

This is a pre print version of the following article:

Technology and Work in Services: Vulnerable Workers under Automation and Digitalisation / Cirillo, V., Rinaldini, M., Virgillito, M.E.. - (2025), pp. 1-167. [10.1007/978-3-031-88149-7]

Springer Science+Business Media
Terms of use:

The terms and conditions for the reuse of this version of the manuscript are specified in the publishing policy. For all terms of use and more information see the publisher's website.

11/08/2026 04:38

Technology and Work in Services

Valeria Cirillo · Matteo Rinaldini ·
Maria Enrica Virgillito
Editors

Technology and Work in Services

Vulnerable Workers under Automation
and Digitalisation

palgrave
macmillan

Editors

Valeria Cirillo
Department of Political Sciences
University of Bari 'Aldo Moro'
Bari, Italy

Matteo Rinaldini
University of Modena and Reggio
Emilia
Reggio Emilia, Italy

Maria Enrica Virgillito
Institute of Economics
Sant'Anna School of Advanced
Studies
Pisa, Italy

ISBN 978-3-031-88148-0 ISBN 978-3-031-88149-7 (eBook)
<https://doi.org/10.1007/978-3-031-88149-7>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer
Nature Switzerland AG 2025

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Cover credit: © Melisa Hasan

This Palgrave Macmillan imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

If disposing of this product, please recycle the paper.

*To the vulnerable, often invisible, workers around the world and within
our everyday lives*

ACKNOWLEDGMENTS

This book builds upon the findings of the research project “Case Studies of Automation in Services” conducted in collaboration with the Human Capital and Employment Unit of the Joint Research Centre (JRC) of the European Commission, Seville.

The contributors gratefully acknowledge the support received from the JRC Human Capital and Employment Unit team, including Enrique Fernandez Macías, Marta Fana, Annarosa Pesole, Matteo Sostero, and Cesira Urzì-Brancati, during the research activities.

The authors extend their appreciation to the HR staff, IT technicians, workers, and trade union representatives from Poste Italiane, Amazon, PMI Manufacturing and Technology Bologna, Santa Maria Nuova Hospital Reggio Emilia, Azienda Sanitaria Unica Regionale Marche, Humanitas Research Hospital, Coopservice, Nestlé Vera, and Dussmann Service Italy for sharing insights about their work practices. Special thanks are due to Poste Italiane, Amazon, PMI Manufacturing and Technology Bologna, Santa Maria Nuova Hospital Reggio Emilia, Azienda Sanitaria Unica Regionale Marche, Coopservice, and Dussmann Service Italy for accommodating in-person visits to their establishments.

The completion of this book was made possible through support from the Italian Ministry of University and Research under the PRIN2022 project (2022Z78M8J): *The Digital Transition and the World of Work*:

Labour Markets, Organizations, Job Quality, and Industrial Relations (DIGITWORK).

The editors would also like to thank Dr. Adrian Bronson for proof-reading the book.

CONTENTS

1	Technology and Work in Services: The Relevance of Vulnerable Workers	1
	Valeria Cirillo, Matteo Rinaldini, and Maria Enrica Virgillito	
2	Logistics Under Automation and Digitalisation: How Technology <i>Displaces</i> Human Work	35
	Valeria Cirillo, Francesco S. Massimo, Matteo Rinaldini, and Jacopo Staccioli	
3	Between Empowering and Risk: Organizational Change and Professional Upskilling Through Digital Health Technologies	65
	Eleonora Costantini, Marialuisa Divella, Caterina Manicardi, and Matteo Rinaldini	
4	Automation in Cleaning: Why Dirty, Invisible, and Risky Jobs Will Not Be Replaced by Robots Yet	97
	Armanda Cetrulo, Caterina Manicardi, and Angelo Moro	
5	Automation, Digitalisation, and Technological Autonomy in the Periphery. A Case Study in the Automotive Complex of Argentina	131
	María Celeste Gómez and Carina Borrastero	
	Index	165

LIST OF CONTRIBUTORS

Carina Borrastero Centro de Investigaciones en Ciencias Económicas, Universidad Nacional de Córdoba & CONICET, Córdoba, Argentina

Armanda Cetrulo Institute of Economics, Sant’Anna School of Advanced Studies, Pisa, Italy

Valeria Cirillo Department of Political Sciences, University of Bari ‘Aldo Moro’, Bari, Italy

Eleonora Costantini Marco Biagi Foundation, University of Modena and Reggio Emilia, Modena, Italy

Marialuisa Divella University of Bari ‘Aldo Moro’, Bari, Italy

María Celeste Gómez Centro de Investigaciones en Ciencias Económicas, Universidad Nacional de Córdoba & CONICET, Córdoba, Argentina

Caterina Manicardi Institute of Economics, Sant’Anna School of Advanced Studies, Pisa, Italy

Francesco S. Massimo Sciences Po, Paris, France; University of Bologna, Bologna, Italy

Angelo Moro University of Modena and Reggio Emilia, Modena, Italy

Matteo Rinaldini University of Modena and Reggio Emilia, Reggio Emilia, Italy

Jacopo Staccioli Catholic University of Milan, Milan, Italy

Maria Enrica Virgillito Institute of Economics, Sant'Anna School of
Advanced Studies, Pisa, Italy

