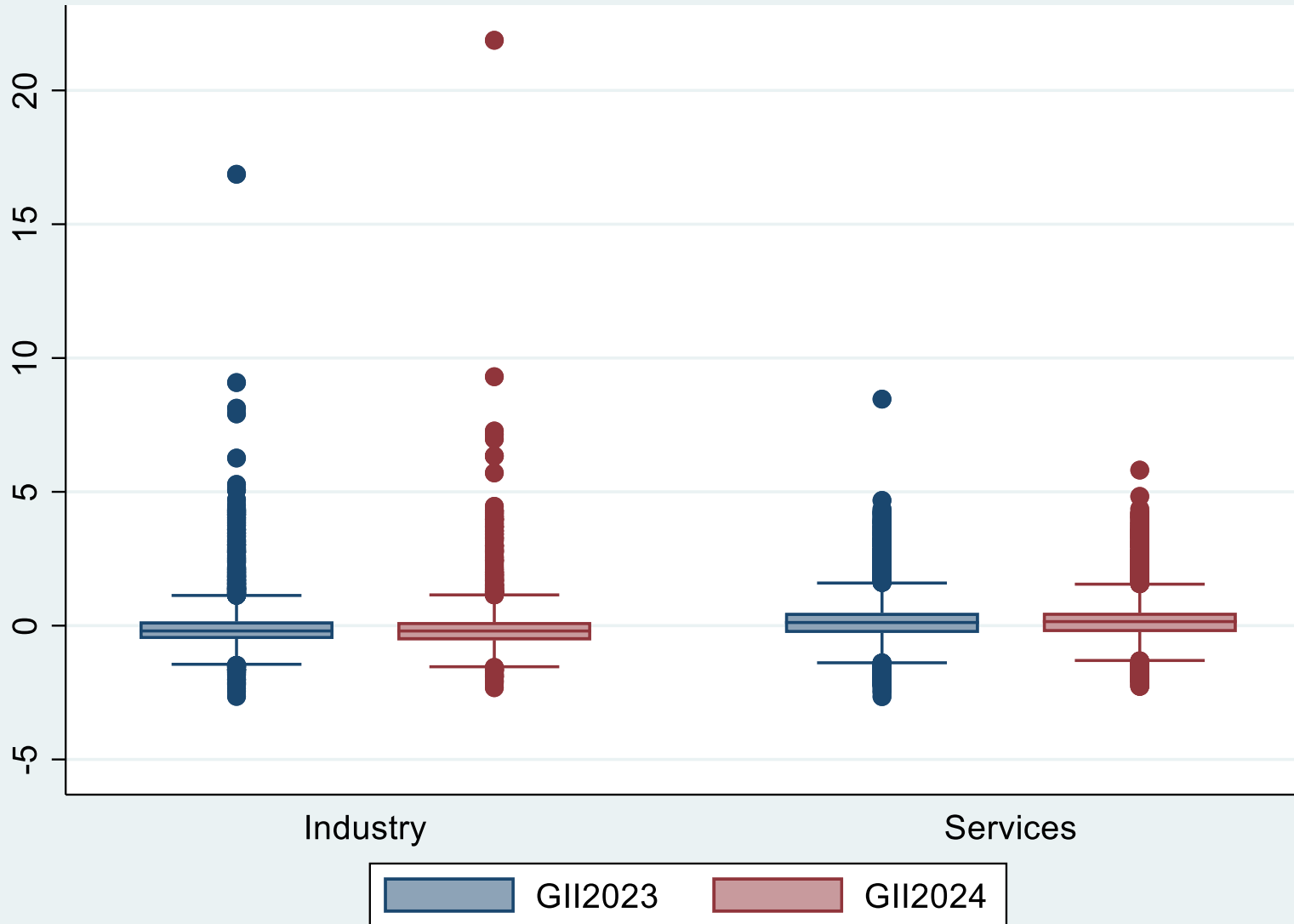
Differences between 2023 and 2024 are limited, suggesting gradual rather than structural changes.

