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Regulatory government policies and organizational practices to improve inclusion and well-being

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Abstract

This thesis contributes to the ongoing discourse on promoting sustainability from a socio-economic perspective. In particular, the attention is directed towards the role of government regulatory measures and population support initiatives, alongside organizational interventions, which specifically involve the human resources departments of major institutions such as public hospitals. The promotion of a sustainable society encompasses a broad range of themes and issues. A critical topic concerns the promotion of gender equality in decision-making positions, which is investigated in Chapter 1. This chapter examines the Golfo-Mosca law, which was introduced by the Italian government to require listed and state-participated companies to increase the percentage of women on boards to one third of the total number of directors. Additionally, this chapter analyzes the glass cliff phenomenon, a form of gender stereotype that is observed among top positions. The analysis is based on a sample of Italian companies from the top 250 by total assets in both 2010, before the law was enacted, and 2017, after its complete implementation. Chapter 2 focuses on the analysis of the mental health of European citizens during the pandemic outbreak. The promotion of mental health is an important issue in the context of advancing a sustainable society. Its importance has been highlighted in the aftermath of the pandemic crisis. This chapter uses a sample of European citizens surveyed by Eurofound during February and March 2021. This study examines the impact of public social support policies on the mental well-being of citizens and assesses how trust in people and institutions can enhance or reduce this effect. Another theme closely related to mental health is work ability, which is often used as an indicator of sustainable employability. This concept refers to the balance between employees' resources and the demands they face in carrying out their work. Chapters 3 and 4 explore this issue by examining the policies and actions that organizations can take to prevent early decline in work ability on a sample of healthcare professionals from the University-Hospital of Modena, who were interviewed between August and September 2022. The focus on the healthcare sector is relevant because promoting work ability can improve the quality of outputs and services, which in turn serves to preserve the health of the community. Chapter 3 presents primarily descriptive and preliminary analyses, providing essential context and setting the stage for the more in-depth exploration undertaken in the subsequent chapter. Chapter 4 focuses on organizational and psychosocial factors that influence work ability. Specifically, it analyzes both the organizational levers that influence work ability and the non-work demands arising from the

external context, such as having small children or dependent adults. Finally, this chapter pays particular attention to the role of work-life balance.

The findings of the thesis suggest that creating a more sustainable and equitable society requires the involvement of multiple actors at different levels. These include governments, institutions, but also human resource departments and managers. As seen in Chapter 1, The introduction of gender quotas is crucial in promoting gender equality in decision-making roles, as it generates positive spillover effects across companies not directly targeted by the law, thereby significantly reducing the glass ceiling. However, although the introduction of quotas can help mitigate discrimination, evidence of the glass cliff phenomenon among underperforming companies suggests that gender stereotypes are present. Therefore, it is important that organizational inclusive policies accompany such diversity initiatives. In this regard, promoting inclusive leadership and providing mentorship and sponsorship to marginalized groups, particularly women, are crucial. Additionally, promoting formal and informal events to expand women's networks can serve as a source of social support, representing an essential step. Chapter 2 emphasizes the significance of government action in promoting mental health, which is a crucial theme in the context of building a sustainable society. The chapter highlights that providing high-quality public support, characterized by fairness, responsiveness, transparency, and reliability, is key during the pandemic to enhance citizens' mental well-being. It also highlights the importance of trust, both in individuals and in institutions, as a factor that enhances the positive impact of social support on mental health. By prioritizing these aspects, governments can play a crucial role in strengthening the mental resilience of their citizens, thereby contributing to the overall sustainability and well-being of society. Chapters 3 and 4 further explore mental health, with a specific focus on work ability in healthcare. The results emphasize the significance of organizational interventions, particularly those centered around an effective leadership. Empowering leadership, which grants employees greater autonomy, emerges as a crucial factor in promoting work ability. Furthermore, policies regarding flexible work arrangements, which provide employees with more discretion, are considered important. These arrangements not only improve work-life balance but also have a positive impact on work ability. By implementing such interventions and policies, organizations can create a workplace that promotes the mental well-being and sustainable employability of their employees. These policies serve a dual purpose by improving the ability to work and by promoting greater inclusion in the workplace, which helps to reduce forms of discrimination and the stereotypes associated with them. By addressing

these multifaceted aspects, governments and organizations can work collaboratively towards creating a more sustainable and equitable society.

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Introduction

This thesis explores tools to safeguard and intervene with vulnerable and marginalized populations, with the aim of improving the representation of discriminated groups, mental well-being, and the quality of individuals' aging. These aspects are crucial for contributing to a more equitable and sustainable society. The concept of sustainability encompasses many aspects related to the way of life of a community, and these include a wide range of themes, expertise, and knowledge. In this regard, the promotion of greater gender equality in leadership and decision-making roles, along with the promotion of mental health and well-being, are key goals for achieving sustainable development, as outlined by the United Nations (specifically, Goal 5.5 and Goal 3, respectively). In addition, many authors consider the promotion of work ability as a crucial factor for a sustainable employability, as it acts to prevent premature aging resulting from inadequate workloads, methods and work environments.

The aim of this thesis is to propose an assessment of aspects related to promoting a sustainable society. This will be achieved by providing organizational interventions for human resources departments and managers, as well as regulatory tools and social measures that can be adopted by national or international institutions. These actors can complement each other through their interventions to more effectively reduce gender inequalities and enhance the mental health and work ability of workers.

The first chapter focuses on the under-representation of women on boards of directors and the existence of the glass cliff phenomenon. Indeed, the under-representation of women in decision-making positions is one of the areas where the gender gap is even wider (Eige, 2022). Many governments have introduced gender quotas to partially solve this problem. And, as a result of this, several studies have attempted to evaluate the influence of gender quotas on corporate performance (Mazzotta and Ferraro, 2020; Sarhan et al., 2019; Yu and Madison, 2021) or on other types of performance, such as ethical or social performance (Arnaboldi et al., 2021; Ullah et al., 2022; Zalata et al., 2022, 2019). Only few studies actually evaluate the primary objective of these instruments, which is to increase gender balance on boards, and, in particular, the spillover effects that this policy has on boards of directors not directly affected by gender quotas (Bongiovanni et al., 2022; Del Prete et al., 2022).

Consistent with the latter, this chapter assesses the actual capacity of gender quotas in Italy to increase gender representation not only on the boards of directors of companies directly targeted by the quotas, but also on the boards of companies not targeted by the gender quotas, in order to assess the presence of “horizontal spillover effects”. For this purpose, a balanced

panel including 116 Italian companies ranked among the top by total assets in the years 2011 and 2017 is adopted. Another issue concerns the presence of gender stereotypes and discrimination among upper echelons. To assess this, the first chapter also investigates the presence of the glass cliff phenomenon, a form of gender stereotyping that relates the greater propensity to appoint women to top positions when companies face periods of crisis or instability. In particular, most studies investigate the phenomenon in Anglo-Saxon or Northern European states (Morgenroth et al., 2020), while no studies investigate it in Italy or other Southern European countries, although the phenomenon is closely linked to the socio-cultural context of the countries. It is therefore interesting to assess its presence in a country like Italy, which is typically characterized by gender barriers and stronger forms of discrimination (Eige, 2022).

A further topic of interest, discussed in the second chapter, concerns the analysis of mental health during the pandemic, with a particular focus on the youngest, who appear to be the most severely affected in terms of depressive episodes and decreased well-being (Eurofound, 2021). In this regard, several studies argue that citizens' perceptions of government performance and trust play a particularly relevant role in periods of instability, such as the pandemic. Higher levels of trust in people and institutions are associated with greater mental health and life satisfaction (Barrafrem et al., 2021; Clench and Holte's 2021; Lee et al., 2022). Similarly, good government performance, represented by adequate support measures and quality of governance, is crucial to ensure higher levels of mental health in times of crisis and uncertainty (Helliwell and Huang, 2008; Turska and Stępień-Lampa, 2021; Alfano, Ercolano, and Pinto, 2022). In this context, it is interesting to consider how the quality of government support, identified by the characteristics of integrity, fairness, responsiveness and accountability, may have influenced the mental health of individuals during the pandemic and how channels of trust in people and institutions may have mediated this relationship, amplifying or reducing the effect of government support on well-being. In particular, the role of trust as mediator has been adopted by some authors to investigate how economic distress (Lee, 2022), concerns about covid (Chan et al., 2023), and perceived corruption (Ciziceno and Travaglino, 2019) affect well-being, in the wake of the covid-19 pandemic.

However, no study evaluates its mediating influence on the quality of social supports, which may play a key role in determining individuals' mental health. Furthermore, special attention is paid to differences between young and non-young people, to assess whether trust in people and institutions plays a different role across age groups and to identify policies and implications that may differ across generations.

The third and fourth chapters focus on analyzing the work ability of health workers, which represents a further topic of interest in this thesis. The concept of work ability refers to the balance between resources and demands arising from personal and professional spheres, and is often adopted to assess the quality of aging of employees in the context of a sustainable employability (Demerouti et al., 2001; Ilmarinen, 2006). According with the Job Demands-Resources Model (Demerouti et al., 2001), individuals' ability to work is affected by personal resources, including elements such as lifestyle and personal traits, as well as working conditions categorized into job resources and demands. Enhanced job resources, such as autonomy or leadership support, should increase individuals' overall work ability, while job demands, such as increased workload and time pressure, reduce work ability.

The work ability assessment is a very important indicator for companies, as it predicts, among other aspects, early retirement, sick leave requests and work performance. Its role is also of particular relevance for the health sector, where the effects of the pandemic have implied, especially during the emergency phase, a significant increase in the workload of health workers, negatively affecting the mental and physical health of employees.

It is therefore crucial to understand the health status of healthcare workers, assessing the most vulnerable areas and providing organizational tools that can help mitigate the deterioration of work ability. This is important not only to ensure a better well-being of workers, but also for the entire community, as an increased work ability ensures a better quality of services provided and, consequently, a lower likelihood of making mistakes, improving overall patient safety (Ruitenburg, Frings-Dresen and Sluiter, 2012).

Based on these considerations, the third and fourth chapters study the work ability in a sample of healthcare professionals from the University-Hospital of Modena (Italy). In particular, the third chapter provides a preliminary analysis of work ability correlates and investigates the most vulnerable groups of employees, while chapter four delves into the socio-demographic, organizational and family determinants. Specifically, a point of interest in assessing the work ability of health professionals concerns the role of work-life balance and domestic workload as determinants typically little studied by current research on this topic (Smyth, Pit and Hansen, 2018; Berglund et al., 2021; McGonagle et al., 2022).

In this regard, the Work Ability House Model (Ilmarinen, 2019) provides a frame to include multiple determinants of work ability, comprising not only personal health and working conditions, but also non-job demands and elements arising from the external work environment.

An added value related to this research topic concerns the analysis of work-life balance as a possible mediator between working conditions and work ability. Indeed, while some studies find that working conditions related to job resources and job demands influence work-life balance (McCarthy et al., 2013; Kumar and Mokashi, 2020) and some studies find evidence that work-life balance predicts work ability (La Torre et al., 2021; Smyth, Pit, and Hansen 2018; McGonagle et al., 2022), no studies assess it as a mediator between working conditions and work ability. However, increased work resources and demands affect the ability of individuals to manage both work and non-work tasks and duties, thus affecting the quality of work-life balance (Hobfoll, 1989). A better work-life balance, on the other hand, should allow individuals a higher level of well-being, less stress resulting from role conflict and greater work ability (Hobfoll, 1989; Kahn et al., 1964).

In summary, as supported by theoretical and empirical studies, work-life balance may play a significant mediating role between working conditions and work ability. It is therefore important to assess this relationship and contribute to the general debate on the determinants and mechanisms through which organizational and external environment factors influence work ability.

This thesis is structured as follows. Chapter 1, titled *"Do women on boards break the glass ceiling or face the glass cliff?"* focuses on our first area of research, concerning the introduction of gender quotas in Italy, its spillover effects and the possible presence of the glass cliff phenomenon among managerial positions. This first chapter, co-authored by prof. Pistoresi, has been published in the journal *Corporate Governance (ISSN: 1472-0701)*

Chapter 2, titled "*Mental well-being and government support in Europe. The mediating role of trust in people and institutions"*, investigates the role of government support quality on the individuals' mental health during the pandemic, with a focus on the potential differences between young and non-young age groups. Among these mechanisms, the mediating role of trust in individuals and institutions is considered. This chapter, co-authored with prof. Pistoresi and dr. Giovinazzo, has been published in the *International Journal of Social Economics (ISSN: 0306-8293).*

Chapter 3, which is single-authored, is titled *"Work ability of health workers: Analysis of vulnerable groups of individuals and organizational factors*" and provides an initial assessment of the levels of work ability among a sample of healthcare workers of the University-Hospital of Modena, Italy.

This chapter is preliminary in nature as it serves as a framework to better contextualize the final chapter.

Chapter 4 is a single-authored chapter entitled "*The work ability of healthcare workers: a comprehensive overview of determinants with a focus on the mediating mechanism of work-life balance"*. It conducts a thorough assessment of the determinants of work ability, taking into account organizational and external elements in a holistic approach. This last chapter also examines the role of work-life balance as a mediator between the effect of working conditions and the work ability of employees. Finally, the section titled *"Conclusion and final remarks"* summarizes the main findings of this research and discusses their broader implications for promoting equality and sustainability.

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Do women on boards break the glass ceiling or face the glass cliff?*

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Abstract

Purpose

This paper appraises the effectiveness of gender quotas in breaking the glass ceiling for women on boards in companies that are legally obliged to comply with quotas (listed companies and state-owned companies, LP) and in those that are not (unlisted companies and non-state-owned companies, NLNP). Furthermore, it investigates the Glass Cliff phenomenon, according to which women are more likely to be appointed to apical positions in underperforming companies.

Design/methodology/approach

A balanced panel data of the top 116 Italian companies by total assets which are present in both 2010 and 2017 is used for estimating Anova tests across sectors and–fixed-effects panel regression models.

Findings

Women on boards significantly increased in both the LP and the NLNP companies and this increase was greater in the financial sector. Furthermore, the relationship between the percentage of women on boards and firm performance is not linear, but depends on the financial corporate health. Specifically, the situation in which a woman ascends to a leadership position in challenging circumstances where the risk of failure is high (glass cliff phenomenon) is only present in companies with the lowest performance in the sample, in other words when negative values of Roe and negative or zero values of Roa occur together.

Originality

We explore (i) the ability of gender quotas to break through the glass ceiling in companies that are not legally obliged to do so, (ii) for the first time the glass cliff phenomenon in the Italian context.

Keywords: Gender quotas, women on boards, woman executives, glass cliff, spillover effects

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Interpretation of the data: EP

All authors review the manuscript

Introduction

In recent decades, gender equality in decision-making positions has been an urgent and debated issue around the world. According to the Index of Gender Equality (EIGE), the under-representation of women in leadership roles has always been one of the worst dimensions of the gender gap: the EIGE index referring to the European average and measured in 2022 registers a score of 57.2 out of 100 for the domain of power, that is the representation of women in decision-making positions across the political, economic and social spheres (Eige 2022).

This phenomenon is identified by the term 'glass ceiling', often adopted to describe the presence of gender barriers in top positions that cause vertical gender segregation, particularly in certain types of sectors and in organizations with a male-dominated culture, such as the financial and banking sector. For instance, the only 8% of the CEOs of European credit and investment institutions and 20% of the positions in the governing bodies of the largest European banks are occupied by women, moreover women on management boards of most institutions also continue to be paid less (European Banking Authority, 2020; Knights and Tulberg, 2013).

Several studies explore the multiple nuances related to the concept of the glass ceiling, identifying more subtle forms of gender barriers that persist even when women reach top positions. Some authors refer to these barriers as the 'second glass ceiling', in relation to the thesis that even when women access leadership roles, they continue to face invisible barriers that prevent them from fully influencing strategic decision-making processes (Wearing and Wearing, 2004; Field, Souther and Yore, 2020). The glass cliff represents another phenomenon in which gender barriers persist even when women reach higher positions, as documented by Ryan and Haslam (2005). These authors point out that once glass ceiling barriers appear to be reduced, women may continue to experience difficulties in career progression, as they are more likely to be appointed to senior positions in underperforming companies.

Governments and international organizations have taken various actions to address these problems. For instances, the European Union considers the gender equality as one the founding principles of the European Pillars of Social Rights and, moreover, its Gender Equality Strategy prioritizes the participation of women in senior management positions, recognizing that the women's access to the boards of directors and decision-making roles is one of the most important goals for pursuing overall gender equality. International pressures to improve gender equality have led to the adoption of mandatory quotas on company boards in various countries. Norway was the first to introduce mandatory gender quotas in 2003, followed by different

western countries such as Belgium, Denmark, France, Italy, Iceland, Austria, Germany, Ireland, Germany.

Italy therefore, despite being historically characterized by low levels of female participation in the labor market and management positions, was one of the first EU nations to introduce mandatory gender quotas for company boards. This happened with the enactment of Law 120/2011, known as the "Golfo-Mosca" Law (henceforth GM law), by the name of its two main parliamentary proponents, Lella Golfo and Alessia Mosca.

Since the implementation of quotas, studies on the presence of women on boards have seen a cascade of contributions focusing on the positive effects that a greater presence of women on boards of directors (abbreviated as WoBs) has on corporate performance (Terjesen and Sealy, 2016). A minority strand of literature, in which our contribution also fits, focuses on the effect that gender quotas have on career advancement opportunities in top management positions and how these increased opportunities spread to companies not necessarily affected by quotas through forms of spillover. Furthermore, our focus will be on the study of the performance characteristics of companies as determinants of the probability of occupying top management positions in the company.

Spillover effects relate to the influence of gender quotas on gender diversity, vertically, that is in other job positions, or horizontally, towards other states or companies not targeted by quotas. The analysis of these effects focuses mostly on the presence of vertical spillovers, i.e. the effect of quota laws on gender diversity in other managerial positions, while horizontal spillover effects are little investigated.

Empirical works carried out in Norway and the United States have found that gender quotas facilitate women's access to CEO or top management positions (Wang and Kelan, 2013; Matsa and Miller, 2011). In the case of Italy, studies on vertical spillover effects find no significant evidence (Maida and Weber, 2022; Bennouri et al., 2020). Conversely, horizontal spillover effects have been only studied marginally by Ahern and Dittmar (2012)**,** who found an *horizontal spillover effect* from gender quotas in Norway to the boards of companies in Denmark, Finland and Sweden, which, although not subject to gender quotas, also increase women's representation on boards.

To the best of our knowledge, there are only two other contributions investigating horizontal spillovers but focusing only on the banking sector (Bongiovanni et al., 2022; Del Prete et al., 2022). The present paper fills a gap by investigating whether gender quotas in Italy have produced horizontal spillover effects on companies not directly affected by the law by

extending the analysis to all sectors, and thus generalizing the already existing contributions that focus only on the banking sector (Bongiovanni et al., 2022; Del Prete et al., 2022).

To this aim, we firstly analyze the ability of the GM law to break the glass ceiling for women on the boards of companies that are legally obliged to comply with quotas, i.e. listed companies and state-owned companies (LP) and those that are not, unlisted companies and non-state-owned companies (NLNP). Particular attention is paid on the financial sector, a typically male-dominated industry in which women face greater difficulties in advancing their careers and reaching higher positions (Knights and Tulberg, 2013; Kinateder et al., 2021).