LIST OF FIGURES

Fig. 1.1	Share of employees by selected professions in Italy and Europe (2023). <i>Source</i> Labor Force Survey (employees), Eurostat. Selected ISCO codes: Logistics 333, 432; Cleaning 911; Health 321, 532	9
Fig. 1.2	Number of employees and hours worked by selected sectors over time. <i>Source</i> Annual National Accounts, Italian National Institute of Statistics. Logistics: warehousing and transport support activities (Nace 52); Cleaning: service activities for buildings and landscape (Nace 81); Health assistance: health care (Nace 86)	10
Fig. 1.3	Hourly gross real wages of private sector dependent job positions over time by wage percentile. <i>Source</i> Annual Register on Wages, Hours and Labor Costs for Individuals and Enterprises (RACLI), Italian National Institute of Statistics. Logistics: warehousing and transport support activities (Nace 52); Cleaning: service activities for buildings and landscape (Nace 81); Health assistance: health care (Nace 86). The main unit of analysis in the RACLI register is the employee position, defined as the relationship established between an employer and an employee, characterized by a start date and comparable to an employment contract	11

Fig. 1.4 Technologies and work organizational practices by selected professions (2021). *Source* V Survey on Work Quality 2021, Italian National Institute for Public Policy Analysis. Dimensions: (A) **Technology used at work** is built on the question: “Do you use the following tools in your work?” (i) Computers and/or electronic/digital devices (tablet, smartphone); (ii) Internet/email/social media; (iii) Machinery and/or automated systems; (iv) Collaborative robotics (cobots); (v) 3D printers; (vi) Information-sharing systems (Cloud computing); (vii) Systems for simulating production processes (Cloud manufacturing); (ix) Tools for collecting and analyzing large volumes of data (Big Data Analytics). Variable coding: Variables are coded as 1 if the worker responds with “yes” and 0 if the response is “no”. (B) **Teamwork and job rotation** are built upon the question: “Do you rotate your activities with other workers (e.g., changing positions, departments, job rotation)?” and “Do you work in a team, meaning a group with shared responsibilities where you can plan and organize your own work?”. (C) **Autonomy at work** is built upon the question: “In the context of your work, do you have the opportunity to choose or modify the following?” (i) The strategies and objectives to achieve; (ii) The methods and techniques of your work; (iii) The planning of your activities; (iv) Work speed/rhythm. Variable coding: variables are coded as 1 if the worker responds with “yes, always”, and 0 if the response is “sometimes” or “never”. (D) **Work surveillance** refers to the question “Has your company introduced technological innovations in recent years aimed at monitoring and/or evaluating the work activities of employees?” (For example, audiovisual systems or other remote-control tools for organizational and production needs, or related to workplace safety and the protection of company assets.). (E) **Training** refers to the question: “Have you attended one or more training/upgrading courses relevant to your work in the last year?”. (F) **Mandatory courses** are built upon the question: “Referring to the course(s) you took in the last year, what was the subject matter covered”. Sample weights applied, ISCO 1 excluded from the analysis for comparability across occupations. Logistics is built on CP (Italian coding for ISCO) 33410, 43120. Cleaning: CP 81410, 81420, 81430. Health: CP 32111, 32112, 32121, 32122, 32123, 32124, 32125, 32126, 32132, 32133, 32141, 32142, 32143, 32144, 32145, 32151, 32152, 32161, 32162, 32170, 53110

- Fig. 1.5 Percentage of Workers by Technology Used in selected occupations (2021). *Source* V Survey on Work Quality 2021, Italian National Institute for Public Policy Analysis. Question: “*Do you use the following tools in your work?*” (i) *Computers and/or electronic/digital devices (tablet, smartphone)*; (ii) *Internet/email/social media*; (iii) *Machinery and/or automated systems*; (iv) *Collaborative robotics (cobots)*; (v) *3D printers*; (vi) *Information-sharing systems (Cloud computing)*; (vii) *Systems for simulating production processes (Cloud manufacturing)*; (ix) *Tools for collecting and analyzing large volumes of data (Big Data Analytics)*. Variable coding: Variables are coded as 1 if the worker responds with “yes” and 0 if the response is “no”. Sample weights applied, ISCO 1 excluded from the analysis 15
- Fig. 1.6 Share of workers by level of autonomy in work organization and methods (2021). *Source* V Survey on Work Quality 2021, Italian National Institute for Public Policy Analysis. Question: “*In the context of your work, do you have the opportunity to choose or modify the following?*” (i) The strategies and objectives to achieve; (ii) The methods and techniques of your work; (iii) The planning of your activities; (iv) Work speed/rhythm. Variable coding: Variables are coded as 1 if the worker responds with “yes, always”, and 0 if the response is “sometimes” or “never”. Sample weights applied, ISCO 1 excluded from the analysis 16

LIST OF TABLES

Table 1.1	Thousand of employees and share over total economy by selected sectors	8
Table 1.2	Share of dependent workers by selected professions in Italy and Europe and their variation	10
Table 2.1	Automated guided vehicles in the three companies	49
Table 2.2	Labour process restructuring in relation to AGVs	51
Table 2.3	Task reconfiguration in relation to AGVs	55
Table 2.4	Distribution of interviews by company	58
Table 3.1	Summary of technologies and contexts of implementation	79
Table 5.1	Interviews conducted at the plant level	138
Table 5.2	Dimensions of analysis	139
Table 5.3	Interviews on state role dimensions	139