GII2023	Mean	Std. Err.
Small (6–49)	-0.011	0.017
Medium (50–249)	0.010	0.017
Large (250+)	0.070	0.017
GII2024		
Small (6–49)	-0.009	0.018
Medium (50–249)	0.016	0.024
Large (250+)	0.084	0.011

Note: Statistics are weighted using survey sampling weights

GII by industry

14



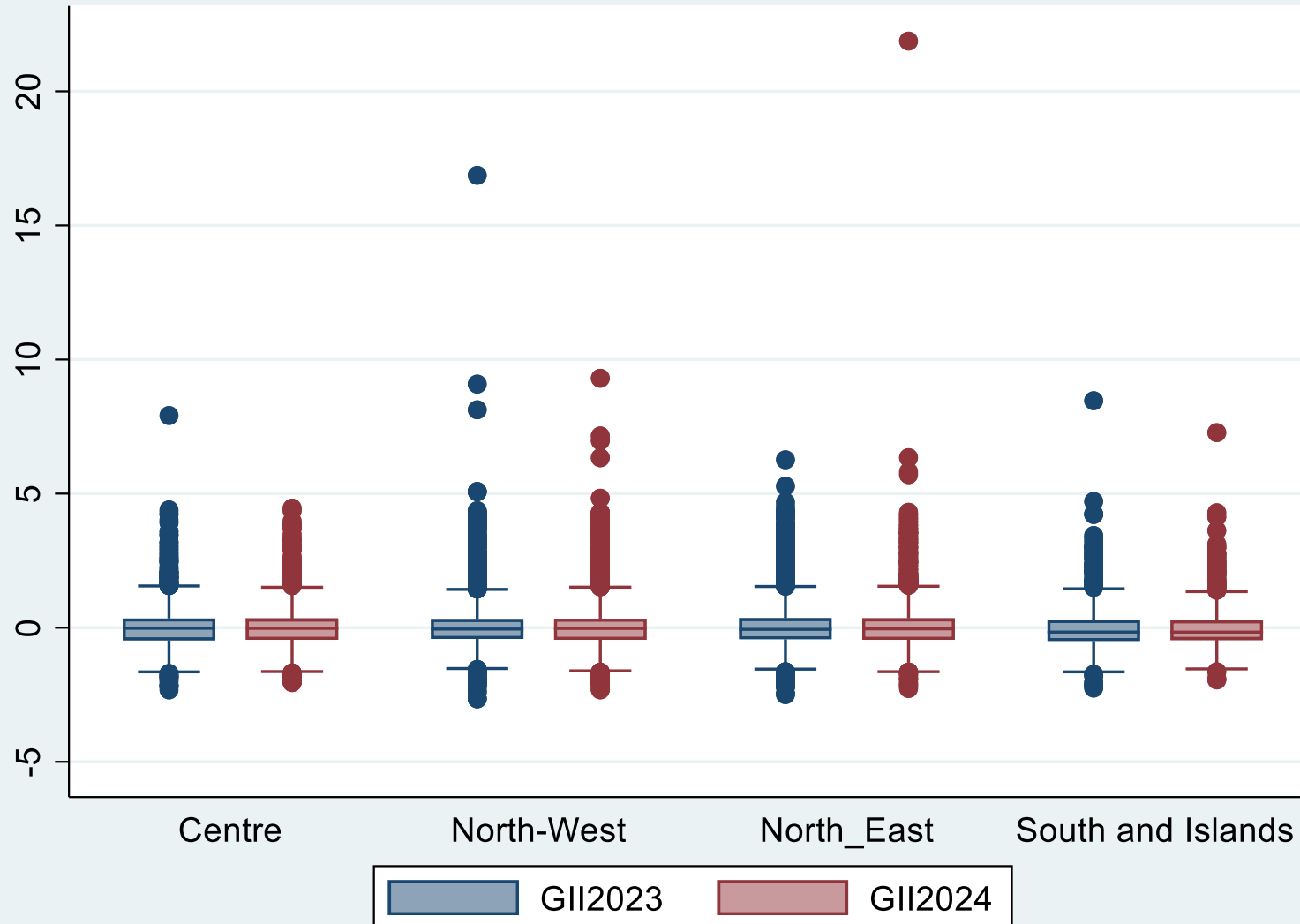
Gender inclusion in training appears broadly **similar across manufacturing and services**, with comparable distributions and only limited differences between 2023 and 2024.

This suggests that sectoral disparities are less pronounced than firm-level heterogeneity.

GII2023	Mean	Std. Err.
Industry	-0.175	0.018
Services	0.154	0.022
GII2024		
Industry	-0.205	0.018
Services	0.187	0.024

Note: Statistics are weighted using survey sampling weights

GII by geographical macroarea



Gender inclusion in training shows **moderate regional differences**, with slightly higher dispersion in Northern areas, particularly in the North-West.

However, median values remain close across regions and over time, suggesting that **territorial disparities are limited** compared to firm-level heterogeneity.