Another novelty of our work is that it applied a multi-theoretical perspective to evaluate gender quota mechanisms on women's appointments to boards. Spillover effects are analyzed by adopting neo-institutional and legitimacy theories, which are little considered in quota studies. These theories focus on whether organizations, voluntarily or involuntarily, imitate other actors in their own environment to gain institutional legitimacy or as a result of informal pressures that lead to mimetic isomorphism behaviors (Ashford and Gibbs, 1990, Bongiovanni et al., 2022; Di Maggio and Powell, 1983, 1991).

Along with these theories, we also apply glass cliff theory, to study the presence of different mechanisms that may lead women to increase more on corporate boards under precarious and crisis conditions (Nguyen et al., 2020; Ryan and Haslam, 2005).

In fact, according to recent literature reviews, studies on gender quotas should apply more theories to assess this phenomenon in order to better understand the mechanisms beyond the appointment of women to boards after quota reform (Nguyen et al., 2020; Terjesen and Sealy, 2016).

In particular, Terjesen and Sealy (2016) suggest that future avenues of research should consider whether women on boards are still intentionally or inadvertently placed in post-quota glass cliff positions, yet there are no studies that apply glass cliff theory to the study of gender quotas. Moreover, the glass cliff has been studied mainly in the United Kingdom and the United States, while no studies analyze it in Southern European countries, yet it has been pointed out that this phenomenon is closely related to the cultural and social values of the countries (Morgenroth et al., 2020).

In synthesis, this research enhances our understanding of gender disparities in leadership roles and the effectiveness of gender quotas, contributing to existing literature in a variety of ways. Specifically, it offers novel evidence of horizontal spillover effects across various sectors of Italian companies unaffected by the law, with a particularly pronounced spillover effect observed in the financial sector. Furthermore, it enriches the 'glass cliff' debate by applying this

perspective to the study of gender quotas and gender diversity in boards of directors. In this regard, this study's contributions lie in investigating the glass cliff phenomenon in the context of post-quota reforms (Terjesen and Sealy, 2016), particularly in Italy where studies on the glass cliff are unprecedented (Morgenroth et al., 2020). Most studies on the glass cliff focus on Anglo-Saxon countries, while there is no research on southern European cultures, such as Italy, although the country-dependent cultural influence on this phenomenon is significant. It is therefore important to examine it in a culturally distinct environment.

Our empirical analysis is based on a balanced panel data of the top 116 companies by total assets, which are present in both 2010 and 2017. We chose these two benchmark years because 2010 represents the year immediately preceding the enactment of the GM law and 2017 is the year in which the GM law has been fully implemented. The sample comprises both LP companies, which were targeted by the gender quotas, and NLNP firms, which were not targeted by the quota requirements.

The article is structured as follows: In Section 1 we describe the entry into force of the Golfo-Mosca law (GM law) and the implementation of gender quotas in Italy. Section 2 provides the theoretical literature review, while Section 3 presents the empirical literature review and outlines the research hypothesis. Section 4 discusses the research design of this study, while Section 5 leads to the empirical results. Section 6 reports some robustness results. Discussions and conclusions, including limitations and avenues for future researches are presented in Section 7

1. Background

Several European states decided to introduce gender quotas in the corporate sector to improve the gender representation in strategic decision-making positions. Norway was the first country to introduce mandatory gender quotas for boards of listed companies in 2003, followed by France and Italy in 2011 and, in more recent years, also Belgium, the Netherlands, Germany and Portugal. Other countries, such as Spain and the United Kingdom, have introduced voluntary gender quotas.

Italy introduced gender quotas for the members of boards of listed and state-participated firms with the “Golfo-Mosca Law” (Law 120/2011) that came into effect in August 2012. Henceforth we will abbreviate the law as "GM law”.

Different from other countries that have adopted voluntary "soft" quotas, in Italy the GM law is mandatory and gradual. Further, the GM law targets only listed or state-owned companies. It specifically requires boards of these companies to achieve at least one-fifth of board seats by

the least represented gender for the first board renewal and to increase this quota to one-third by the third appointment of directors.

The regulatory body of the Italian Stock Exchange (CONSOB) has the function of monitoring and supervising the compliance to the GM law. Specifically, in case of non-compliance, CONSOB warns the company, which has four months to comply. If non-compliance persists, any elected board member loses legitimacy and the appointment of members is invalidated

Prior to the implementation of gender quotas, Italy exhibited significant gender disparities in top positions with respect to other countries in Europe. For example, in 2010, the European Institute for Gender Equality's gender equality index for power and gender representation in decision-making was just 25.2 out of 100 in Italy, compared to the European average of 41.9 in the same year (European Institute for Gender Equality). In other words, before the introduction of gender quotas, Italy had a notably higher underrepresentation of women in top roles compared to other European countries.

For this reason, we believe it may be more interesting to study the effect of gender quotas on a context like Italy, where the gender equality gap is higher than in other states and the gender quota instrument may be more powerful. Moreover, it is interesting to study the Italian case because, together with France, they seem to be the states in Europe with the largest increase of women on boards after the introduction of quota legislation (Cerved 2018; Bongiovanni et al., 2022).

Another interesting aspect of the Italian context is its relevance to the study of the glass cliff phenomenon. Regarding this issue, the glass cliff is influenced by various structural and psychological mechanisms that can differ in diverse cultural contexts. A meta-analysis conducted by Morgenroth et al. (2020) indicates that the glass cliff phenomenon is context-dependent and that specific contexts and domains warrant further research. Given the absence of studies on the glass cliff in Italy and other southern European countries, we consider it valuable to explore its existence in a distinct cultural context.

2. Theoretical Framework

Regulatory actions, such as gender quotas, may prove to be important policy instruments to promote the representation of women on boards, especially when they generate spillover effects among organizations. This allows to enhance a cultural change that goes beyond the effect on companies directly affected by quota requirements but spreads broadly to other companies and job positions. Spillover effects are supported by Neo-Institutional Theory, according to which

organizations seek to gain legitimacy from actors in the same environment by adopting behaviors that result from *isomorphic pressures* (i.e., pressures exerted by other institutions and organizations in the same system). While firms directly targeted by quotas have been subjected to a form of *coercive isomorphism*, gender quotas may also lead to forms of *mimetic isomorphism* to non-target firms, which may adopt similar behaviors to increase institutional and stakeholder acceptance and gain legitimacy. The literature suggests that mimetic isomorphism occurs more in sectors affected by economic and financial crises or instability. Firms in the financial and banking sector, which were deeply affected by the 2008 crisis and inherently characterized by greater uncertainty and risk, may therefore adopt more mimetic isomorphism behaviors than firms not affected by the GM law in other sectors (Bongiovanni et al., 2022; Di Maggio and Powell, 1983, 1991). A similar perspective is adopted by the Legitimacy Theory, according to which companies and organizations tend to adopt behaviors that are consistent with the value system of the environment in which they operate. According to these theories, gender quotas may reinforce a widespread value system that promotes greater equality within the board of directors, with positive effects for all companies and organizations that share the same environment and value system, even if they are not directly affected by the quota law (Suchman, 1995; Ashford and Gibbs, 1990).

Focusing on the socio-cultural environment of organizations and the psychological factors that prevent women from advancing to top positions, Social Role Theory (identified by the acronym *SRT*, Eagly, 1987, Eagly et al., 2000) points out that there are different expectations with respect to behaviors and personal traits associated with men and women. Gender expectations are both descriptive and prescriptive, which means that individuals who break them may face social sanctions for violating these prescriptive norms. According to SRT, some agentic traits associated with the male gender concern being aggressive, ambitious, self-confident and dominant. On the other hand, women are attributed personality traits related to being kind, affectionate, helpful and sensitive. Interestingly, Role Congruence Theory (RCT), based on SRT, also focuses on the gender characteristics attributed to the ideal leader and argues that the female role is perceived as incompatible with leadership positions because the expectations individuals have for leadership roles are identified primarily through agentic traits attributed to men (Schein, 1973, Eagly and Karau, 2002). These psycho-sociological processes lead to the underrepresentation of women in top positions, but they can also support other less visible gender barriers, as the case of the glass cliff. The glass cliff was first described by Ryan and Haslam (2005) and develops the glass ceiling metaphor: once the glass ceiling is broken,

women are more likely than men to be on a glass cliff. While traditional SRT and RCT emphasize the *"Think Manager, Think Man"* stereotype, the glass cliff replaces this concept with *"Think Crisis, Think Woman"*: women are more likely to be appointed to precarious positions, although the antecedents of this phenomenon are not clearly defined (Ryan et al., 2011). Specifically, the stereotypical qualities associated to a good leader during a situation of crisis change, because in these cases are more requested other characteristics, identified with a charismatic leadership, such as emotional sensitivity and interpersonal abilities, which serve for making difficult personal decisions (Cook and Glass, 2014; Ryan and Haslam, 2007; Ryan et al., 2010). Women, associated with communal traits, are perceived as more suitable in these situations of crisis and instability (Eagly and Carli, 2003). A different perspective comes from the meta-analysis of Morgenroth et al.'s (2020), which shows that also other disadvantaged groups, for which female stereotypes do not exist, (e.g., Black and Asian Americans) are appointed into class cliff, supporting that there are also other reasons for the glass cliff, which go beyond the stereotyping argument associated with agentic and communal traits. One of these alternative approaches relates the inter- and intra-groups conflicts. In particular in organizations in which there is a strong legitimated socio-political system, the appointment of women to the upper echelons in situation of crisis serve for avoiding social change and keep the present status-quo: the higher probability of failure related to glass cliff positions can, in fact, prevent women progress and set back their status (Tajfel and Turner, 1979; Brown et al., 2011). Finally, another explanation for the glass cliff is the attempt to gain visibility in a time of crisis by appointing "visible outsiders" to the board, for example, women at the top who represent a minority (Bruckmüller and Branscombe, 2010). The entry of women on boards of directors and their appointment to Glass Cliff positions is thus more likely in typically male sectors and industries with greater presence of gender barriers and forms of segregation (Acker, 1990).

3. Empirical literature review and hypothesis development

Empirical works investigating the effects of gender quotas and increased presence of women on boards (WoBs) of directors mainly focus on the relationship between gender diversity and firm performance (Mazzotta and Ferraro, 2020; Sarhan et al., 2019; Yu and Madison, 2021). Other works focus on the relationship between WoBs and the ethical and sustainability performance of companies, such as reducing managerial opportunism, disclosing social

responsibility, reducing financial misconduct (Arnaboldi et al., 2021; Ullah et al., 2022; Zalata et al., 2022, 2019). Most contributions therefore focus on the economic benefits associated with the introduction of quotas, while few articles study the spillover effects that this policy has on boards of directors not directly affected by gender quotas (Bongiovanni et al., 2022). Moreover, those investigating the role of spillover effects focus mainly on the presence of vertical spillovers, i.e. the effect of the quota law on gender diversity in other managerial positions. Studies in Norway and the United States have found that gender quotas facilitate women's access to CEO or top management positions (Wang and Kelan, 2013; Matsa and Miller, 2011). Different seems to be the case of Italy, where the empirical studies on vertical spillover effects do not find any evidence of them (Bennouri et al., 2020; Maida and Weber 2022).

If gender quotas are indeed able to produce a change in the value system of the countries that introduce them, then even companies that are not directly targeted by the law should be oriented to follow the behavior of companies affected by quotas, as a result of external pressure and in order to gain legitimacy from organizations and stakeholders in their own environment (Ashforth and Gibbs, 1990; Di Maggio and Powell, 1983) Although this topic seems very relevant to us, it is very difficult to find studies analyzing the presence of horizontal spillover effects related to the effect of gender quotas on gender diversity in the boards of directors of companies that are not legally obliged to follow quotas.

In particular, horizontal spillover effects have been studied marginally by Ahern and Dittmar (2012), who found a "horizontal spillover effect" from gender quotas in Norway to the boards of companies in Denmark, Finland and Sweden, which, although not subject to gender quotas, also increase women's representation on boards. Only two other studies have investigated horizontal spillover effects, focusing only on the banking sector (Bongiovanni et al., 2022; Del Prete et al., 2022). Among these, only the article of Bongiovanni et al. (2022) finds that, after the introduction of the GM law, also the unlisted banks, not targeted by GM law, significantly increase the presence of WoBs, though, it supports the presence of horizontal spillover effects in the banking sector.

The conservative Italian gender culture and the scarce amount of studies on horizontal spillover effects generated by gender quotas make the case of Italy particularly interestingly for evaluating the ability of gender quotas to produce pressures on firms not targeted by them (Ashforth and Gibbs, 1990; Di Maggio and Powell, 1983).

Our work deepens the presence of horizontal spillovers in a sample of Italian companies belonging to different sectors, thus extending the analysis of Bongiovanni et al. (2022) and Del Prete et al. (2022) focused only on the banking sector.

On the basis of these arguments, we proposed the following hypothesis:

H1: The GML has produced a reduction of the glass ceiling through a significant increase of women on boards from 2010 to 2017 in both firms directly involved by the law than in those which were not (i.e. "horizontal spillover effects").

It seems particularly relevant to us to focus on the presence of spillover effects in the financial sector, as it was particularly affected by the 2008 crisis and thus probably subject to mimetic isomorphism characterizing the riskier companies as we mentioned earlier (Di Maggio and Powell, 1983). Therefore, we expect that this industry has experienced a greater increase of women on the boards of companies not obligated directly affected by the law.

While the majority of empirical papers on gender quotas in the financial sector are mainly addressed toward the effects on firms' financial performance (Cardillo et al., 2021; Kinateder et al., 2021; Mateos de Cabo et al., 2012). We mention only those of Del Prete et al. (2022) and Bongiovanni et al. (2022) that analyze the presence of horizontal spillover effects in the banking sector. Furthermore, The analysis of changes in the percentage of WoBs in the financial industry provides us with some insights into the size of the effects of the law in a particular and relevant sector, which is characterized by a strong masculine culture and increased instability and riskiness, manifested especially after the financial crisis.

On the basis of these arguments, we proposed a second hypothesis:

H2: The increase of women on boards in the financial and banking sector, a male dominated industry, where women were under-represented, was greater than in other sectors, both in companies directly affected by the law and in those that were not.

The glass cliff phenomenon dates back to the work of Ryan and Haslam (2005), although the idea has also been noted in less recent empirical work (Haslam, McGarthy and Brown, 1996; McGarty, Haslam, Turner and Oakes, 1993). Nonetheless, the merit of the work by Ryan and Haslam was to show that the share price performance of their selected companies was lower *before* women appointment and that there was no difference of the performance levels *after* the

appointment of a woman or a man (Ryan and Haslam 2005, 2007). Specifically, these authors propose the metaphor of the "glass cliff," meaning that once the glass ceiling seems to have been broken down, women continue to face barriers that increase their likelihood of "falling."

Although several studies find evidence for the existence of the glass cliff, it has been clearly pointed out that the glass cliff is not a universal phenomenon, but rather is determined by the socio-psychological and cultural characteristics of companies and organizations. In other words, it remains to be clarified precisely *when and why* the glass cliff occurs (Haslam et al., 2010; Ryan et al., 2016).

The *"when*" of the glass cliff concerns the factors and conditions under which this phenomenon occurs. As reported by the meta-analysis of Morgenroth et al. (2020), the magnitude of the glass cliff depends on multiple factors, including the level of gender inequality of countries. Nonetheless, this meta-analysis points out that studies on the glass cliff have been conducted mainly in the United States, the United Kingdom, and Germany, while there are no studies developed in southern Europe, where gender inequality is greater and therefore the phenomenon may be stronger. The organization's leadership history seems to be another relevant dimension, as when companies are characterized by mixed gender leadership the glass cliff seems not to arise, perhaps as a result of a culture that is gender-neutral and thus not characterized by structures, relationships, and value systems that reinforce episodes of gender discrimination and stereotyping (Acker, 1990; Bruckmüller and Branscombe, 2010; Morgenroth et al., 2020). Finally, other studies focusing on the "when" of the glass cliff have adopted various moderators, which influence the presence of this phenomenon, such as the appointment type and the severity of company loss (Mulcahy and Linehan, 2014; Reinwald et al., 2022).

To answer "*why"* the glass cliff occurs, the literature documents several reasons and processes behind it. These reasons range from the characteristics of gender stereotypes that make women more attractive in precarious roles to the presence of structural barriers to advancement that make it necessary for women to take greater career risks (Mulcahy and Linehan, 2014). Among these theories and mechanisms, the most cited relate to perceived leadership qualities typically attributed to women and perceived as more suitable in times of crisis (Eagly and Karau, 2002; Schein, 1973). This has been supported by Haslam and Ryan (2008), where, among processes contributing to glass cliff, the belief that glass cliff positions provide better opportunities for women than for men is one of the main determinants of this phenomenon. Other reasons

supporting the glass cliff relate to group dynamics and processes aimed at protecting the current status quo by the majority group (Tajfel and Turner, 1979; Branscombe and Ellemers, 1998). Specifically, there are studies which found evidence of it also with other minority groups, suggesting that stereotypes arguments are not the only driver of the glass cliff. Conflicts between majority and minority groups and desire to maintain the present status quo in presence of cultural changes, or situations in which the majority groups perceive a threat from part of the minority groups (Tajfel and Turner, 1979).

The empirical difficulties in detecting the glass cliff are also determined by the type of performance indicator considered. Most studies on the glass cliff find evidence of it only with subjective performance measures related to investor perceptions and behaviors, while work adopting objective accounting-based measures finds no significant effect of the glass cliff (Adams, Gupta and Leeth, 2009; Elsaid and Ursel, 2011; Haslam et al., 2010). A possible reason for this lack of evidence is that objective accounting measures (e.g Roe and Roa) may require a longer time to be perceived as a signal of crisis by the firms and the consequent appointment of women occurs only when the crisis is imminent. Subjective and market-based measures, e.g. the Tobin-q, better reflect the short-time reactions of the market and investors by implying an immediate choice of firms in hiring women on boards and top positions (Haslam et al., 2010). Further, indicators of poor performance should also include dimensions relating to the perceptions of precariousness and risk. glass cliff is, in fact, linked to social, organizational and psychological processes relating the company's history of failure and the risk of criticism (Haslam and Ryan, 2008).

Since in this paper we adopt a large time-span, we focus on the accounting based measures of Roe and Roa to test the presence of the glass cliff in Italy, a country with an historical low level of gender equality, which has never been considered among the studies on the glass cliff.

We therefore proposed the following hypothesis:

H3: The increase of women on board is stronger on those firms which perform worse, as demonstrated by the presence of lower levels of financial performance, according to the glass cliff phenomenon.

4. Research design

The source we used in this paper to identify the companies of interest, observed in the benchmark years 2010 and 2017, is "Le principali società italiane", an annual report on the balance sheets of major Italian companies edited by R&S Mediobanca, the studies office of Mediobanca, Italy's largest investment bank. The two reference years were chosen because 2010 represents the year immediately preceding the enactment of the GML and 2017 is the year in which the GML had been fully implemented.

From the balance-sheet information provided by R&S Mediobanca, we considered the total assets to proxy the size of the company. Specifically, we considered the 250 top companies by total assets as in Rinaldi and Tagliazucchi (2022) in order to use the information these authors originally derived on women on boards of directors. These authors kindly provided us with information on the gender composition of boards of directors for 2010, which they extracted for their study from Infocamere, a large dataset of Unioncamere, the association of Italian chambers of commerce, which contains information on companies (corporate and non-corporate) registered with any Italian chamber of commerce. For 2017, the names of the directors were from AIDA, the database of the Italian joint-stock companies of Bureau Van Dijck.

To estimate a balanced panel, we only focused on 116 of the 250 firms used by Rinaldi and Tagliazzucchi (2022), i.e. those that were present in both 2010 and 2017 and did not change the characteristic of belonging to the LP or NLNP group. The firms present in 2010 that are no longer present in 2017 (134 firms) may have changed name and/or company name, gone bankrupt or are no longer in the top 250 due to a reduction in total assets. Table 1 summarizes the sample selection process.

Table 1. Sample Selection

	Total	Listed or state-participated	Unlisted and non-state participated
Top 250 companies by total asset selected from "Le principali Società Italiane", R&S Mediobanca for the years 2010 and 2017	250 companies	100 (40%)	150 (60%)
Companies not appearing in both years 2010 and 2017	134 companies	43 (32%)	91 (68%)
Final sample (Companies that ranked in the top 250 in both 2010 and 2017)	116 companies	57 (49%)	59 (51%)

Company year observation	232

We synthesize in Table 2 the dependent, independent and control variables used and the data source.

Table 2. Variables, definition and source

Name	Definition	Source	Measure
Dependent variable			
Percentage of women on board (WoBs)	Ratio of female directors to total directors	AIDA for the 2017 Infocamere for the 2010	Percentage
Independent variables			
Roe	Net income divided by stockholders' equity	AIDA	Percentage
Roa	Net income divided by total assets	AIDA	Percentage
Bad Performance	Dummy = 1 when jointly negative or equal to zero Roe and Roa	Self-produced	Binary value (0,1)
Financial (Moderator)	Dummy = 1 for companies in the financial sector	Self-produced	Binary value (0,1)
Control variables			
Firm size	Total assets (in logs)	R&S Mediobanca	Natural logarithm
Women executives	Dummy = 1 when the companies have, at least, one woman holding a top position (president or CEO) in the board	AIDA for the 2017 Infocamere for the 2010	Binary value (0,1)
Board size	Total number of directors in the board.	AIDA for the 2017 Infocamere for the 2010	Number of board members
Variable used for the subgroup of NLNP			
NLNP	Dummy = 1 when NLNP companies	Self-produced	Binary value

	(0,1)

The empirical strategy used is as follows. Firstly, we provide descriptive statistics and Anova tests to assess some sample characteristics such as the presence of significant differences in the presence of women on boards of directors (WoBs) and financial performance (Roe, Roa) among different companies in the five target industries in 2010 and 2017. Secondly, H1 and H2 and H3 are tested for both the total sample and the group of NLNP companies using panel regressions with *fixed effects* to reduce potential omitted variables bias, that represent a source of endogeneity (Wintoki et al., 2012).

Specifically, we test the following specifications with dependent variable women on boards of directors (WoBs):

(1) $WoBs_{it} = \beta_1 Wom\_executive_{it} + \beta_2 Law_t + \beta_3 Board\ size_{i,t} + \beta_4 Firm\ size_{i,t} + \alpha_i$

(2) $WoBs_{it} = \beta_1 Wom\_executive_{it} + \beta_2 Law_t + \beta_3 Board\ size_{it} + \beta_4 Firm\ size_{i,t} + \beta_5 Financial \times Law_{it} + \alpha_i$

(3) $WoBs_{it} = \beta_1 Wom\_executive_{it} + \beta_2 Law_t + \beta_3 Board\ size_{i,t} + \beta_4 Firm\ size_{i,t} + \beta_5 Roe_{it} + \alpha_i$

(4) $WoBs_{it} = \beta_1 Wom\_executive_{it} + \beta_2 Law_t + \beta_3 Board\ size_{it} + \beta_4 Firm\ size_{i,t} + \beta_5 Roe_{it} + \beta_6 Roe_{it}^2 + \alpha_i$

Where α_i represents the fixed effects, while the definition of the variables is in Table 2. Models 3-4 are also estimated using the Bad Performance variable and the quadratic polynomial with Roa instead of Roe, with the aim of assessing the presence of the glass cliff with other performance proxies as well. The rationale behind the choice of baseline Models 1-4 rests on a testing strategy detailed in the Supplementary Materials (Table A), which led us to select panel regression models instead of pooled specifications.

Note that further estimates are presented in the Robustness section, where we present the same models with random effects instead of fixed effects. Furthermore, to mitigate potential endogeneity due to reverse causality, we also estimate fixed effects panel regression using Two-Stage Least-Squares regression (2SLS) to assess the causal relationship between women on boards of directors (WoBs) and the endogenous variables Roe, Roa and Bad Performance, used in alternative models.

This method requires finding instruments that are exogenous to the error term, i.e. correlated with the potential endogenous independent variable and uncorrelated with the dependent

variable, which favors unbiased parameters estimates. For this purpose, we use the Asset-to-Equity Ratio instrument, i.e. the ratio of total assets to shareholders' equity, as this variable is assumed to fulfil the above mentioned characteristics.

5. Empirical findings

Table 3. Sectoral representation of the total sample and sub-samples of LP and NLNP companies

	Total		NLNP		LP	
	N	**%**	**N**	**%**	**N**	**%**
2010						
Manufacturing	28	24%	19	32%	9	16%
Financial	23	20%	11	19%	12	21%
Public Utilities	34	29%	14	24%	20	35%
Service	19	17%	6	10%	13	23%
Other	12	10%	9	15%	3	5%
N	116		59		57	
2017						
Manufacturing	28	24%	18	30%	10	18%
Financial	23	20%	10	17%	13	22%
Public Utilities	27	23%	16	28%	11	19%
Service	27	23%	7	11%	21	36%
Other	11	10%	8	14%	3	5%
N	116		59		57	

Table 4. One-way Anova on women representation and firm performance across sectors

Total Sample								
	2010							
	Financial	Public Utilities	Manufacturing	Services	Other	F-Test	Levene Test	Welch Test
WoBs	0.03 (0.054)	0.04 (0.097)	0.06 (0.083)	0.07 (0.098)	0.12 (0.111)	2.311	0.085	0.105
Roa	0.004 (0.110)	0.02 (0.040)	0.03 (0.041)	0.02 (0.029)	0.04 (0.036)	1.110	0.000	0.340
Roe	0.05 (0.046)	0.04 (0.164)	0.11 (0.191)	0.07 (0.114)	0.09 (0.117)	2.772	0.005	0.000
N	23	19	28	35	11	TOT. 116		
	2017							
	Financial	Public Utilities	Manufacturing	Services	Other	F-Test	Levene Test	Welch Test
WoBs	0.26 (0.161)	0.26 (0.151)	0.18 (0.145)	0.23 (0.162)	0.19 (0.147)	1.413	0.850	0.239

Roa	0.003 (0.014)	0.037 (0.032)	0.02 (0.043)	0.02 (0.036)	0.05 (0.037)	4.211	0.025	0.000
Roe	0.01 (0.169)	0.14 (0.130)	0.06 (0.140)	0.10 (0.165)	0.10 (0.074)	2.467	0.672	0.070
N	23	27	28	27	11	TOT. 116		
Subsample of NLNP companies								
2010								
	Financials	Public Utilities	Manufacturing	Services	Other	F-Test	Levene Test	Welch Test
WoBs	0.03 (0.057)	0.05 (0. 093)	0.04 (0.064)	0.10 (0.126)	0.15 (0.111)	2.765	0.013	0.054
Roa	0.002 (0.059)	0.031 (0.044)	0.014 (0.035)	0.025 (0.024)	0.040 (0.042)	1.923	0.000	0.003
Roe	0.06 (0.059)	0.10 (0.168)	0.01 (0.270)	0.08 (0.098)	0.08 (0.132)	0.483	0.040	0.817
N	11	6	19	15	8	TOT. 59		
2017								
	Financials	Public Utilities	Manufacturing	Services	Other	F-Test	Levene Test	Welch Test
WoBs	0.155 (0.148)	0.108 (0.123)	0.112 (0.089)	0.163 (0.166)	0.142 (0.133)	0.428	0.313	0.798
Roa	0.001 (0.009)	0.033 (0.043)	0.040 (0.025)	0.018 (0.045)	0.050 (0.041)	2.331	0.062	0.002
Roe	0.017 (0.195)	0.095 (0.142)	0.183 (0.197)	0.102 (0.211)	0.092 (0.079)	0.890	0.580	0.644
N	11	6	18	16	8	TOT.59		

Notes. The Welch Test is the robust test of Equality of Means. Levene Test is the Test of Homogeneity of Variance. Standard deviations are in parenthesis.

Table 3 shows descriptive statistics of our sample. Specifically, it shows that the two groups NLNP and LP are almost equally represented across the 116 enterprises, (NLNP= 59; LP = 57 per year). No significant disparities exist between the two groups of companies regarding their sector distribution in the two benchmark years. The LP group is primarily concentrated in public utilities, service, and financial industries, while the NLNP group is predominantly found in manufacturing, public utilities, and financial sectors. This initial analysis is essential as we intend to investigate variations in women representation and performance within these two company groups, with sectors potentially exerting a substantial influence on these aspects.

Table 4 depicts differences in gender representation and performance levels across sectors and types of companies in 2010 and 2017. The main results show that the financial sector is the one with the lowest average percentage of women on boards (WoBs) in 2010 on both the total

sample (F-Test$_{4,116}$ = 2,311) and in the subgroup of NLNP ($F_{4,59}$=2,765): in both these cases the average percentage of women is equal to 3%, confirming that women were particularly under-represented in the financial industry. This result is consistent with the literature, which finds that the financial sector is typically characterized by a male culture and gender barriers; in these cases, the few women on boards are also more likely to have an "outsider" status (De Cabo and Nieto, 2012).

Surprisingly, in 2017 the financial sector results to be one of those sectors with the highest average of WoBs on both the total sample, in which it reaches an average of 26% and in the group of NLNP, in which, although firms were not subject to the GM law, the financial significantly increase the representation of WoBs, reaching an average of 16%.

Finally, in terms of performance levels, the presence of significant difference across sectors is mixed: Roe differs significantly in the total sample in both 2010 ($F_{4,116}$=2,775) and 2017 ($F_{4,116}$=2,467) years, with the financial that accounts the lower level of performance. In the NLNP group Roe is not significantly different across sectors, even if the financial is still the one with lower average values. With respect to Roa, it seems to have significant different values in the NLNP group on both 2010 and 2017, but not in the total sample, in which it is significantly differs across industries only in 2017 ($F_{4,116}$=4,221): financial is still the sector which accounts the lower values of performance, also in terms of Roa.

Next, we focus more on this higher increase in WoBs in the financial sector and the mechanisms behind it, which could be related to the Glass Cliff behaviors that occur when firms are in crisis and have low performance levels.

The fixed effects panel regressions models in Table 5 are estimated on the total sample of companies (Model 1, Model 2) and in the group of NLNP (Model 3, Model 4). All these models are well-specified with the R-squared ranging from 0.32 to 0.57.

Model 1 shows that the percentage of women on boards of directors is positively and significantly related to the regressors Law and Women Executives (1% significance level). Specifically, the percentage of WoBs in companies with at least one woman in an executive position, is 15 per cent higher than in companies without women in these roles. A similar result is also confirmed in the NLNP group, where companies with at least a woman in executive positions have, on average, 13% more women on boards (Models 3,4 Table 5). Different empirical works identify the role of women executives as a significant determinant of higher WoBs (Gould et al., 2018; Gupta and Raman, 2014; Tinsley et al., 2017; Nguyen et al., 2020). Indeed, women executives play a more influential role in board decisions, and because they are likely to perceive other women as part of the same social group, they may adopt behaviors such

as cooperation, altruism, and empathy, thus facilitating other women's access to the board (Fiske 1998; Turner et al., 1987).

Model 3 estimates the same specification of Model 1, but on the sub-sample of NLNP companies.

Law still correlates positively and significantly (1%) with the percentage of women on boards. In particular, Model 3 suggests that the percentage of women in the NLNP is 5 points higher in 2017 than in 2010.

Hence, the presence of WoBs increased in both LP and NLNP companies, although to a lesser extent in the latter. Finding horizontal spillover effects for all sectors reinforces Bongiovanni's result that only documented it for the banking sector.

The behavior of NLNP companies may stem from their need to gain legitimacy from other organizations in the same environment. In light of this, quotas could influence the shared value system and make companies more motivated to achieve gender-balanced boards as suggested by Suchman, (1995) and Ashford and Gibbs (1990).

In Model 2, the interaction Financial×Law indicates that women, from 2010 to 2017, increased 9% more in the financial sector than in other sectors (5% significance level). The same outcome is also found on the subsample of NLNP (Model 4). This greater increase of WoBs in the financial sector is supported by the neo-institutional theory, according to which sectors characterized by greater riskiness and uncertainty, such as finance, may adopt imitative behavior to a greater extent than other sectors (Bongiovanni et al., 2022).

The results obtained confirm that the GM has reduced the glass ceiling in different ways: it increases the gender representation on board of LP companies, obliged by the mandatory requirements of the law, as well as in the NLNP through a spillover effect. Moreover, gender quotas have had a beneficial effect also in the financial sector, typically characterized by higher glass ceilings. In sum, gender quotas may have produced pressures and changes in the value system, leading also other organizations, not directly affected by the GM law, to increase the gender representation on boards (Di Maggio and Powell 1983, 1991; Suchamn 1995; Ashford and Gibbs 1990).

Table 5. Gender quotas and glass ceiling. *Fixed effects* panel regression models

	Total Sample		*Non-Listed Non-Participated group*	
Variables	*(1)* *β (se)*	*(2)* *β (se)*	*(3)* *β (se)*	*(4)* *β (se)*
Board size	-0.002	-0.001	-0.01**	-0.01**
	(0.004)	(0.004)	(0.005)	(0.004)
Firm size	0.02	0.05	0.02	0.04*
	(0.033)	(0.033)	(0.032)	(0.035)
Law	0.15***	0.13***	0.05***	0.03*
	(0.018)	(0.019)	(0.017)	(0.018)
Women executives	0.15***	0.14***	0.13**	0.13**
	(0.037)	(0.034)	(0.052)	(0.052)
Financial×Law		0.091**		0.07*
		(0.039)		(0.043)
R-squared within	0.551	0.570	0.407	0.433
N	232	232	116	116

Notes. Robust Standard errors are in parenthesis. ***≤ 0,01; **≤ 0,05; *p≤ 0,1

After analyzing the impact of GM law on gender representation on the total sample and on the NLNP group, we test H3 on the glass cliff phenomenon, according to which, once glass ceiling barriers are overcome, women are more likely to be appointed in precarious positions and in poor-performing societies. To this aim, we estimate panel models including financial indicators on the total sample and on the subsample of NLNP.

There is not a significant correlation between the percentage of women on boards and the Roe, in both the total sample (Model 1, Table 6) and in the NLNP group (Model 2, Table 6). However, a significant link emerges when considering a non-linear specification of Roe (quadratic polynomial specification) that accounts for the fact that the presence of women on boards depends on the level of corporate performance.

This result is consistent with that of Mulcahy and Linehan (2014), who show that the glass cliff occurs in the presence of particularly negative performance conditions, thus in cases where performance indicators are significantly low, as in our case. Indeed, the nonlinearity found confirms that worsening in Roe values are associated with greater increases in WoBs. This result is also reinforced by Models 3 and 8, displayed in Table 5, in which the dummy variable

Bad Performance is significant and with a positive sign, indicating that women increase more in firms that have jointly negative or zero values of Roe and Roa, both in the total sample (Model 3) and in the NLNP group (Model 8). Our results also highlight a group of companies where very high levels of Roe are associated with higher WoBs. It is possible that this group of companies, which appears to act in the opposite manner from those that exhibit glass cliff behavior, is characterized by a gender-neutral culture and fewer gender stereotypes and barriers (Acker 1990; Ryan et al., 2016; Morgenroth et al., 2020).

As a robustness analysis, we use Roa instead of the variable Roe. Again, the nonlinear relationship is confirmed and the sign of the coefficients is the same as in the estimates where Roe is used, although statistical significance is only present in the overall sample (Model 5, Table 6).

Table 6. Glass Cliff and WoBs. *Fixed effects* panel regression models

	Total Sample					*Non-listed and non state-participated*				
Variables	(1) *β (se)*	(2) *β (se)*	(3)* *β (se)*	(4) *β (se)*	(5) *β (se)*	(6) *β (se)*	(7) *β (se)*	(8)* *β (se)*	(9) *β (se)*	(10) *β (se)*
Board size	-0.003	-0.002	0.005***	-0.002	-0.002	-0.01**	-0.01***	0.006***	-0.01**	-0.01*
	(0.004)	(0.004)	(0.000)	(0.004)	(0.004)	(0.004)	(0.004)	(0.000)	(0.006)	(0.002)
Firm size	0.02	0.03	-0.002	0.02	0.02	0.02	0.03	-0.013	0.02	0.02
	(0.031)	(0.029)	(0.010)	(0.058)	(0.057)	(0.033)	(0.032)	(0.012)	(0.030)	(0.030)
Law	0.14***	0.14***	0.16***	0.15**	0.15**	0.04***	0.04**	0.07***	0.04	0.04
	(0.017)	(0.017)	(0.000)	(0.007)	(0.005)	(0.018)	(0.018)	(0.010)	(0.008)	(0.015)
Executives	0.58***	0.15***	0.13***	0.15*	0.15*	0.14**	0.12**	0.14***	0.13	0.13
	(0,038)	(0.036)	(0.029)	(0.019)	(0.017)	(0.055)	(0.056)	(0.033)	(0.054)	(0.043)
Roe	0.08	-0.13*				-0.02	-0.03			
	(0.072)	(0.077)				(0.080)	(0.080)			
Roe^2		0.38**					0.34[1]			
		(0.168)					(0.212)			
Bad Performance			0.01***					0.02***		
			(0.000)					(0.006)		
Roa				-0.21	-0.34				0.15	-0.03

				(0.183)	(0.245)				(0.276)	(0.108)
Roa^2					2.44*					7.61
					(0.302)					(2.614)
R-squared within	0.557	0.568	0.539	0.553	0.554	0.408	0.436	0.290	0.409	0.428
N	232	232	232	232	232	116	116	116	116	116

Notes. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 * Models 3 and 10 are without fixed effects for high collinearity. [1] significance level=12%

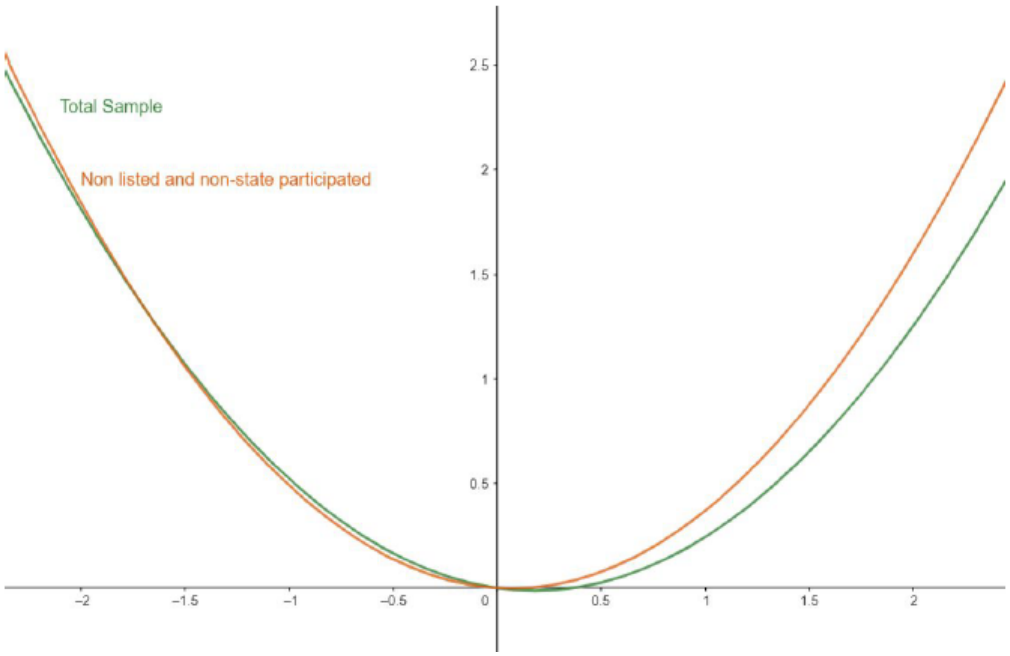
Figure 1 shows the marginal effects derived from Models 2 and 5 in Table 6. The x-axis is represented by the Roe values, while the y-axis is represented by the percentage of women on boards (WoBs). The plot draws a nonlinear relationship between women on boards and performance for both the LP and NLNP companies. The glass cliff occurs only for firms with Roe's values at or below turning points of 0,17 for the total sample and 0,09 for the NLNP.