GII2023	Mean	Std. Err.
North-West	0.020	0.032
North-East	0.009	0.022
Centre	0.027	0.027
South and Islands	-0.134	0.041
GII2024		
North-West	-0.017	0.040
North-East	0.002	0.021
Centre	0.051	0.032
South and Islands	-0.100	0.038

Note: Statistics are weighted using survey sampling weights

Empirical analysis

Considering the different distributions of the dependent variables (continuous or discrete), we apply different econometric models while keeping the same set of independent variables.

The following is **the model adopted**:

$$\begin{aligned} Perf_{i,2024} = & \\ = & \beta_0 + \beta_1 GII_{1,2023} + \beta_2 d_GII_i + \beta_3 InternalShare_{i,2023} + \beta_4 CostRatio_{i,2023} + \beta_5 FemaleFirm_{i,2024} \\ & + \beta_6 Rating_{i,2023} + \beta_7 Size_{i,2024} + \beta_8 Sector_i + \beta_9 Macroarea_i + \varepsilon_i \end{aligned}$$

- The **dummy variable d_GII** takes value 1 if the firm experiences an increase in gender inclusion in training (GII) between 2023 and 2024, and 0 otherwise.
- The **dummy variable $FemaleFirm$** equals 1 if the firm is female-owned (or female-led), and 0 otherwise.
- The **$Rating$** variable captures the firm's financial solvency, with higher values indicating better solvency conditions. It is measured on a 10-category ordered scale.
- **$Size$** is measured as the natural logarithm of total assets, using AIDA financial data.
- **$Sector$** and **$geographical$ macro-area** fixed effects are included in the model.

Descriptive statistics

	Variable	Obs	Mean	Std. Dev.	Min	Max
Economic performance	Dependent variable					
	Sales on Employees (AIDA)	15,610	365099	1311872	0	87100000
	Value of prod. on personnel costs (AIDA)	15,545	7.234	20.713	-84.959	1311
HR performance	Turnover (Indaco2025)	18,255	0.752	2.476	0.105	183
Innovation performance	Innovation Intensity (Indaco2025)	18,255	8,102	2.299	0	10
	Intangible Assets on Sales (AIDA)	15,541	0.085	0.873	0	74
Independent variable						
Variable of interest	GII2023	11,714	0.018	0.814	-2.651	17
Variable of interest	d_GII	18,255	0.781	0.414	0	1
Control variable	Internal Share 2023 (Indaco2025)	18,255	0.202	0.342	0	1
Control variable	Cost Ratio 2023 (Indaco2025)	11,355	0.890	4.018	0	334
Control variable	Size (AIDA, in natural log)	15,728	8.869	2.022	2.684	20
Control variable	Female firm (Indaco2025)	18,255	0.052	0.221	0	1
Control variable	Rating class (AIDA)	15,564	6.618	1.548	1	10

To mitigate the influence of extreme values, selected continuous variables are winsorized at the 1st and 99th percentiles. Winsorization replaces extreme values with percentile thresholds, without removing observations.

Preliminary results

Robust standard errors in parentheses
*** p<0.1, ** p<0.05, * p<0.01

18

VARIABLES	Economic performance		HR performance	Innovation performance	
	Sales on empl. (ln)	Value of prod. on pers. costs (ln)	Turnover	Innovation intensity	Intangibles assets on sales
GII2023	-0.013 (0.024)	-0.022 (0.018)	0.011 (0.007)	-0.208*** (0.074)	0.006*** (0.003)
d_GII	0.018 (0.021)	0.031*** (0.016)	-0.006 (0.006)	0.163*** (0.072)	0.003 (0.003)
Internal share2		-0.060*** (0.017)	0.005 (0.002)	-0.637*** (0.002)	
Cost ratio2023		0.016 (0.012)			
Size		0.132*** (0.004)			
Female firm		-0.050*** (0.026)			
Rating class	0.085*** (0.005)	0.051*** (0.004)			-0.010*** (0.001)
Constant	9.415*** (0.060)	0.328*** (0.046)	0.899*** (0.017)	11.247*** (0.210)	0.047*** (0.008)
Sector (FE)	yes	yes	yes	yes	yes
Macro-area (FE)	yes	yes	yes	yes	yes
Observations	9,999	10,034	10,063	10,063	10,028
R-squared	0.495	0.403	0.433	0.139	0.135

Firms that improve gender inclusion in training exhibit higher efficiency in the use of labour, as measured by the ratio of value of production to personnel costs.