For Roe values less than or close to zero, i.e for worse performing companies, the percentage of women on boards increases more than proportionally to the worsening performance in total and NLNP sample. For Roe values greater than zero, the percentage of women on boards again increases more than proportionally to the improvement in performance in the total and NLNP samples. Therefore, we partially support H3, confirming that the increasing presence of women on the boards of underperforming firms occurs only when they have particularly severe bad performance, as similarly found by Mulchahy and Linehan (2014).

Badly performing firms are more easily depicted when they have jointly negative Roe and negative or close to zero values of Roa, as evidenced by the Bad performance variable, which is positive and significant for both the total sample and the NLNP at 1% significance level (Models 3, 8, Table 6). For robustness, similar turning points are also calculated for Roa. In particular, in this case the Glass Cliff occurs when Roa is equal or lower than 0,003 for NLNP and 0,07 for the total sample (Models 5, 10, Table 6).

In summary, the results presented in Table 6 and depicted in Figure 1 reveal that the glass cliff phenomenon occur even when objective accounting measures such as Roe and Roa are used, particularly they differ in the severity of performance levels (Haslam et al., 2010; Adams Guptha and Leeth, 2009; Mulcahy and Linehan, 2014).

Figure 1. Percentage of women on boards (Y) and Roe (X)



6. Robustness

Table 7. Robustness Check: Gender quotas and glass ceiling. *Random effects* panel regression models

	Total sample		*Non listed and non-state participated*	
Variables	(1)	(2)	(3)	(4)
	β (se)	*β (se)*	*β (se)*	*β (se)*
Board size	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm size	-0.001	-0.004	-0.01	-0.02***
	(0.010)	(0.004)	(0.011)	(0.004)
Law	0.16***	0.16***	0.08***	0.06**
	(0.001)	(0.012)	(0.015)	(0.027)
Women executives	0.14***	0.14***	0.14***	0.14***
	(0.030)	(0.031)	(0.030)	(0.034)
Law x Financial		0.04		0.07
		(0.058)		(0.075)
R-squared within	0.539	0.550	0.539	0.550
N	232	232	116	116

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

Table 8. Robustness check: Gender quotas and glass cliff. *Random effects* panel regression models

	Total sample					*Non listed and non-state participated*				
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	β (se)	*β (se)*	*β (se)*	*β (se)*	*β (se)*	*β (se)*	*β (se)*	*β (se)*	*β (se)*	*β (se)*
Board size	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm size	-0.002	-0.002	-0.002	-0.002	-0.002	-0.01	-0.01	-0.01	-0.01	-0.01
	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)	(0.012)	(0.012)	(0.012)	(0.010)	(0.010)
Law	0.16***	0.16***	0.16***	0.16***	0.16***	0.08***	0.07***	0.08***	0.08***	0.07***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.013)	(0.016)	(0.015)	(0.015)	(0.015)
Women executives	0.14***	0.14***	0.14***	0.14***	0.14***	0.13***	0.13***	0.14***	0.14***	0.14***
	(0.026)	(0.024)	(0.029)	(0.030)	(0.029)	(0.033)	(0.033)	(0.033)	(0.030)	(0.028)
Roe		-0.10***				-0.04	-0.05***			
		(0.011)				(0.066)	(0.000)			
Roe^2		0.12					0.26***			
		(0.078)					(0.037)			
Bad Performance			0.01***					0.02***		
			(0.001)					(0.006)		
Roa				-0.16*	-0.24**				0.07	0.02
				(0.0853)	(0.0929)				(0.071)	(0.176)
Roa^2					1.31**					0.91
					(0.606)					(3.410)
R-squared within	0.543	0.549	0.539	0.540	0.540	0.542	0.548	0.548	0.539	0.540
N	232	232	232	232	232	116	116	116	116	116

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

In this section, we offer further insights into the robustness of our results not only in relation to the use of alternative performance indicators, but also in relation to the different specifications of panel regression models with random effects and the resolution of endogeneity through reverse causality using 2SLS.

Firstly, Hausmann's test suggests that random-effects panel regressions are more appropriate when the total sample of firms is considered, while the fixed-effects specification is preferred for the NLNP subsample of firms (1% significance level). In addition, Ramsey's RESET test and Chow's test suggest that pooled specification is not appropriate (1% significance level). For details on testing to select a panel structure with fixed or random effects instead of a pooled specification see the Supplementary Materials (Table A).

The panel regressions with random-effects in Table 7 confirm the presence of a spillover effect on the NLNP group, where women significantly increase from 2010 to 2017, as suggested by the variable law (Models 3 and 4). This strengthens our evidence on the presence of horizontal spillover effects, confirming (H1).

Women executives is significantly and positively correlated with increased WoBs both in the total sample and in the NLNP group (1% significance level), confirming the results obtained from the fixed-effects models. Women in president or CEO are a significant determinant that induces a higher percentage of WoB also in the NLNP group, thus strengthening our results (Models 1-4 Tables 7; Models 1-10 Tables 8).

We find a positive, but not significant correlation between the Financial x Law interaction and WoBs. Women directors, from 2010 to 2017, increased the most in the financial sector, although this increase is not statistically significant, unlike the results from fixed-effects panel models (Models 2,4 Table 7).

In the total sample, we find evidence of the glass cliff using Roe, Roa and Bad Performance (Models 1, 2, 3,4 and 5, Table 8). Further, we find evidence of a nonlinear relationship between the presence of women on boards and the Roa, confirming the inverted U-shaped relationship we also find with Roe in the panel regressions with fixed effects at the 5% significance level (Model 5, Table 8).

A similar nonlinear relationship between WoBs and Roe is also found in the NLNP subsample at the 1% significance level (Model 7, Table 8). While we do not find a significant relationship between Roa and WoBs in the subsample of NLNP.

The glass cliff is also confirmed by the dummy Bad Performance, which is positively and significantly correlated with the percentage of women on boards, both in the total sample and in the NLNP subsample at 1 % of significance level (Models 3, 8, Table 8). These results

confirm that women increase more in companies in critical financial condition, which recorded both negative or equal to zero values of Roe and Roa jointly. Thus, random-effects panel regression models confirm (H3), reinforcing the results obtained with fixed effects.

Table 9. Robustness checks: gender quotas and glass cliff. *Fixed effects* panel regression models (2SLS)

	Model 1 *Roe* as endogenous variable		Model 2 *Roa* as endogenous variable		Model 3 *Bad performance* as endogenous variable	
	First stage Y=Roe	*Second stage Y=WoBs*	*First stage Y= Roa*	*Second stage Y= WoBs*	*First stage Y=Bad performance*	*Second stage Y=WoBs*
Board size	-0.01 (0.021)	-0,01 (0.008)	-0.001 (0.001)	-0.02 (0.015)	0.01 (0.016)	-0.01 (0.008)
Firm size	0.03 (0.046)	0.10 (0.071)	-0.003 (0.008)	-0.003 (0.113)	-0.132 (0.100)	0.13** (0.062)
Law	-0.01 (0,021)	0.13*** (0.036)	-0.00 (0.004)	0.14** (0.073)	0.02 (0.051)	0.13*** (0.032)
Women Executives	0.08* (0,048)	0.26*** (0.082)	0.01 (0.008)	0.26** (0.142)	-0.06 (0.113)	0.18*** (0.066)
Roe		-1.48*** (0.333)				
Bad performance						0.55*** (0.100)
Roa				-15.99** (6.862)		
Asset-to-Equity ratio	0.00*** (0.000)		0.00*** (0.000)		-0.00*** (0.000)	
Sanderson-Windmeijer F test of excluded instruments	F(1,111)=16.42; Prob > F = 0.0001		F(1,111)=4.92; Prob > F = 0.028		F(1, 111) = 30.58; Prob > F = 0,000	
Observations	232	232	232	232	232	232
F – test; Prob > F		F(5, 111) = 17,18; p-value = 0,000		F(5, 111) = 26.12 ; p-value = 0.000		F(5, 111) = 55.33, P-value = 0.000

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

Secondly, to address reverse causality issues between WoBs and firm performance variables, we chose 2SLS, that is a method used to address reverse causality by using instrumental variables to isolate the variation of the independent endogenous variable that is not affected by

the error term, allowing for more reliable parameter estimates. Note that we use this technique for the potential endogenous variables Roe, Roa and Bad Performance, considered alternatively in three different models, as shown in Table 9.

As an instrument, we chose the Asset-to-Equity Ratio, i.e. the ratio of total assets to equity, as it satisfies the conditions of (i) relevance: the instrument is assumed to be correlated with the endogenous firm performance variables, (ii) exogeneity: it should not be directly correlated with the dependent variable, the percentage of women on the board, so it should not be correlated with the error term, (iii) exclusivity: it should only influence the percentage of women on the board through its impact on the firm performance variables. Furthermore, the Sanderson-Windmeijer F-test of the excluded instruments for the Asset-to-Equity relationship supports the validity of this instrument for the variables Roe (Model 1, Table 9), Roa (Model 2, Table 9) and Bad Performance (Model 3, Table 9).

As can be seen from the results of Models 1-3 in Table 9, all alternative corporate performance variables are significantly correlated with the presence of women on boards, even when we instrumented to control for reverse causality. Specifically, Roe (Model 1) and Roa (Model 2) are both significantly and negatively correlated with the percentage of women on boards, suggesting that women are more likely to be appointed when companies experience lower levels of corporate performance. Similarly, the Bad performance variable (Model 3) is significantly and positively correlated with the percentage of women on boards, suggesting that women are more likely to be appointed in companies with negative Roe and Roa values.
In summary, the 2SLS estimation confirms that the glass cliff also occurs even when considering endogeneity due to reverse causality.
Note that another appropriate technique for dealing with endogeneity is estimation using the Generalised Method of Moments (GMM), which would require a longer period of time than in our case (Wintoki et al., 2012).

7. Discussion, conclusion and practical implications

This paper documents that the presence of women on boards has increased significantly in both LP and NLNP companies, (H1 is confirmed) in all sectors; the financial sector has registered a higher increase of women on boards with respect to the other sectors, also in the NLNP group (H2 is confirmed). Further, this study shows that the appointment of women in poor-performing

firms, i.e. the Glass Cliff, represents a further barrier which is less visible, but still important to be considered, since it reduces women opportunities to advance in their careers. In this regard, we find that the increasing presence of women on the boards of underperforming firms occurs only when they have particularly severe bad performance (H3 is only partially supported).

Our first contribution provides evidence of the existence of horizontal spillovers, that is gender quotas are an important tool both for increasing the presence of women on the boards of Italian companies subject to the law and for the positive effect they have on companies not directly affected by quota requirements in all sectors and particularly in financial one, reinforcing the outcome of previous studies (Ahern and Dittmar, 2012; Bongiovani et al., 2022).

Another contribution of our work is to investigate the link between the appointment of women on boards after the gender quota reform and the Glass Cliff, specifying under which conditions this phenomenon occurs (Ryan and Haslam 2005, 2007; Terjesen and Sealy, 2016). Indeed, one element that characterizes the presence of the Glass Cliff concerns the severity of economic loss. In this regard, our results show that it can be documented even when objective accounting measures, such as Roe and Roa, are used, and especially when particularly bad performance levels are considered. (Mulcahy and Linehan, 2014).

Finally, we also depict that the presence of women executives is also relevant to increase the presence of women on boards, suggesting that there are also other dimensions, in addition to the gender quota law, that may facilitate the increase of gender balance on the board.

Evidence provided also yields some practical, managerial and regulatory implications. From a regulatory perspective, tools such as quotas should also be targeted at roles with greater influence in decision-making processes, such as executive positions, as this could lead to a "double" spillover effect: on the one hand, it could generate horizontal spillover effects on the same job positions in companies not targeted by these measures, and, on the other hand, it could generate "vertical spillover effects" on other job positions of the company, as women executives favor greater gender representation across the board (Matsa and Miller, 2011; Wang and Kelan, 2013). In addition, mandatory or voluntary quotas can be an effective instrument for increasing the presence of other minority groups in leadership positions or corporate boardrooms, e.g, ethnic minorities, individuals discriminated against because of age, disability or nationality.

The practical and managerial implications concern interventions to support women in 'glass cliff' positions, the provision of mentoring and support by supervisors to prevent women from leaving management roles and to enhance their career advancement possibilities. Career

advancement possibilities for women can also be improved through social activities organized by companies to increase women's social networking, since gender segregation in specific positions can also be linked to differences in networking. Moreover, initiatives to increase networking can also be an opportunity to obtain a greater source of support and help. Finally, the glass cliff is a cultural phenomenon that can be reduced through real cultural change within the company. In this sense, both regulatory instruments, such as gender quotas, and company policies that help reduce gender barriers, such as providing support, increasing group and networking activities, and providing employees with training courses that raise awareness of stereotyping processes, strengthening an overall inclusive organizational culture towards women, ethnic minorities or other marginalized groups, can also help reduce the phenomenon of stereotypes such as the glass cliff. The theoretical implications concern, on the one hand, further analysis of the mechanisms that can lead to horizontal spillover effects between companies, sectors or countries not directly affected by gender quotas. Evidence on this issue is still scarce and future studies should seek to better understand how spillover effects are generated. Another theoretical implication concerns the study of the glass cliff, which according to our results seems to occur only in the presence of particularly negative performance conditions. In this case, it is also important to evaluate this phenomenon in other contexts and countries and with alternative performance indicators.

8. Limitations and prospects for future research

One indication for future research on the glass cliff emerges from our work, that is of focusing more on the type of performance indicator adopted. Objective accounting indicators of poor performance may take longer to be perceived as a crisis signal by companies, whereas subjective, market-based measures better reflect short-term market and investor reactions (Haslam et al., 2010). It is therefore necessary to better clarify how objective accounting measures are able to capture the glass cliff phenomenon.

An important limitation of our study is the narrow two-year time frame, which may benefit from a broader time span for a more comprehensive analysis and the application of advanced techniques like GMM to address endogeneity concerns (Wintoki et al., 2012).

Future studies should consider the incorporation of corporate governance variables, such as variables related to monitoring quality, the average number of board meetings and the financial leverage of the company, as additional control variables.

Another shortcoming is that we pay little attention to the organizational and subjective dimensions that may be related to both the presence of spillover effects and the presence of the glass cliff. Our future research will be more focused on understanding those organizational elements that can promote gender representation on corporate boards, even if not targeted by mandatory actions such as quotas, and secondly, that limit the likelihood of glass cliff episodes. Indeed, this article highlights a group of companies with good performance levels that increase gender representation and the study of the organizational traits that characterize these companies will therefore be the subject of future research To this end, the adoption of qualitative approaches, such as semi-structured interviews or focus groups with women on boards of directors, can be helpful in understanding more nuanced elements that characterize the causes of glass cliff and, on the other hand, situations in which women perceive themselves as truly part of companies without any form of stereotype or barrier.

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Supplementary materials

In Table A, we show several tests to select the most appropriate specification for panel regression models. The Chow Test can be used to compare Pooled OLS with Fixed-Effects panel regression models. It suggests that it is more appropriate to use Fixed-Effects rather than the Pooled OLS regression models: the p-value =0 for both the total sample and the NLNP. The Ramsey's RESET test suggests that Pooled OLS specification is not the appropriate form of regression to use for our data and other forms of regression model, including panel regression model are favorite. This result is confirmed for both the total sample (p-value = 0) and the NLNP group (p-value = 0.0191).

According to Hausman's test, Random Effects panel regression models are more appropriate for our dataset only when we analyze the total sample (p-value=0.40), while the Fixed-effects specification seems to be more appropriate for the NLNP subsample (p-value = 0.003).

To conclude, the Pooled OLS regression model is not an appropriate representation for our data and the panel representation is adequate.

Table A. Tests for panel specification

Test	Hypothesis	Total sample	NLNP
Chow test: Pooled vs Fixed-Effects	H_0: Regression coefficients β are identical across subsample (Pooled OLS regression is preferred) H_1: At least one regression coefficient β shows significant differences across subsamples (Fixed Effects panel regression is preferred)	F Statistic = 55.49; Prob>F=0.0000	F Statistic = 7.94; Prob >F = 0.0006
Ramsey's RESET test: Pooled vs other functional forms	H_0: the Pooled OLS has not omitted variable bias (Pooled OLS regression is preferred) H_1:Other forms of the regression (e.g. non linearities or panel structure) are more appropriate	F Statistic = 7,956, Prob > F = 0,000458	F Statistic = 4,111, Prob> F = 0,0191

Hausman test: Fixed-Effects vs Random Effects	H_0: Random-Effects panel regression is preferred H_1: Fixed effects panel regression is preferred	X^2 =4.02 Prob>chi2=0.403	X^2=17.51 Prob>chi2=0.003

As robustness, in Table B and Table C we depict the Pooled OLS estimates which do not substantially contradict the results of the favorite Fixed-Effects and Random-Effects panel regression models presented in the paper (Tables 4 - 7). The Pooled regression models confirm the presence of spillover effects on the NLNP companies (Model 1,3 Table B). They also confirm that, from 2010 to 2017, women increased significantly more in the financial sector, on both the total sample and in the subsample NLNP (Models 2,4 Table B). We also evidence the presence of the Glass Cliff both with Roe and Roa in the total sample, WoBs is negatively and significantly related with both Roe and Roa, even if the non-linear function of them is not statistically significant (Models 2 and 5, Table C). Differently, in the subsample of NLNP we find a significant non-linear relationship between women on board and Roe, confirming the results of the panel fixed effect models (Model 4, Table C).

Table B. Glass ceiling and gender quotas. Pooled OLS regression models

	Total Sample		*Non-listed and non-state participated*	
Variables	(1)	(2)	(3)	(4)
Board size	0.005**	0.005**	0.006***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm size	-0.001	-0.004*	-0.014**	-0.024**
	(0.000)	(0.000)	(0.000)	(0.001)
Law	0.164***	0.157***	0.074**	0.059**
	(0.000)	(0.000)	(0.001)	(0.004)
Women executives	0.136***	0.136***	0.128***	0.130**
	(0.001)	(0.001)	(0.001)	(0.002)
Law x Financial		0.033**		0.086**
		(0.002)		(0.003)
R-squared	0.416	0.419	0.316	0.340
N	232	232	116	116

Notes. Robust Standard Errors for firms with negative performance. *** p<0.01, ** p<0.05, * p<0.1

Table C. Glass Cliff and WoBs, Pooled OLS regression models

	Total Sample					*Unlisted and non-state participated*				
Variables	(1)	(2)	(3)	(4)	(5)	(3)	(4)	(8)	(9)	(10)

Board size	0.005***	0.005***	0.005***	0.005**	0.005*	0.006***	0.006**	0.006***	0.006**	0.006**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm size	-0.002	-0.001	-0.001	-0.002**	-0.002***	-0.014**	-0.014*	-0.013*	-0.014***	-0.014***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Law	0.163**	0.163**	0.163**	0.164***	0.163***	0.075**	0.073*	0.075*	0.074***	0.074***
	(0.006)	(0.007)	(0.009)	(0.002)	(0.002)	(0.004)	(0.006)	(0.008)	(0.001)	(0.001)
Women executives	0.140***	0.140***	0.140***	0.137***	0.138***	0.133**	0.127**	0.132***	0.127***	0.128***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.002)	(0.001)	(0.001)	(0.002)
Roe	-0.100**	-0.104*				-0.043[1]	-0.061			
	(0.006)	(0.015)				(0.008)	(0.019)			
Roe²		0.115					0.253**			
		(0.030)					(0.006)			
Bad performance			0.036					0.033		
			(0.032)					(0.036)		
Roa				-0.154**	-0.235				0.048	-0.019
				(0.011)	(0.041)				(0.030)	(0.080)
Roa²					1.298					1.016
					(0.732)					(0.812)
R-squared	0.423	0.424	0.417	0.417	0.418	0.319	0.331	0.323	0.318	0.316
N	232	232	232	232	232	116	116	116	116	116

Notes. Robust Standard Errors for firms with negative performance. [1] P-value = 0.12. *** p<0.01, ** p<0.05, * p<0.1

Mental well-being and government support in Europe. The mediating role of trust in people and institutions*

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Abstract

Purpose

This paper investigates the determinants of subjective well-being in Europe using the European Living, Working and COVID-19 Survey carried out by Eurofound (2021). Socio-demographics characteristics, employment status, measures of economic distress, inequality and work life balance are considered. Particular attention is paid to how quality of government support (QgS), that considers the dimensions of good governance such as integrity, fairness, reliability, responsiveness, influences subjective mental well-being (WHO-5) through the mediation of trust in other people and in institutions.

Design/Methodology/Approach

To this end, we estimate a moderated mediation model for analysing the indirect role of QgS on WHO-5 through institutional trust and trust in people.

Findings

The results support the hypothesis that the reduction in WHO-5 in the European population during Covid-19, particularly marked in the 18-34 age group, is related to the perceived inadequacy of government interventions in managing economic and social uncertainty through supportive measures. This outcome is also due to reduced trust in institutions and other people, as both are significant mediators that reinforce the impact of public support on WHO-5.

Practical Implications

Government should pay greater attention to this relationship among good governance, trust and mental health of citizens because a healthy human capital is a significant factor for the long-run economic growth, in a special way when we refer to the young workforce with a greater life expectancy.

Originality

In the literature, the role of trust as a mediator has been analyzed in the relationship between individual economic situations and subjective well-being before and during the Covid-19 pandemic. To the best of our knowledge, no studies have examined the role of perceived quality of government support on subjective mental well-being using the mediating and backing effects of trust in people and institutions.

Keywords: subjective well-being, quality of government support, institutional trust, trust in people, Europe, young population, mediation model

Jel Code: I10, I18, I38, C10

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Design of the Work: BP, EP, CG
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Theoretical background: CG
Interpretation of the data: EP
All authors review the manuscript

Introduction

The spread of Covid-19 has resulted in an impact on multiple aspects of life, from employment and financial insecurity, to an increasing need for work-life balance, and concerns about quality of life and people's subjective well-being.

Together with non-pharmaceutical intervention (NPI) aimed at stopping the spread of the virus, countries have implemented economic support measures able to positively counterbalance the negative impact of closure policies on economic growth (Alfano et al., 2022). Apart from the economic result of contextual implementation of containment and mitigation policies, states' actions to cope with health and socioeconomic crises act on a psychological level, providing guidance for behavioral responses to uncertainty, when financial insecurity is a major source of negative feelings and mental distress. The quality of public action can therefore contribute to restoring subjective well-being among the public, in addition to taking care of their economic interests during the Covid-19 pandemic. A rich branch of socio-economic literature sheds light on how subjective well-being is influenced by welfare and social interventions and, more generally, by the quality of government support such as responsiveness and reliability, as well as the values of fairness and integrity (Helliwell and Huang, 2008; OECD, 2017; Veenhoven, 2010). In order to reduce uncertainty in times of crisis, governments increase citizens' wellbeing when they promote accessible and efficient support that effectively addresses the needs and expectations of society as a whole. Fairness and openness in the process and outcomes of public policies also play a role in ensuring that supportive action is successful (Charron et al., 2015; Kaufmann et al., 2011; OECD, 2017a).

A further issue is the mechanism through which public action impacts on individual mental well-being. It may act directly or through other determinants of subjective well-being. The Covid-19 pandemic gives rise to a greater need for trust as the public authorities rely on individual compliance to make anti-contagion measures and behavioral guidelines effective. In turn, individuals need to feel that the authorities have the power to do something to protect them. Trust plays a role in the effectiveness of public interventions considering that it influences the relationship between the general public and government and, in turn, it may make public interventions more or less successful.

Some authors suggest that trust is also a key factor for public health in times of crisis. In the Covid-19 period, low trust induces socially uncooperative behavior, increased mobility of

individuals and potentially results in higher mortality growth rates (Bargain and Aminjonov, 2020). Similarly, Alfano (2022) found that European countries with higher social capital stocks have fewer Covid-19 cases, *ceteris paribus* as a result of government recommendations and restrictions.

Given the significance of this dimension, we enrich the analysis exploring the direct and indirect factors influencing the impact of government policies on individual well-being, investigating the mediating role of trust in people and institutions.

Specifically, we examine whether (i) the perceived quality of government support is successful in promoting mental well-being, (ii) the quality of government support has an impact on trust in people and institutions, (iii) trust in institutions and in other people influence subjective well-being, (iv) institutional trust and trust in people play a mediating role in the relationship between the perceived quality of public support during the Covid-19 pandemic and subjective well-being, (v) this process of mediation was different for the various age groups of population. To this aim, we estimate a moderated mediation model using the database drawn from the European Living, Working and COVID-19 Survey, carried out by Eurofound (2021). With regard to the assessment of subjective well-being, we use the index validated worldwide, the *WHO-5* mental well-being index developed by the *World Health Organization (WHO-5)*, while to capture the perceived quality of government support we provide an original indicator identifying the dimensions of responsiveness and reliability of state capabilities, integrity and equity values, such as transparent and fair rules for access to income support measures.
To the best of our knowledge, no studies have examined the role of perceived quality of government support on subjective mental well-being using the mediating and backing effects of trust in people and institutions. Up to now, trust has been used as a mediator only in the relationship between individuals' economic status and subjective well-being before and during the Covid-19 pandemic (Clench-Aas and Holte, 2021; Lee, 2022). In addition, another novelty of the present work is the analysis of the moderating role of age in the relationship between government support, trust and subjective mental well-being, in line with the view that a particular moment in history may affect trust across age groups and generations to a different extent (Eichengreen and Aksoy, 2020). Specifically, we analyze the 18-34 age group based on statistical evidence from the Eurofound report (2021), which shows that this group has experienced the greatest reduction in both mental well-being (e.g., risk of depression, perceived

anxiety and stress) and economic and financial well-being, for example, due to higher rates of unemployment and job insecurity (Lambovska et al., 2021; Rossi et al. 2020).

We find a positive relationship between WHO-5 and perceived QgS (direct effect) and the presence of indirect positive effects produced by QgS on subjective mental well-being through trust in people and institutions. In addition, worsening subjective well-being conditions are partly due to reduced trust in institutions and other individuals, as both are significant mediators that enhance the positive impact of public support on well-being.

Finally, institutional trust has less of an indirect effect onWHO-5 in the younger age group (18-34 years old), which may suffer a major lack of influence in political decision-making, with negative consequences on their trust in institutions. Nonetheless, they attribute a higher relevance to the trust in other people, with respect to the individuals over 34.

The paper is structured as follows. In Section 1 we develop the theoretical background, Section 2 outlines data and methods used in the empirical strategy. The results are pictured in Section 3. Section 4 includes the discussions and Section 5 presents conclusions and policy implications.

1.Theoretical background

Responding to individual needs in time of crisis: public support and subjective well-being

In recent years, many scholars have focused on whether and how subjective well-being is influenced by welfare supports and public services. As highlighted by the OECD (2017a), good governance captures factors such as responsiveness, reliability, fairness, openness and integrity of public interventions.

The empirical literature has found that states that are characterized by low levels of transparency in the public sphere and low levels of perceived fairness in public policy are associated with lower levels of happiness (Veenhoven, 2010) and diminished overall subjective well-being (Helliwell and Huang, 2008). Helliwell (2003) compares different aspects of subjective well-being to a set of government measures using the World Bank Worldwide Governance Indicators (WGI) and finds that government effectiveness, a functioning regulatory framework, a guaranteed rule of law and robust action against corruption are closely associated with higher levels of subjective well-being.

The main insight obtained from these studies is that well-being depends more on the perceived quality of the services provided than on the funding allocated to their provision.

In this connection, Kaufmann et al. (2011, p. 239-240) claim that "first, perceptions matter because agents base their actions on their perceptions, impression, and views […] Second, in many areas of governance, there are few alternatives to relying on perceptions data. For instance, this has been particularly the case for corruption, which almost by definition leaves no 'paper trail' that can be captured by purely objective measures. Third, we note that even when objective or fact-based data are available, often such data may capture the de jure notion of laws 'on the books', which often differs substantially from the de facto reality that exists on the ground".

Since these arguments appear to be convincing, in the empirical part of our paper we propose a measure of quality of government support (QgS) based on perceptions of public sector interventions by which we seek to capture how individuals judge the responsiveness, reliability, fairness and integrity of public intervention.

Leveraging trust for well-being: trust as a key mediator

Good governance can improve the evaluation of quality of life either directly, in the sense that individuals feel better living in a context of high quality of public support, or indirectly, in the sense that good governance enables individuals to achieve higher levels of other determinants of subjective well-being, including trust in institutions and in people.

To address this issue, we take the study one step further by integrating quality of government support (QgS), trust and subjective well-being for the purpose of examining the processes by which public policy can have a bearing on individual subjective well-being.

Many authors suggest that trust is a key factor for public health in times of crisis: Pagliaro et al. (2021), in assessing individual experience of trust, associated with the willingness to coordinate efforts with others and cooperate with requests from the authorities, find that psychological differences in terms of trust in government, people and science are a good predictor of individual behavioral responses and cooperation with government needs for compliance across countries. Similarly, Alfano and Ercolano (2021) highlight that both local social capital and institutional quality have affected the efficiency of lockdown measures in Italian provinces.

According to the OECD guidelines for measuring trust (2017b), the multidimensional concept of trust can be distinguished as follows: a general trust in other people, including individuals with whom no direct relationship exists but who belong to the same community and those personally known, and a specific trust in well-identified political and non-political institutions.

Since seminal Putnam's studies (1993) an overlap between the concept of trust and the concept of social capital has been emerging. Putnam himself argues that the concept of social capital «refers to features of social organization, such as network, norms, and trust, that facilitate coordination and cooperation for mutual benefit» and he defines trust as a «lubricant» for social life (Putnam, 1994, p. 7-9). Later, the same author argues that, generally speaking, the decline in institutional trust is due to the citizen's perception of a worsening in the performance of many Western institutions (Putnam, 2000).

The process of transmission by which public policies affect trust in the public institutions has been referred to in the literature as the micro-performance hypothesis: better quality of governance can result in people being more satisfied, which in turn can generate increased institutional trust (Van de Walle and Bouckaert, 2003).

It is not surprising that responsive and effective public governance have an impact on trust in institutions (Van Ryzin, 2007). However at the same time, a branch of empirical research shows that when a society is not governed in a way that fosters equity among all its members, trust in people declines. The traditional institution-centered argument (Rothstein and Stolle, 2008), claims that when institutions are universally oriented and act effectively and fairly, individuals tend to think that the state will successfully intervene to avoid opportunism and to safeguard individual rights. In turn, this will encourage cooperation and lower the risk perception in trusting others.

Considering that good governance can have a positive impact on both trust in people and in institutions, we should bear in mind that a society characterized by high levels of trust has an impact on mental well-being.

Barrafrem et al. (2021) report that trust in government to deal with healthcare challenges arising from the Covid-19 pandemic had a significant direct impact on an index of individual well-being (Diener, 1985). These results reinforce other studies, such as Clench-Aas and Holte's (2021) research, which found that individual life satisfaction is directly associated not only with trust in other people, but also with trust in institutions.

With regard to the key role of trust, different recent studies investigate the mediating role of trust or social capital during the pandemic on the well-being and mental health of citizens on large data sets. In particular, Lee (2022) analyzes the mediating role of trust in institutions with respect to its ability to reduce the negative effect of financial distress on mental well-being, finding that this dimension has a significant indirect impact. The author focuses on middle-aged and older adults. Otherwise, we decide to focus on the younger group of individuals, under 35 years old, adopting a moderate mediation that allows us to study the differences between

the two age groups. Other studies on the buffer effect of trust include those of Chan et al. (2021) and that of Ciziceno and Travaglino (2019). The former adopts the more general dimension of social capital as a mediator between Covid-19 concerns and mental health problems. The latter shows that trust in institutions is a significant mediator between perceived corruption, which can be considered a proxy for the quality of government support, and life satisfaction, which is a dimension of individual well-being.

The theoretical connection between trust, subjective well-being and the mediating role of both trust in people and in institutions provides the ground for the transmission mechanism developed in the following empirical analysis. The path diagram theoretically discussed is provided by Figure 1, supplementary material.

2. Data and methods

Data and sources

To explore the hypotheses arising from the theoretical framework above, we employ a database drawn from the European Living, Working and Covid-19 Survey carried out by Eurofound (2021) developed during the Covid-19 pandemic (hereinafter the ELWC). The survey was conducted in three different rounds: the first one was launched in April 2020, the second one in July 2020 and the third one was implemented in February and March 2021. The three rounds reached almost 190,000 European citizens. The aim of the ELWC is to examine changes taking place during the pandemic in terms of trust in the public institutions, working conditions, financial and economic instability and other dimensions which capture individual well-being, such as life satisfaction, positive and negative attitudes and other measures of mental well-being. The ELWC also measured the assessment of the survey respondents with respect to income support and social and financial assistance provided during the pandemic by national governments and the European Union. We selected the third round of the ELWC involving 46,800 respondents (Eurofound 2021). This round comprises variables of interest for our study, not sampled in the previous rounds, for example, interpersonal trust.

Most of the variables we analyzed are related to perceptions, such as the perception of how fair the measures are, how much individuals trust institutions and others, and the perception of the individual financial situation. Subjective perceptions and impressions appear to influence agents' choices and evaluations of public measures even more than direct and personal experiences. In fact, individuals make their overall assessment on the basis of past experiences or evaluations shared by other individuals in their social networks, as well as on the basis of

public information and media reporting. We return to the role of perceptions in the following sections.

Preliminary analysis and variable definition

Our sample consists of individuals from the European Union,[1] mainly women (63%), in the age range from 18 to 98 years. The majority of the sample is characterized by individuals over 50 years of age (61%), followed by individuals from 36 to 49 years (25%), while individuals from 18 to 34 represent a minority of the sample (14%). Most of the interviewees were employees (49%), a significant share consisted of retired people (24%), followed by the unemployed (9%), self-employed (8%), homemakers (4%), individuals unable to work due to disabilities or long-term illness (3%) and students (3%). Moreover, the majority of our sample had a high level of educational qualifications: 51% had a bachelor's degree, a master's or a doctorate. With regard to household composition, 61% of the sample reported having a spouse or partner and 45% had, at least, one child up to 11 years old. A total of 79% live in a household consisting of one to three individuals. In terms of work-life balance, from the first wave in April 2020 to the second wave in July 2020 there was a general worsening that was particularly significant for women working from home with children. However, statistics relating to the third wave, in March 2021, show a partial improvement in work-life balance conditions (Eurofound, 2021). In fact, in the sample as a whole, 60% of the respondents stated that they worried about work when not working at least sometimes, 73% felt too tired after work to do some of the household jobs that needed to be done, 55% reported that their job prevented them from dedicating the time needed for their family.

With respect to subjective mental well-being, the European Living, Working and Covid-19 Report provides evidence of a significant deterioration between the first and the third e-survey, in which the lowest levels of mental and psychological health were measured. This worsening of mental health is particularly evident in the 18-to-34 age group and for the unemployed (Eurofound 2021). In our sample, our calculations show that the average levels of mental well-being are relatively low: the mean score on the mental well-being index,[2] ranging from 0 to

[1] The European countries included are: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

[2] The mental well-being index (WHO-5) as proposed by the World Health Organisation ranges from 0 (representing the least favorable level of well-being) to 100 (which is the most favorable level of well-being).

100, was equal to 47. Moreover, low levels of mental well-being were reported by 56% of the total sample, placed in the first and second percentile of the mental well-being index. In addition, 29% of respondents stated that they were downhearted and depressed more than half of the time, and 36% of respondents suffered from frequent feelings of tension, while 28% reported persistent feelings of loneliness and isolation. These average levels were lower for young people aged from 18 to 34 years, with an average mental well-being index of 44, while the share of young individuals who reported feeling frequently depressed or downhearted rose to 35%, and those reporting frequent feelings of tension amounted to 46% of the sample. Similarly, the perception of loneliness and isolation was higher among young people, 35% of whom report habitually suffering from these emotional states. In terms of financial and economic difficulties, we find that almost one-quarter of the total sample reported struggling to make ends meet, and a worsening of their financial situation.

Another important dimension is institutional trust, which significantly declined between the first to the third round of the Eurofound survey. In particular, institutional trust increased between the first round in April 2020 and the second round in July 2020, while it significantly declined between the second and the third round in March 2021, falling to average levels below those of April 2020 (Eurofound 2021). In our sample, from the data analysis, we found that the police and the healthcare system were the institutions that individuals trusted more: 47% of the sample reported higher levels of trust in the healthcare system and 44% in the police. High levels of trust in the European Union (34%) and in the government (26%) were reported by a minority of individuals. The higher levels of trust reported by a significant part of the sample to the police and the healthcare system may be linked to the type of public service offered by these institutions during the pandemic: the proximity of the service and direct contact with the public are elements that can play an important role in determining levels of trust. Moreover, the police and the healthcare system are institutions with a primary role in containing the pandemic during the state of emergency. We also analyzed the levels of trust in other people, finding that only 34% of individuals reported high levels of trust in other individuals: Europeans seem to trust institutions, particularly the police and healthcare system, more than they trust other people. Only trust in government seems to be lower than trust in other people in general. Lower levels of interpersonal trust may reflect growing inequalities among the most vulnerable groups of the population and the characteristics of fairness and equity of the social support measures adopted during the emergency (Eurofound 2021).