Innovation is driven by change, not by the level of inclusion.
Firms that improve inclusion may be undergoing broader organizational changes that foster innovation.

Gender-inclusive training is associated with a stronger accumulation of intangible assets on sales.

Key findings (1)

19

Gender Inclusion

- Improvements in gender inclusion (ΔGII) are associated with higher labour productivity and stronger innovation performance,
- The initial level of inclusion GII_{2023} , instead, is generally non-significant and may even be negatively related to innovation intensity
- This indicates that what matters for innovation performance is not simply being inclusive (the initial level of inclusion), but becoming more inclusive over time (improvement in inclusion).
- **The evidence supports a dynamic rather than static view of inclusion:** Improvements in gender inclusion appear more relevant than historical inclusion levels.
- Gender-inclusive training may act as an indicator of organizational change and capability development rather than a stable organizational attribute.

Intangible capital

- Gender-inclusive training is positively associated with the accumulation of intangible assets relative to sales
- This suggests that inclusion contributes to knowledge formation, organizational learning and the development of firm-specific capabilities.
- The relationship appears particularly relevant for assets that accumulate over time rather than for immediate financial returns.
- Inclusive training may therefore represent an investment in organizational capital and future competitiveness.

Key findings (2)

20

Training investment in women allocation

- A higher female training cost ratio is positively associated with **innovation intensity**, suggesting that investing more heavily in women's skill development may strengthen firms' innovative capacity.
- However, a higher cost ratio is negatively associated with **sales per employee**, indicating that the returns from gender-targeted training investments may not materialize immediately in terms of labour productivity.
- Female-oriented training investments also appear to reduce **employee turnover**, suggesting positive effects on retention and workforce stability. Overall, the results indicate that gender-targeted training investments are more strongly linked to **long-term capability building and innovation** than to short-term economic performance → trade-off

Workforce Dynamics

- No significant relationship emerges between gender inclusion and overall workforce turnover.
- However, greater investment in women's training is associated with lower turnover rates.
- This suggests that retention benefits may stem less from equal access per se and more from the intensity of developmental opportunities offered to women.
- Training investments may therefore contribute to workforce stability through enhanced commitment, employability, and perceptions of organizational support.

Key message

- What matters is not simply whether firms are **gender-inclusive**, but whether they become more **gender-inclusive over time**.
- Improvements in gender inclusion are associated primarily with **innovation and productivity gains**, while stronger investments in women's training are linked to **innovation, retention, and intangible capital accumulation**.
- The findings suggest that gender-inclusive training should not be viewed merely as an equality-oriented HR practice, but as a mechanism for developing organizational capabilities and strengthening long-term competitiveness.
- Overall, the evidence supports the idea that **inclusive human capital development constitutes a strategic organizational resource whose benefits emerge more clearly in innovation, knowledge creation, and capability building than in short-term economic performance**.

Main takeaways: inclusion as a dynamic process²²

- The effect of **gender inclusion varies** significantly **across firm size**, showing heterogeneity rather than a uniform impact
- **The effect of gender inclusion on turnover** increases with firm size and becomes statistically significant **for medium and large firms**, suggesting stronger labour dynamics in larger organizations
- Gender inclusion is positively associated with **intangible assets for small and medium firms**, highlighting its role in building knowledge and organizational capital
- Overall, the evidence supports the idea that **dynamic changes in inclusion** (rather than its level) are **the main drivers of firm performance, innovation, and intangible** capital accumulation

These results reinforce our main finding: **gender inclusion does not have a clear static effect on firm outcomes**, while its impact emerges through **dynamic changes and firm-specific characteristics**

Conclusions: What drives inclusive performance?

23

Limitations

- The analysis is based on survey data, which may be subject to measurement error and reporting biases
- The identification strategy relies on cross-sectional variation, limiting causal interpretation
- Innovation is measured as a count of activities, capturing breadth rather than intensity in economic terms
- Short-term dynamics (2023–2024) may not fully capture long-term effects of training inclusion
- Effects are heterogeneous across firm size and often imprecise, with wide confidence intervals in interaction models

Policy implications

- Promoting gender inclusion in training can enhance firms' performance, particularly by improving labour efficiency, innovation, and intangible capital accumulation over time
- Policies should support inclusive training as a dynamic process, rather than focusing only on static targets
- The negative association of internal training suggests the importance of external knowledge and spillovers
- Supporting women's access to training investments may foster innovation capacity and long-term knowledge accumulation, even if short-term effects on efficiency are mixed
- Policy effects may differ across firm size, suggesting the need for tailored interventions targeting small, medium, and large firms