With regard to access to income support measures, the findings show that the percentage of individuals who effectively assessed them was low: 87% of respondents reported that they did not make use of income support measures such as state aid for businesses, unemployment benefits, wage support, paid sick or care leave and other forms of assistance. This provides evidence that the majority of the sample consists of individuals who evaluate the efficacy of support services without any direct experience of them. Thus, the opinions expressed about income support measures, which we consider in our analysis, reflect the general perception of the ability of the institutions to respond to social needs. With respect to those making use of income support measures, the findings show that the most significant category was state aid for businesses, requested by 34% of the total sample, unemployment benefit, requested by 9% of the sample, paid leave or sick leave (8%), other types of social support (8%) and wage support (7%).

For the sake of brevity, the intercorrelations between dependent and independent variables are not presented in the text, but these are available in the supplementary material to provide an initial picture of the strength of the relationships between the pairs of variables used in the moderated mediation model (Table D).

Variables derived from non-linear CATPCA

In the moderated mediation model proposed in this paper, we included composite indices described by factors derived using Categorical Non-linear Component Analysis (CATPCA). An important advantage of CATPCA is its ability to deal with categorical variables by discovering and managing nonlinear relationships among them, particularly in the presence of large datasets characterized by the presence of different types and scales of categorical variables, which are often correlated nonlinearly (Linting et al., 2007).

Table C, in the supplementary material, shows the Cronbach's alphas of each factor, which suggest high internal consistency among the items. It also displays that the variance accounted for (VAF) each factor is high and above 90 percent.

In summary, we used both the variables directly adopted from the dataset provided by Eurofound and the additional composite indices (factors) presented in Table 1, calculated through nonlinear CATPCA (for details see Table A, in the Supplementary File).

In the following, we present the variables used.

Quality of Government Support (QgS): this factor comprises four items from the survey relating different dimensions of welfare policies adopted by the national government. As suggested by OECD (2017) we consider state competencies in terms of responsiveness and reliability, as well as the values of fairness and equity, representing important dimensions influencing institutional and interpersonal trust. Specifically, this factor comprises the following variables: clarity and transparency of support measures (integrity), fairness, the ability to reach those most in need (reliability), efficiency in terms of obtaining benefits (responsiveness). The Cronbach's α of this factor is equal to 0.902.

Institutional Trust: this is a factor computed by considering local, national and multinational dimensions. In particular, we include in this factor the level of trust by individuals in national governments, healthcare systems, the police and the European Union. The Cronbach's α relating to this factor is equal to 0.843

Economic distress (ECO-STRESS): this factor combines economic and financial variables linked to past performance and expectations concerning the future financial condition of respondents. In addition, it comprises a variable that measures the degree of poverty individuals face in the present moment. The factor has a Cronbach's α equal to 0.737.

Work-Life balance (WLB): this factor is related to work-life balance, including five items concerning the ability to balance work and life spheres. The Cronbach's $\alpha$is equal to 0.784.

We then consider additional variables already included in the original database provided by Eurofound (2021):

WHO-5: this is a subjective composite well-being index developed by the W*orld Health Organization* for screening depression and measuring mental well-being. The index ranges from 0 to 100, with higher scores denoting higher levels of well-being. It is derived from five statements indicating the frequency with which individuals felt, in the last two weeks, cheerful and in good spirits, calm and relaxed, active and vigorous, fresh and rested and interested in daily activities of their life. This index has been validated in studies on both younger and older persons, confirming that this scale has good construct validity (Topp et al., 2015; WHO, 1998).

Trust in people: this variable expresses how much individuals trust other people, in a range from 0 to 10, with higher scores indicating higher levels of trust in other people.

Young: this dichotomous variable is based on the threshold adopted by the Eurofound Report (2021) considering young Europeans aged 18-to-34 years.

Control variables: under this heading socio-demographics characteristics are considered. They are identified by the following dummies: FEM (female=1), EDUC (high level of education, i.e bachelor's degree, master's, doctorate=1), SPOUSE (having a spouse or a partner =1), CHILD (having children up to the age of 11 =1), URB (medium/large town and city suburb =1). Dummies relating to the employment status are also analyzed, with the excluded characteristic for students (student= 0): EMPL (employee =1), SELF-EMPL (self-employed =1), UNEMP (unemployed =1), RETIRED (retired =1), HOME (homemaker =1). Finally, the perception of economic inequality compared to others INEQ (Likert scale 1-5) is also included.

Empirical strategy

We estimate a moderated mediation model with Hayes' PROCESS Macro (Version 4.0, released in August 2022) (Model 58) for analyzing our hypotheses relating the indirect role of QgS on WHO-5 through Institutional Trust and Trust in people. The indirect paths are estimated with the moderator Young for assessing the presence of significant differences between the 18-34 age group and those over the age of 34. This is also supported by the t-tests displayed in Table B in the supplementary file. The moderated mediation and the path diagram (Figure 1, supplementary material) are represented by the following equation models:

$$(1)\ M_{1i} = \beta_1 x_i + \beta_2 w_i + \beta_3 (x \times w)_i + Control\ variables_i$$

$$(2)\ M_{2i} = \beta_1 x_i + \beta_2 w_i + \beta_3 (x \times w)_i + Control\ variables_i$$

$$(3)\ Y_i = \beta_1 x_i + \beta_2 w_i + \beta_4 M_{1i} + \beta_5 M_{2i} + \beta_6 (M_1 \times w)_i + \beta_7 (M_2 \times w)_i + Control\ variables_i$$

Whereas x_i is represented by the variable QgS, M_{1i} and M_{2i} indicate, respectively, the mediators of Institutional Trust and Trust in People, adopted as dependent variables in the equation (1) and (2) and then, as regressors in equation (3). The dependent variable Y_i in the equation (3) is identified by WHO-5; w is the moderator identified by the dummy Young. To estimate the moderation effect, we consider the interaction term $(x \times w)_i$ in the equation (1)

and (2), and the interaction terms $(M_1 \times w)_i$ and $(M_2 \times w)_i$ in the equation (3). We also include controls represented by socio-demographic characteristics, variables concerning employment status, work-life balance conditions, economic distress and the perception of inequality.

3. Results

The results of our moderated mediation analysis may be outlined as follows. First, we show the impact of QgS on Trust in People and Institutional Trust (Model 1, 2), and, second, we present the results relating to the impact of QgS, through Trust in People and Institutional Trust (mediators) on *WHO-5* (Model 3). Coefficients between the mentioned variables are differentiated by the moderator Young. We also briefly comment on the control variable coefficients without carrying out an in-depth analysis with further comments.

Analysis of the quality of government support on institutional Trust (Model 1), trust in people (Model 2) and age-related differences.

First, QgS was found to be a significant and positive determinant of both Institutional trust and Trust in other people (Model 1, 2). The ability of the authorities in terms of responsiveness and reliability, and respect for fairness and integrity values are attributes with a significant impact on both trust in people and institutions.

The interaction (QgS × Young) on Institutional Trust is significant and negative, indicating that QgS was found to be a weaker determinant of institutional trust for individuals aged 18-to-34 years. This result suggests that the young people may be less involved in welfare policies and thus perceive a greater distance from the institutions, with important consequences in terms of trust in the institutions.

The 18-34 age group is also characterized by lower levels of trust in other people, as supported by the coefficient of the dichotomous variable Young (in Model 2). However, the interaction (QgS × Young), shows a positive and significant impact on Trust in People (Model 2). Although young people tend to trust other people less, QgS has a higher positive impact on Trust in People in this age group than for the over 34 age group. This result may suggest that young Europeans assign more importance to issues of fairness, transparency and integrity, that have a significant impact on trust in other people.

Implications of institutional trust and trust in people on subjective mental well-being, mediation effects and age-related differences (Model 3).

With regard to the subjective mental well-being model, the findings show that the QgS has a positive and significant impact on WHO-5: individuals who positively evaluate the overall quality of governance show higher levels of WHO-5 (Model 3). Further, institutional trust and trust in people are also dimensions that enhance individual well-being. Institutional Trust, which has a positive and significant coefficient, helps individuals to deal with economic and financial risks, while increasing the individuals' perception of control over their lives (Barrafrem et al., 2021; Roccato et al., 2021). Similarly, Trust in People is another positive and significant determinant of WHO-5.

The index of Institutional Trust is equal to -0.523, CDI = [-0.812; - 0.229], indicating that the indirect positive effect on WHO-5 produced through trust in institutions is less significant for the young population. On the other hand, the index of moderated mediation of Trust in People is equal to 0.149, CDI = [0.015; 0.293], suggesting that the indirect positive effect generated by trust in others is higher for young individuals. We examine these different paths in greater depth below.

The impact of control variables and socio-demographic characteristics on well-being (Model 3)

Women experience lower mental well-being than men. Conversely, having at least one minor child (< 12 years old), having a partner and good levels of work-life balance are all dimensions positively related to WHO-5. Individuals who are subject to conditions of economic and financial instability, present lower levels of subjective mental well-being. With respect to the occupational dummies, the retired and self-employed represent the job occupation with the highest WHO-5. The students, which represent the only work categories not considered in the model, are one of the categories with the lowest WHO-5 together with the unemployed. For reasons of brevity, we outline the control variables only in this paragraph, without carrying out an in-depth analysis with further comments.

Table 1. Regression models and Moderated Mediation on Well-Being through Trust in people and Trust in institutions

	(1)	(2)	(3)		
	Path a1: Institutional trust	Path a2: Trust in People	Path b: WHO-5		
	B (SE)	B(SE)	B(SE)	LLCI	ULCI
Independent Variable: QgS	0.428*** (0.005)	0.205*** (0.015)	1.151*** (0.130)		
Mediator 1: Institutional trust			3.185*** (0.146)		
Mediator 2: Trust in people			1.354*** (0.049)		
Moderator: Young	0.020 (0.014)	-0.275*** (0.043)	-1.788** (0.770)		
Qgs × Young	-0.034*** (0.013)	0.143*** (0.040)			
Institutional trust × Young			-1.068*** (0.353)		
Trust in people× Young			-0.137 (0.138)		
Control variables:					
EDUC	0.076*** (0.010)	0.376*** (0.029)	-0.297 (0.241)		
FEM	0.130*** (0.009)	0.058** (0.028)	-3.669*** (0.227)		
CHILD	-0.007 (0.010)	-0.005 (0.032)	0.466* (0.263)		
SPOUSE	0.042*** (0.011)	0.120*** (0.034)	1.385*** (0.282)		
WLB	0.011* (0.005)	0.261*** (0.017)	7.601*** (0.142)		
URB	-0.02*** (0.005)	0.016 (0.028)	-0.729*** (0.227)		
INEQ	-0.04*** (0.007)	0.040** (0.020)	-0.150 (0.168)		
ECO-STRESS	-0.305*** (0.007)	-0.516*** (0.022)	-4.901*** (0.183)		
EMPL	-0.181*** (0.028)	-0.338*** (0.085)	2.060*** (0.695)		
SELFEMPL	-0.278*** (0.032)	-0.385*** (0.093)	5.731*** (0.780)		
UNEMPL	-0.244*** (0.031)	-0.727*** (0.122)	-1.147 (0.764)		
RETIRED	-0.256*** (0.030)	-0.378*** (0.092)	4.732*** (0.750)		
HOME	-0.287*** (0.036)	-0.862*** (0.108)	0.419 (0.880)		
R-squared	0.346	0.098	0.282		

Index of moderated mediation on Institutional Trust	-0.529 (0.147)	-0.832	-0.237
Index of moderated mediation on Trust in people	0.146 (0.069)	0.016	0.282

Note. We included all the employment status while the excluded dummy is the Student. Standard errors are in parenthesis. *** 0.01; ** 0.05; *p 0.1

Direct and indirect paths of Trust in People and Institutions

In the following, we compare the positive indirect effects of institutional trust and trust in other people with the total effect of the QgS on WHO-5. Moreover, we differentiate the indirect effects of Trust in People and Institutional Trust on the 18-34 age group and those over 34.
By comparing the coefficients of the indirect effects of Institutional Trust and Trust in People with the total effect, the results show that these two indirect channels of trust account for more than 50% of the total effect produced by the QgS, in both age groups. This result shows that the positive effect of government support on well-being is in a large part determined by its effect of increasing trust in people and institutional trust, which, in turn, improves subjective mental well-being. Moreover, institutional trust is the major component of the indirect effect in both age groups, even if it has a greater effect on those over 34. Specifically, its indirect effect is equal to 34% of the total effect for young people and 49% for the others, with a differential of 14 percentage points. Adults over the age of 34 benefit more from the effect of institutional trust on mental well-being, induced by positive perceptions of the quality of government support. Trust in People is another dimension of trust that significantly mediates the effect of QgS, by amplifying its positive impact onWHO-5. In contrast with Institutional Trust, this type of trust accounts for a major indirect effect for young people, mediating 18% of the total effect, while in the over 34 age group, it mediates only 10% of the overall effect of government support.

Table 2. Indirect and direct paths of the Quality of Governance on Well-Being through Interpersonal and Institutional Trust

	Coefficient and Standard Error	LLCI	ULCI
Direct effect for both groups	1.151 (0.130)	0.896	1.406
Young = 1			
Indirect effect through Institutional Trust	0.834 (0.136)	0.570	1.102
Indirect effect through Trust in people	0.423 (0.065)	0.298	0.553

Total	2.417 48% Direct effect of QgS 34% Mediated effect of Institutional Trust 18% Mediated effect of Trust in people		
Young = 0			
Indirect effect through Institutional trust	1.363 (0.069)	1.228	1.500
Indirect effect through Trust in people	0.277 (0.024)	0.228	0.326
Total	2.791 41% Direct effect of QgS 49% Mediated effect of Institutional Trust 10% Mediated effect of Trust in people		

4. Discussion

This study goes beyond the usual link between good governance and economic outcomes, confirming the validity of previous research examining how the quality of institutions affects health and subjective well-being, especially in a time of emergency such as the pandemic.
Positive evaluations of the perceived QgS, relating to the responsiveness and reliability of state capabilities, integrity and equity values, such as transparent and fair rules for access to income support measures, significantly increase both trust and subjective well-being (WHO-5).
Our findings also cast light on the fact that most of the relationship between QgS and WHO-5 is mainly due to the buffer effect of trust: positive evaluations of QgS promote trust in people and in institutions which, in turn, increases subjective WHO-5. This is evidence that the role of trust is fundamental for increasing levels of subjective well-being in periods of crisis, in accordance with previous empirical research (Barrafrem et al., 2021; Roccato et al., 2021).
Finally, we find that the 18-34 age group is more influenced by the trust in other people, which accounts for a greater share of the indirect effect of QgS on WHO-5 with respect to the over 34 age group.

Although this study contributes to the literature with these novel findings, it has some limitations. The paper neglects the positive correlation between trust in institutions and trust in others: on the one hand, general trust in people can support the effectiveness of institutions and, on the other hand, institutions can condition the emergence, persistence and efficiency of trust in people, improving the situation of those in the network, without worsening that of others (Barca, 2001).

Another limitation concerns the estimated coefficients, that are interpreted as average effects and should therefore be applied with caution to specific countries. In fact, an increasing stream of literature on the reasons of compliance to Covid-19 containment and mitigation measures highlights that there are numerous variables that may differ among countries: Maloney and Taskin (2020) indicate that, for the United States, much of the decrease in mobility is due to greater awareness of risk, driven by data on contagion risk; Kantor and Kantor (2020), through a cross-sectional age, sex and race stratified survey of the general US population, point out that NPI adherence is associated with expectations and believes; in Italy the drivers of mobility responses to mitigation efforts during different restriction schemes may be the local structure of the labor market, together with other demographic factors (Gauvin et al., 2021).

5. Conclusion and implications

This paper highlights the importance of good governance, especially in times of crisis, for increasing trust in people and in institutions, and for promoting individual well-being.

We suggest theoretical and practical implications. From a theoretical point of view, the analysis expands the list of relationships mediated by the buffer role of trust both in institutions and in other people (Lee 2022; Chan et al., 2021; Ciziceno and Travaglino, 2019), underlining how this factor acts in the macro-micro dynamics of public intervention and individual well-being.

In terms of practical contribution, this study provides indications on the mechanism of functioning and transmission of public support. This highlights that governments should pay greater attention to integrity, fairness, reliability and responsiveness dimensions of welfare programmes. as they result in significantly increasing both trust in institutions and trust in other people, with important consequences on social cohesion, sense of community and positive mental health. The dimensions listed above are fundamental both in the design and in the governance of welfare measures.

Possible tools useful to enhance the integrity, fairness, reliability and responsiveness values in welfare programmes should be: long-term sustainability of public policy, continuity of the intervention, a clear and credible communication and a territorial capillarity of the service. That reinforces the perception of reliability and competence of policy makers and, in turn, a general sense of trust in the community.

Moreover, governments should design policies suitable for the needs of diverse age groups. The distance between institutions and younger age groups should be shortened through appropriate communication channels and social programmes in order to encourage civic

participation. This is of particular interest considering that growing evidence suggests that trust attitudes, like other cultural traits, persist for long periods of time (Bjornskov, 2007).

For further development, it should be helpful to promote surveys especially for the most vulnerable groups. Granular data can help to reveal important clusters of distrust, hence, in turn, better policy responses. Surveys of this kind can also foster greater perceptions of social inclusion with respect to the most marginalized groups.

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Supplementary material

Figure 1. Path Diagram of the effect of the Government Support on Subjective Well-Being through Trust in people and Institutional Trust

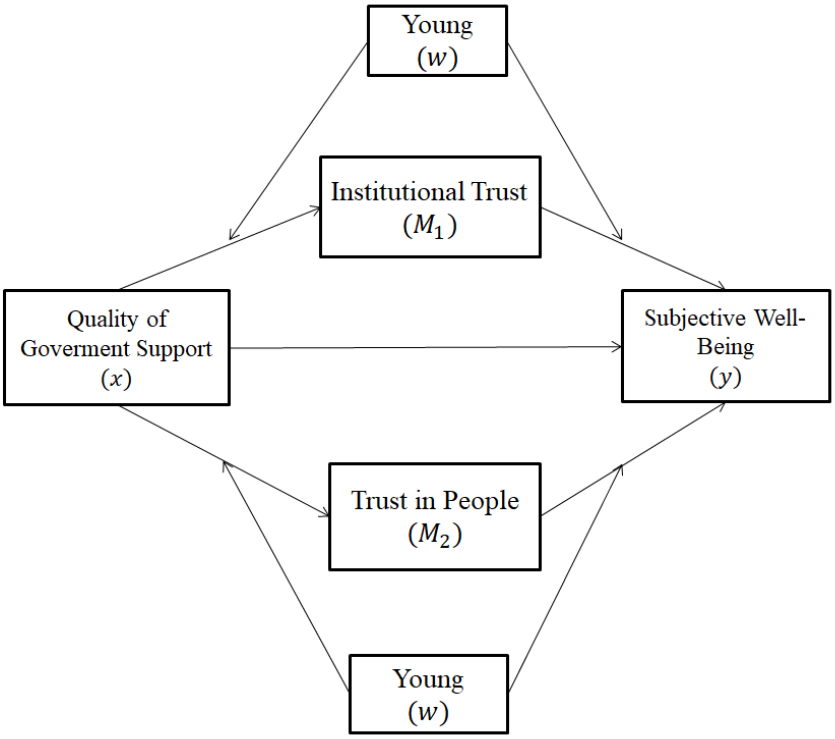

Table A. Component Loadings and Cronbach's α

Items	QgS	Institutional Trust	WLB	ECO-STRESS
The support measures are fair	0.821			
The support measures reach those who need most	0.779			
Obtaining support from public services is easy and efficient	0.747			
The rules for obtaining support are clear and transparent	0.746			
Trust in your country's government		0.872		
Trust in the healthcare system		0.843		
Trust in the police		0.835		
Trust in the European Union		0.742		

Found it difficult to concentrate on your job because of your family responsibility			0.822	
Found that your job prevents you from giving the time you wanted to your family			0.776	
Found that your family responsibilities prevented you from giving the time you should for your work			0.766	
Felt too tired after work to do some of the household jobs which need to be done			0.685	
Kept worrying about work when you were not working			0.592	
Household financial situation since three months ago				0.843
Household ability to make ends meet				0.805
Household financial situation in three months' time				0.780
Cronbach's α	0.902	0.843	0.784	0.737

Table A defines the specific items that enter each factor due to their component loadings and Cronbach's α. The first factor, the QgS, is described by the fairness, reliability, responsiveness and integrity characteristics, mentioned by OECD (2017). Second, the Institutional Trust factor comprises trust in the country's government, the healthcare system, trust in the police, and trust in the European Union. The third factor is WLB is identified by five items on the ability to balance work and family life. The last factor ECO-STRESS concerns the financial situation of the household and the degree of poverty.

Table B. T-tests on specific dimensions of QgS between the youngest and the over 34 age group

	The rules for obtaining support are clear and transparent: **Integrity dimension**	*The support measures are fair:* **Fairness dimension**	*Obtaining support from public services is easy and efficient:* **Reliability dimension**	*The support measures reach those who need most:* **responsiveness dimension**
Young group	3.47	3.65	3.75	3.74

Over 34 age group	3.51	3.70	3.75	3.75
T-test	1.929	3.058	-0.038	0.235

Notes. Original variables are expressed on a Likert scale from 1 (strongly agree) to 5 (strongly disagree). In contrast with the factor adopted in our analysis, in the original variables the highest scores indicate higher levels of dissatisfaction with each dimension of Quality of Government Support.

Table C. Composite indices from CATPCA and Internal Consistency

Factors	Total Eigenvalue	Eigenvalue first dimension	VAF	Cronbach alpha
Quality of government support (QgS)	3,092	2,970	96%	0,902
Institutional trust	2,717	2,682	99%	0,843
Work life balance	2,684	2,655	99%	0,784
Economic distress	1,967	1,915	97%	0,737

Notes. VAF (Variance Accounted For) is the ratio between the Total Eigenvalue and the Eigenvalue of the first dimension.

Table D – Correlation matrix between the main variables adopted in the moderated mediation

Variables	N	M	SD	1	2	3	4	5	6
1- Subjective well-being	46152	47,26	23,296	-					
2- Institutional trust	46628	-,0004	1,00329	,304**	-				
3- Trust in people	46210	5,11	2,556	,297**	,361**	-			
4- Quality of Government Support (QgS)	46628	,0244	,97654	,225**	,507**	,168**	-		
5- Young	46628	,15	,355	-,043**	,050**	-,008	,006	-	

Work ability of health workers: Analysis of vulnerable groups of individuals and organizational factors

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Abstract

The stress related to the recent pandemic, along with the care load and staff shortages, has created great pressure on all healthcare workers. Adequate work ability is a crucial factor in ensuring good working conditions, reducing stress and associated illnesses that lead to a deterioration in worker performance and an increased risk to patient safety. This article measures the work ability and working conditions of a sample of healthcare professionals of the university hospital of Modena through the administration of a questionnaire between 1 August 2022 and 30 September 2022, in order to evaluate the most vulnerable groups of individuals and the organizational factors associated with work ability.

Amongst workers with reduced work ability, the majority are over 45 years old and female, 52% are obese, 64% have 3 or more illnesses, 47% report having a poor work-life balance and 50% have at least one dependent adult. Work characteristics are also highlighted as relevant: supervisor support and cooperation with colleagues, autonomy in decision-making processes, participation in the improvement of work processes, possession of skills appropriate to the tasks required, are associated with high levels of work ability. Finally, nurses and nurses aides are associated with lower work ability. Emergency and medical wards are particularly critical in terms of work ability when gender and age differences are taken into account.

Keywords: Workforce aging, Work ability index, Nurses, Emergency department, Medical wards

Introduction

Work ability is defined as the balance between an individual's resources and the physical and mental demands of the job (Ilmarinen, 2009). The monitoring and measurement of work ability are of particular interest to organizations, especially those in the health sector. This interest arises from the fact that high levels of work ability contribute to the mental and physical well-being of workers (Brady et al., 2020), as well as to reduced sickness absence, lower turnover rates, delayed retirement (Sell, 2009; Tisch, 2015), improved productivity (Van Den Berg et al., 2011), and enhanced quality in the services and products provided (Brady et al., 2020; Tuomi, 2001).

In particular, a reduced work ability is correlated with mental health problems such as work-related stress and burnout episodes. This can lead to a deterioration in employee performance and, in the medical field, to an increased risk for patient safety (Ruitenburg et al., 2012).

In order to keep health care organizations healthy, it is therefore essential to protect the work ability and psychophysical health of employees.

To this end, monitoring and measuring work ability and related psycho-physical well-being indicators (e.g. BMI, presence of comorbidities) can have a twofold function: on the one hand, they can help to map 'critical' occupational categories in terms of early deterioration of work ability and health. On the other hand, a constant monitoring of these dimensions, together with a monitoring of the organizational dimensions of the hospitals (e.g. degree of work intensity, organization of working time, degree of support from superiors and colleagues) can help to understand which are the main determinants of work ability, thus suggesting intervention policies aimed at improving the health of the organization.

One of the main characteristics associated with a deterioration in work ability is certainly an increase in the age of the worker and the number of years of service. In particular, some studies show that a significant deterioration in work ability occurs after the age of 45 (Camerino et al., 2006; Tomietto et al., n.d.). However, there are also studies which show that this deterioration depends on the type of work performed, so that in certain occupations the increase in age is not characterized by a strong deterioration in the ability to work (Costa & Sartori, 2007).

For example, in the healthcare sector, job tasks characterized by heavy physical workload, such as nurses, nursing assistants and midwives, would be subject to an early deterioration in work ability and a high incidence of musculoskeletal diseases (Amirmahani et al., 2022; Costa & Sartori, 2007; Garzaro et al., 2022).

In addition to the type of work performed and the worker's age, various studies show that the individual's resources, determined, for example, by the lifestyle adopted, are other relevant elements in influencing a person's ability to work and general health. In particular, a BMI associated with obesity, a lack of physical activity, little time for personal interests and physical and/or mental stress are associated with low work ability (Amirmahani et al., 2022; El Fassi et al., 2013; Rieker et al., 2023; Ruitenburg et al., 2012; van den Berg et al., 2008).

More recently, organizational studies have also begun to approach the study of work ability, noting, for example, that job characteristics involving physical or mental effort can worsen the ability to work if they are not accompanied by adequate 'job resources', such as support from supervisors and autonomy in the choice of work activities (McGonagle et al., 2014, 2015).

Nonetheless, practical interventions to improve work ability are still scarce and are mainly focused on individual interventions (e.g. counseling, promotion of healthy lifestyles), organizational interventions (e.g. promotion of better support, education and training programmes), and interventions to monitor employees' work ability (Söderbacka et al., 2020).

The present study focuses on a sample of healthcare professionals from the University Hospital of Modena (from here AOU - Modena), anonymously interviewed in the period 1 August - 30 September 2022 through a convenience sampling, which allowed us to collect 443 workers, corresponding approximately to the 11% of the target population.

A first contribution of this study is to point out the socio-demographic and organizational characteristics associated with reduced work ability. In particular, organizational studies have only recently turned to the study of work ability (Brady et al., 2020; Cadiz et al., 2019), so we add further insights into the working conditions that influence employees' work ability. Another issue of interest concerns the inclusion of variables related to household composition and work-life balance, which have been identified as relevant but understudied characteristics in relation to WAI (Ilmarinen, 2006; La Torre et al., 2021; Smyth et al., 2018). Finally, another important theme is the exploration of other dimensions of malaise associated with unhealthy lifestyles (e.g. being a smoker, having a poor work-life balance, working night shifts, etc.) in those departments considered particularly critical in terms of the incidence of workers with a scarce work ability.

The results are key for understanding the individual and organizational determinants of work ability, crucial elements in the development of future interventions. Furthermore, it is particularly important to identify the most vulnerable categories of workers to whom more attention should be paid in order to propose specific interventions (Burr et al., 2022).

1.Materials and methods

1.1 Sample and data collection process

443 professionals from the University Hospital of Modena (AOU - Modena) participated in the survey, representing 11% of the target population. The data collection involved employees of the AOU - Modena who underwent a medical examination between 1 August 2022 and 30 September 2022 and who voluntarily joined this study.

The questionnaire was administered online through the use of Lime Survey.

Given the way the data were collected (physical presence of participants in the hospital between survey months and voluntary adherence) we obtained a convenience sample that is not statistically representative of the entire population. Nevertheless, the comparison with the population, shows that there is a fair degree of similarity between our sample and the reference population with respect to some of the key socio-demographic characteristics (age, gender, professional role, hospital departments, see Table 1, below, for further details).

The study was conducted according to the tenets of the Declaration of Helsinki and approved by the Ethics Committee of the Greater Emilia North Area (reference number 185/2022/SPER/AOUMO SIRER ID 4136, protocol 0017051/22). Participants were informed in advance about the type of study and the objectives of this research, and they were also aware that the compilation was completely anonymous and based on their voluntary adherence.

Table 1. Socio-demographic and occupational characteristics of the sample and population

	Sample		Population	
	N	%	N	%
Total	443	11%	4217	100%
Gender				
F	363	82%	3118	74%
M	80	18%	1099	26%
Age group				
< 35	86	19%	894	21%
35-45	84	19%	1047	25%
45-55	129	29%	1163	28%
> 60	144	33%	1113	26%
Departments				
Outpatient	46	10%	221	5%

Administrative	69	16%	573	14%
Surgery	40	9%	864	21%
Medical ward	170	38%	1444	34%
Emergency	40	9%	517	12%
Health Services	78	18%	598	14%
Job role				
Physicians	78	18%	824	20%
Nurses	281	63%	2923	69%
Administratives	84	19%	470	11%

1.2 Questionnaire, work ability index and other variables

The study uses a self-report questionnaire to measure work ability in relation to a number of variables such as age, gender, household composition, job role, hospital departments, work organization. Specifically, the questionnaire consists of three sections: Section 1 includes socio-demographic questions, the Work Ability Index is measured in Section 2 and is based on the questionnaire proposed in (Tuomi et al., 1998), while Section 3 concerns working conditions and is inspired by the European Working Conditions Survey (2017) (Parent-Thirion et al., 2017).

Socio-demographic characteristics (Section 1) include gender, age groups (< 35; 35-44; 44-55; > 55), years of service (< 5, 5-15, >15), whether the person has a BMI associated with obesity type I, II, or III (BMI > 30), and the presence of specific pathologies. This section also comprises variables related to the household composition and work-life balance, such as having at least one dependent adult who is not self-sufficient, having at least a child under the age of five, perceiving a good work-life balance, and having a partner.

The Work Ability Index (Section 2) is a validated composite indicator that assesses a worker's present and future capacity to fulfill physical and mental job requirements. It yields a final score within the range of 7 to 49 points ((Rieker et al., 2023). In the following, we will assess work ability using the Work Ability Index (WAI) in two ways: on a continuous scale ranging from 7 to 49 and through categorization into two groups. These categories define work ability as follows: low work ability (WAI 7-36) or good work ability (WAI 37-49), based on the specific analysis being conducted (El Fassi et al., 2013; Ilmarinen, 2006).

Working conditions characteristics (Section 3) pertain to i) work intensification, i.e. working night shifts, shifts on public holidays, shifts of more than 10 consecutive hours; ii) work support, i.e. having good support from the supervisor and colleagues, working in a team; iii)

autonomy in defining work objectives and improving the organization/work processes within one's department or company, iiii) receiving a match between skills and required tasks.

A detailed description of the questions used in the questionnaire can be found in Table A of the Supplementary File.

Six hospital departments have been defined: outpatient, administrative, surgery, medical ward, emergency, and health services. These departments have been grouped based on the type of services they provide and the occupational risks associated with them. Specifically, occupational risks can be classified into the following types: biological risk, work-related stress, shift/night work, manual handling of patients, violence, ionizing radiation, video terminals.

The department where the risk pressure is greatest is the emergency department, which is characterized by a high risk of work-related stress, shift and night work, manual handling of patients, violence and biological risks. The medical ward is also particularly critical in terms of biological risk, shift and night work and manual handling of patients. Another area with a rather high concentration of risks is the surgery department, characterized by a high biological risk, shift and night work, manual handling of patients, and a low risk of work-related stress. The health services present a high risk of ionizing radiation and a low risk of biological and manual handling of patients. Finally, the administrative area is characterized by a high risk of video terminals, and the outpatient area by a low biological risk.

The job tasks considered cover the job role of nurses (including nurses and nurses' aides), physicians (including doctors and medical managers) and other HCW (i.e., "other healthcare workers", including, e.g., technicians and administrative). Table 2 provides a detailed description of the distribution of job roles and occupational risks among hospital departments.

Table 2. Job roles and distribution of occupational risks between departments

	Outpatient	Administrative	Surgery	Medical ward	Emergency	Health Services
Job roles						
Physicians	10 (13%)	1 (1%)	8 (10%)	28 (36%)	8 (10%)	23 (30%)
Nurses	34 (12%)	5 (2%)	31 (11%)	132 (47%)	32 (11%)	47 (18%)
Administrative	2 (2%)	63 (75%)	1 (1%)	10 (12%)	0 (0%)	8 (10%)

Total	46	69	40	170	40	78
Occupational risks						
Biological	Low	-	High	High	High	Low
Work-related stress	-	-	Low	-	High	-
Shift/night work	-	-	Yes	Yes	Yes	-
Manual patient handling	-	-	High	High	High	Low
Violence	-	-	-	-	High	-
Ionizing radiations	-	-	-	-	-	Yes
Video display terminals	-	Yes	-	-	-	-

1.3 Data analysis

SPSS version 25 was used for the data analysis. The data were evaluated by means of descriptive and inferential statistical analysis tests, using continuous and categorical variables. In particular, Pearson's chi-square test, the t-test and the one-way Anova test are used. The level of statistical significance was set at $p<0.05$.

2.Results

2.1 Sample description

The sample is mainly represented by women (82%) and by workers in the job role of nurses (63%) followed by administrative (19%) and doctors (18%). Compared to age, the distribution is rather homogeneous among the various groups considered: 19% of the sample belongs to the class of under 35, 19% to the 35-44 group, 29% to the 45-54 group and the remainder 33% to the over 55 group. In terms of departments, we note a majority of workers concentrated in the medical wards (38%), followed by health services (18%), administrative department (16%), outpatient department (10%), surgical department (9%) and emergency department (9%). Finally, 65% of the sample has a good/excellent working ability, i.e. a WAI between 37 and 49 points. It should therefore be underlined that, although the majority of the sample has a good

working ability, there still seems to be a rather significant component, greater than a third of the sample, with a poor/mediocre working ability.

This high incidence of employees with poor work ability can be attributed to several reasons. Among them, the impact of the pandemic has caused great pressure on the healthcare system, leading to a higher incidence of burnout and work-related stress. Prolonged stress can lead to an early deterioration of work ability (Ruitenburg, Frings-Dresen, and Sluiter 2012). Furthermore, some departments, such as the emergency department, are facing a labor shortage problem, whereby demands are concentrated on a reduced workforce (Pourmand et al., 2023). This increased workload may have a significant influence on work ability.

We will explore below which factors are associated with low work ability. A detailed description of the sample and the departments can be found in Tables 1 and 2.

2.2 Work Ability, individual and organizational factors

Table 3 shows that increasing age and job tenure are associated with a significant decrease in individuals with a high work ability, from 86% for the over 35 age group to 53% for the over 54 age group (p-value=0,000). Further, the incidence of employees with a high work ability is lower for women, where it is equal to 63%, with respect to men, where this percentage increases to 75% (p-value=0,047). Table 3 also points that physicians and administrators have a higher incidence of high work ability, respectively, 74% and 76%, than nurses (60%), who, on the other hand, have a significant higher incidence of employees with a low work ability (40% versus 26% for physicians and 24% for administrators, p-value=0,008). Significant differences are also found when employees have a different number of diseases and for employees with a BMI associated with obesity status, who are characterized by a low incidence of high work ability (only 48% of employees with an obesity status have a high work ability, p-value 0,000). Household workload characteristics also appear to be a relevant factor influencing work ability. In fact, the incidence of high work ability is significantly lower for employees with at least one dependent adult and for those with a poor work-life balance. For example, 71% of employees with a good work-life balance report a high level of work ability, compared to only 53% of those with a low work ability (p-value = 0.000).

It is important to emphasize that, although in Table 3 we find no difference between departments in terms of the incidence of employees with high or low work ability (p-value = 0,321), we will elaborate on this later by assessing the presence of gender and age differences within these areas and find different results.

Table 4 presents the relation between work ability and organizational conditions. The supervisor support and colleagues' collaboration are dimensions associated with an increased incidence of high work ability. In fact, in both cases, almost 70% of those with a good supervisor support and colleagues' collaboration have a good work ability (p-value=0,000, p-value =0,016). Similarly, a strong incidence of high work ability is found among those who declare having autonomy over the work goals (72%) and in the improvement of the organization and work processes (75%) (p-value=0,043; p-value=0,003). Finally, the presence of skill match is another condition associated with a highest incidence of good levels of work ability (66%) (p-value=0,018).

The main results from Tables 3 and 4 are presented in Figure 1.