Further research

- Explore alternative measures of Gender Inclusion Index and different weighting schemes
- Investigate different types of training (formal vs informal, internal vs external) in greater detail
- Further investigate heterogeneity across sectors, firm size, and technological intensity, given the strong size-related differences in results
- Extend the time dimension to better capture long-term effects of inclusion on productivity and intangible capital

References

- Armstrong, C., Flood, P. C., Guthrie, J. P., Liu, W., MacCurtain, S., & Mkamwa, T. (2010). The impact of diversity and equality management on firm performance: Beyond high performance work systems. *Human Resource Management*, 49(6), 977–998.
- Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). University of Chicago Press.
- Becker, B. E., & Huselid, M. A. (2006). Strategic human resources management: Where do we go from here? *Journal of Management*, 32(6), 898–925.
- Leuven, E., & Oosterbeek, H. (2008). An alternative approach to estimate the wage returns to private-sector training. *Journal of applied econometrics*, 23(4), 423-434.
- Booth, A. L., & Bryan, M. L. (2005). Testing some predictions of human capital theory: New training evidence from Britain. *Review of Economics and statistics*, 87(2), 391-394.
- Desjardins, R., Thorn, W., Schleicher, A., Quintini, G., Pellizzari, M., Kis, V., & Chung, J. E. (2013). OECD skills outlook 2013: First results from the survey of adult skills.
- OECD (2025), *Gender Equality in a Changing World: Taking Stock and Moving Forward*, Gender Equality at Work, OECD Publishing, Paris, <https://doi.org/10.1787/e808086f-en>.

- Bassanini, A., Booth, A. L., Brunello, G., De Paola, M., & Leuven, E. (2005). Workplace training in Europe. *IZA Discussion Paper No. 1640*.
- Arulampalam, W., Booth, A. L., & Bryan, M. L. (2004). Training in europe. *Journal of the European Economic Association*, 2(2-3), 346-360.
- Blau, F. D., & Kahn, L. M. (2017). The gender wage gap: Extent, trends, and explanations. *Journal of economic literature*, 55(3), 789-865.
- Garavan, T., McCarthy, A., Sheehan, M., Lai, Y., Saunders, M. N. K., Clarke, N., Carbery, R., & Shanahan, V. (2019). Measuring the organizational impact of training: The need for greater methodological rigor. *Human Resource Development Quarterly*, 30(3), 291–309.
- Garavan, T., McCarthy, A., Lai, Y., Murphy, K., Sheehan, M., & Carbery, R. (2021). Training and organisational performance: A meta-analysis of temporal, institutional and organisational context moderators. *Human Resource Management Journal*, 31(1), 93–119.
- Richard, O. C., & Johnson, N. B. (2001). Understanding the impact of human resource diversity practices on firm performance. *Journal of Managerial Issues*, 13(2), 177–195.
- Tharenou, P., Saks, A. M., & Moore, C. (2007). A review and critique of research on training and organizational-level outcomes. *Human Resource Management Review*, 17(3), 251–273.
- Wright, P. M., & McMahan, G. C. (1992). Theoretical perspectives for strategic human resource management. *Journal of Management*, 18(2), 295–320.
- UNDP (United Nations Development Programme). 2020. Human Development Report 2020: The Next Frontier: Human Development and the Anthropocene. New York.
- OECD (2019), *OECD Employment Outlook 2019: The Future of Work*, OECD Publishing, Paris, <https://doi.org/10.1787/9ee00155-en>.
- OECD/European Union/EC-JRC (2008), *Handbook on Constructing Composite Indicators: Methodology and User Guide*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264043466-en>.
- Nardo M, Saisana M, Saltelli A, Tarantola S, Hoffmann A, Giovannini E. Handbook on Constructing Composite Indicators: Methodology and User Guide. Paris (France): OECD publishing; 2008.

Thank you for your attention



XLVII CONFERENZA SCIENTIFICA ANNUALE AISRE

June, 26 2026

Università degli Studi di Firenze

Roberto **Angotti** (INAPP); Luisa **Errichiello** (CNR-ISMed); Greta **Falavigna** (CNR-IRCrES);
Roberto **Ippoliti** (Università del Piemonte Orientale)

Human Capital in Action: Exploring the Gender Sensitive Link Between Training and Firm Performance in Italy Using the INAPP INDACO Survey

Session: SO.63 - Gender Equality in the Labour Market