Table 3. Work ability, socio-demographic characteristics, domestic workload and work-life balance

	high WAI (> 37)	low WAI (7-36)	P-value associated to Pearson's Chi-squared
Age			
< 35	74 (86%)	12 (14%)	*P-value =0,000*
35-44	61 (73%)	23 (27%)	
45-54	78 (60%)	51 (40%)	
> 54	77 (53%)	67 (47%)	
Job tenure			
< 5	101 (87%)	15 (13%)	*P-value=0,000*
5-15	58 (68%)	27 (32%)	
> 15	131 (54%)	111 (46%)	
Gender			
Men	60 (75%)	20 (25%)	*P-value=0,047*
Woman	230 (63%)	133 (37%)	
Job tasks			
Physicians	58 (74%)	20 (26%)	*P-value = 0,008*
Nurses and nurses' aides	175 (60%)	115 (40%)	
Other ACW	57 (76%)	18 (24%)	
Departments			
Outpatient	26 (57%)	20 (43%)	*P-value=0,321*
Administrative	53 (77%)	16 (23%)	
Surgery	26 (65%)	14 (35%)	
Medical wards	108 (64%)	62 (36%)	
Emergency	26 (65%)	14 (35%)	
Health services	51 (65%)	17 (35%)	
Diseases			
0	113 (94%)	7 (6%)	*P-value=0,000*
1-2	108 (82%)	23 (18%)	
> 3	69 (36%)	123 (64%)	

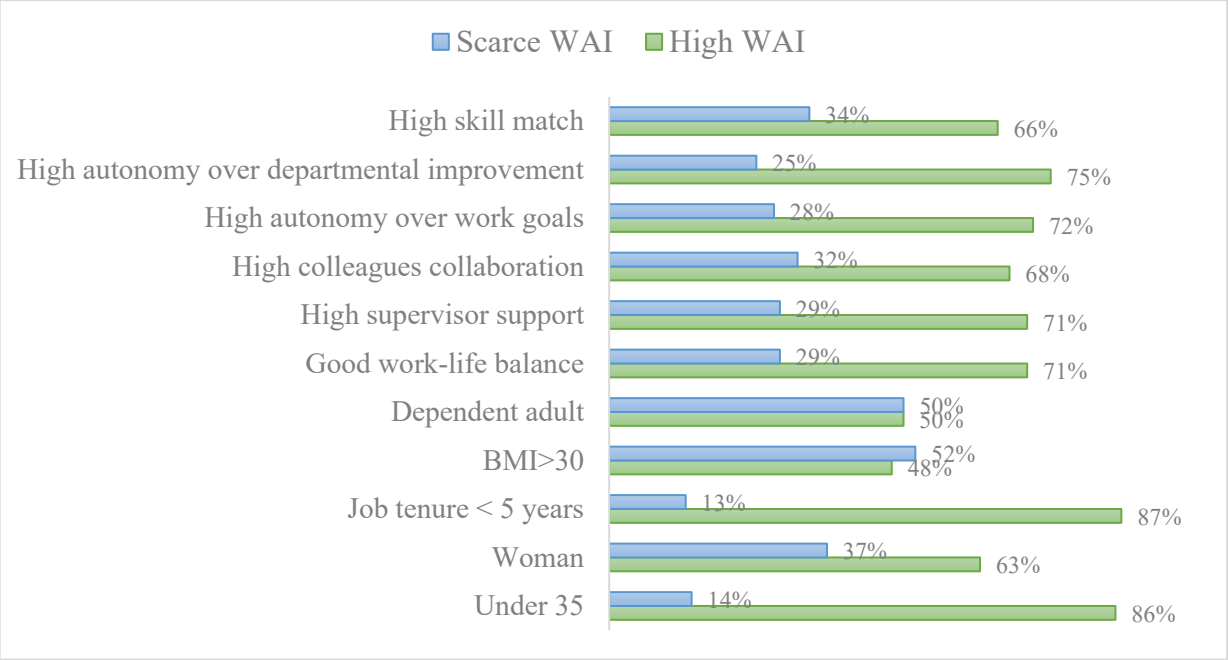
BMI > 30			
Yes	30 (48%)	32 (52%)	*P-value=0,000*
No	260 (68%)	121 (32%)	
At least one dependent adult			
Yes	55 (50%)	54 (50%)	*P-value=0,000*
No	228 (71%)	92 (29%)	
At least one child less than 5			
Yes	59 (60%)	39 (40%)	*P-value=0,215*
No	231 (67%)	114 (33%)	
Work-life balance			
Good work-life balance	218 (71%)	91 (29%)	*P-value=0,000*
Scarce work-life balance	70 (53%)	62 (47%)	
Partner			
Yes	193 (66%)	106 (34%)	*P-value=0,594*
No	94 (67%)	46 (33%)	

Table 4. Work ability and organizational characteristics

	HIGH WAI (> 37)	LOW WAI (7-36)	P-value associated to Pearson's Chi-squared
Night shifts			
Yes	91 (72%)	36 (28%)	*P-value=0,075*
No	190(63%)	113 (37%)	
Holidays shifts			
Yes	128(67%)	62 (33%)	*P-value value=0,415*
No	152(64%)	87 (36%)	
Long hours shifts (> 10 hours)			
Yes	144(73%)	52 (27%)	*P-value=0,003*
No	136(60%)	92 (40%)	
Supervisor support			
High	213(71%)	88 (29%)	*P-value=0,000*
Scarce	72 (53%)	64 (47%)	
Colleagues collaboration			
High	243(68%)	115 (32%)	*P-value=0,016*
Scarce	43 (53%)	37 (47%)	
Teamwork			
Yes	264(67%)	130 (33%)	*P-value=0,183*
No	22 (56%)	17 (44%)	
Autonomy over work goals			
High	102(72%)	39 (28%)	*P-value=0,043*

Scarce	185(62%)	111 (38%)	
Autonomy over departmental improvement			
High	114(75%)	38 (25%)	*P-value=0,003*
Scarce	175(61%)	112 (39%)	
Skill match			
No	4 (33%)	8 (67%)	*P-value=0,018*
Yes	283(66%)	144 (34%)	

Figure 1. Key organizational and socio-demographic characteristics influencing work ability



From Tables 5 and 6 we note that the medical wards and the emergency departments are those in which gender and age differences are statistically significant. Specifically, women have a lower work ability than men in the emergency department, where the average levels of WAI turn from 42 points for men to 36,5 points for women (p-value=0,002) and in the medical wards, where men have an average WAI of 39,8 points that reduces to 37 for women (p-value=0,024). On the other hand, the other departments do not register any significant gender difference, given the 5% threshold of significance selected (Table 5).

Similarly, in terms of age differences, we find that in the emergency department (p-value=0,04) and in the medical wards (p-value=0,002) at increasing age class the WAI significantly deteriorates. For instance, in the medical wards the work ability of employees less than 35 years old is almost 40 points, while this value reduces only to 35 points for the employees of the over 55 age group (Table 6).

These results suggest that the medical wards and the emergency department are those that contain the most vulnerable groups of individuals in terms of age and gender. Therefore, we continue the analysis by focusing on the work and lifestyle characteristics associated with these critical areas. Results related to Tables 5 and 6 are graphically presented in Figures 2 and 3.

Table 5. Work ability and gender differences among departments

	Men	Woman	Difference	P-value associated to T-Test
Outpatient	40,00 (7,07)	37,83 (6,81)	2,17	*P-value=0,662*
Administrative	40,52 (5,501)	39,84 (5,757)	2,76	*P-value=0,660*
Surgery	34,86 (6,094)	38,77 (5,340)	-3,91	*P-value=0,096*
Medical wards	39,88 (5,044)	37,17 (6,811)	2,71	*P-value=0,024*
Emergency	42,25 (3,696)	36,50 (6,935)	5,75	*P-value=0,002*
Health services	40,33 (5,051)	37,42 (5,394)	2,91	*P-value=0,088*

Notes. T-tests are estimated using the WAI in its scale ranging 7-49. Standard deviation is in parenthesis. The significance level is established at 5%.

Figure 2. Gender differences among departments

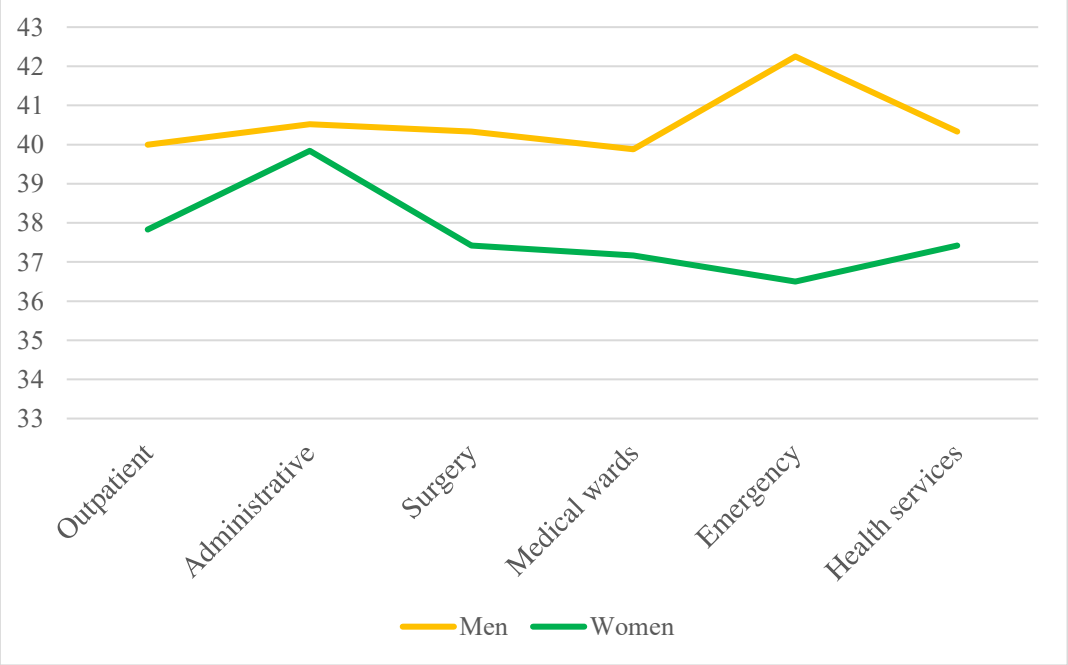
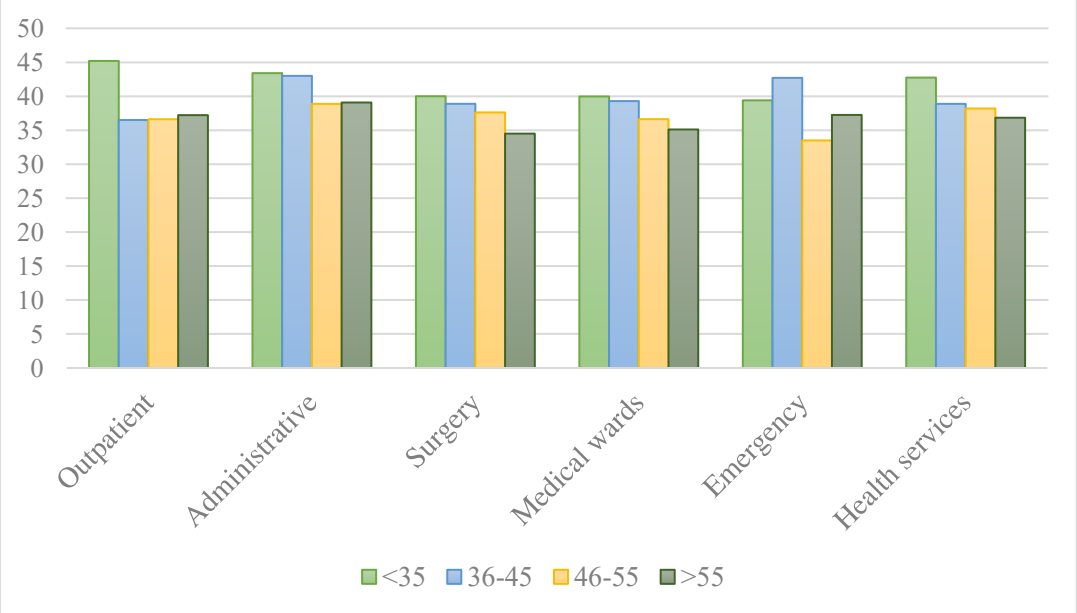


Table 6. Work ability and age differences among departments

Age	< 35	36-45	46-55	> 55	P-value associated to the Test F (one-way ANOVA)
Outpatient	45,20 (4,494)	36,50 (7,778)	36,62 (6,117)	37,22 (6,815)	*P-value=0,08*
Administrative	43,40 (3,406)	43,00 (5,292)	38,88 (6,009)	39,08 (5,415)	*P-value=0,06*
Surgery	40,00 (6,464)	38,89 (6,051)	37,62 (4,970)	34,50 (4,970)	*P-value=0,28*
Medical wards	39,97 (5,247)	39,29 (4,854)	36,63 (7,413)	35,11 (7,186)	*P-value=0,002*
Emergency	39,40 (6,423)	42,71 (5,282)	33,50 (6,279)	37,25 (6,042)	*P-value=0,040*
Health services	42,75 (2,872)	38,33 (5,821)	38,20 (4,764)	36,84 (5,606)	*P-value=0,204*

Notes. F-test and one-way anova are estimated using the WAI in its scale ranging 7-49. Standard deviation is in parenthesis. The significance level is established at 5%.

Figure 3. Work ability and age differences among departments



In the following, we focus our attention on the lifestyle and work organizations of the departments considered most critical, i.e. those where we found groups of individuals most vulnerable in terms of gender and age differences (Table 7, Figure 4).

Firstly, the medical wards and emergency departments are those in which there is a high percentage of employees with a scarce work-life balance: in the total sample, 30% of employees declare a poor work-life balance. This percentage significantly increases up to 43% for the emergency department and to 38% for the medical wards. These results are highly significant (p-value=0,001).

The highest difficulties found in balancing work-life in these areas may be linked to the greatest presence of night shifts, shifts on holidays and long shift hours. Indeed, these are dimensions found more frequently in the medical wards and emergency departments. In particular in the emergency department, where we find that 81% of employees work on holiday shifts, against an average of 44% for all the sample, and 76% work on night shifts, against an average of 29% for all the sample. These dimensions of work intensity seem to typically characterize these two departments. (p-value=0,00).

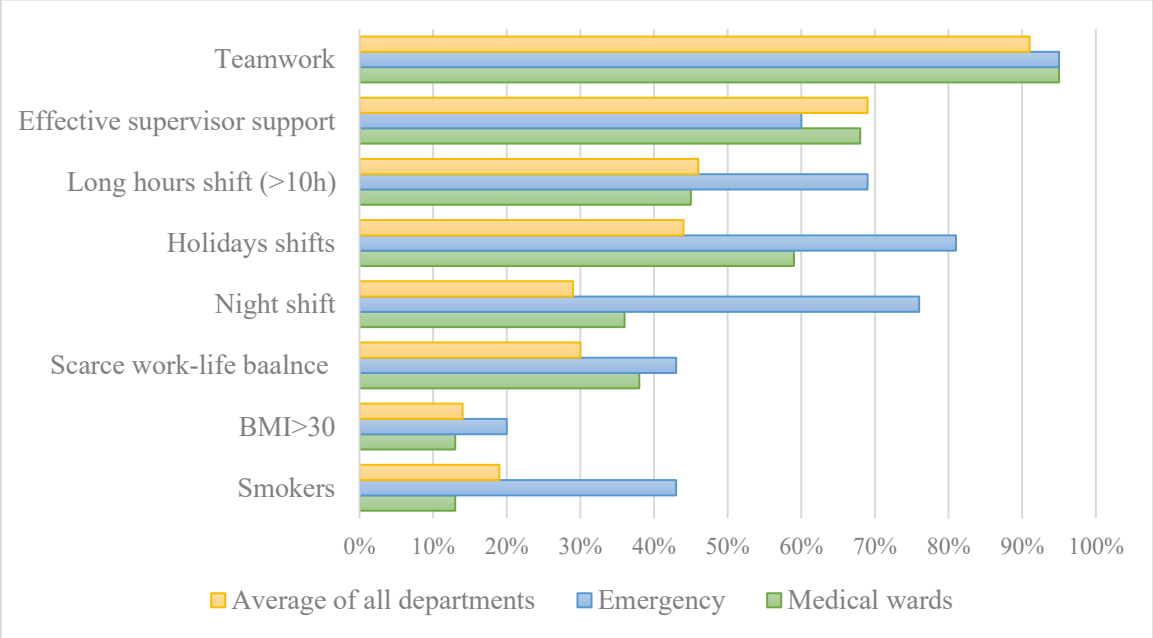
These areas are also characterized by a high presence of teamwork, as in both the departments 95% of employees declare to work in team groups (p-value=0,00). The emergency department is also characterized by a lower supervisor support, in fact, 60% of the workers in this department declare a good support, against an average of 69% in all the sample (p-value=0,00). Finally, we note that the emergency department is also characterized by 43% of smokers, against an average incidence of 19% in the total sample (p-value = 0,00). This difference may be an indicator of severe malaise and stress in this area.

Table 7. Individual and organizational characteristics: critical departments

	Medical wards	Emergency	Average of all departments	P-value associated to Pearson's chi-squared
Smoking	13% (21/168)	43% (17/40)	19% (78/436)	*p-value=0,000*
BMI >30	13% (21/170)	20% (8/40)	14% (62/443)	*p-value=0,894*
Scarce work-life balance	38% (65/169)	43% (17/40)	30% (132/441)	*p-value=0,001*
Night shifts	36% (60/166)	76% (29/38)	29% (127/430)	*p-value=0,000*
Holiday shifts	59% (96/162)	81% (30/37)	44% (190/429)	*p-value=0,000*
Long shifts (> 10H)	45% (73/161)	69% (25/36)	46% (196/424)	*p-value=,000*
Supervisor support	68% (113/167)	60% (24/40)	69% (301/437)	*p-value=0,000*

Colleagues collaboration	79% (132/168)	90% (36/40)	82% (358/438)	*p-value=0,328*
Team work	95% (159/167)	95% (37/39)	91% (394/433)	*p-value=0,000*
Autonomy to improve the organization	38% (65/170)	31% (12/39)	35% (152/439)	*p-value=0,283*
Autonomy over job goals	38% (63/168)	23% (9/39)	32% (141/437)	*p-value=0,172*
Skill match	98% (166/169)	95% (38/40)	99% (427/429)	*p-value=0,589*

Figure 4. Individual and organizational characteristics: critical departments



3. Discussion and practical implications

The analysis in Table 1 focuses on the socio-demographic characteristics associated with work ability. It emerges that the group of employees with a BMI related to an obesity status is characterized by a lower incidence of high work ability, therefore companies should promote a healthy lifestyle and facilitate opportunities for employees to exercise, either within the organization or through external agreements with sports centers and gyms (Söderbacka et al., 2020).

Age, gender and seniority at work are other characteristics that determine a differentiated distribution of work ability. Specifically, women, increasing seniority at work and age, are all categories in which the percentage of workers with a good or excellent work ability is significantly lower. We will elaborate further on the gender and age differences between the different hospital departments.

Another important issue concerns family obligations and the ability to balance the domestic and private spheres. Specifically, having a poor work-life balance and the presence of, at least, one dependent adult, are both characteristics associated with a lower incidence of high work ability. To this end, the promotion of flexible working hours, when possible, and adequate support from the supervisor, can help lighten the workload and facilitate the organization of the working time, improving work-life balance and time spent caring for non-dependent adults. Importantly, recent studies on work ability are paying more attention to the social environment and the family workload of employees, underlining the central relevance of dimensions such as work-family conflict and work-life balance, beyond personal and organizational conditions (Ilmarinen, 2019; La Torre et al., 2021; McGonagle et al., 2022; Smyth et al., 2018).

Nurses are the job roles with the lowest work ability, this may be due to the type of work activity required by this profession and the workload, which may involve considerable physical effort and emotional strain. Specifically, the higher incidence of poor work ability among nurses is supported by a great deal of evidence (Costa & Sartori, 2007; Garzaro et al., 2022; Romero-Sánchez et al., 2022; Rostamabadi et al., 2017). For instance, a recent meta-analysis claims that almost one in four nurses have inadequate work ability (Romero-Sánchez et al., 2022). It is therefore necessary to target preventive measures and interventions in this profession, which appears to be more critical than others (Romero-Sánchez et al., 2022; Rostamabadi et al., 2017). For example, regular checks on the psycho-physical health status of workers and counseling interventions are valuable tools to protect the mental well-being of nurses. Furthermore, in the case of work activities that involve physical strain and thus increase the risk of illnesses such as musculoskeletal disorders, providing adequate support in terms of work equipment and postural or physical activities would be important preventive tools.

There are also organizational interventions that can influence work ability. In particular, having good supervisor support, working in a friendly environment with collaborative colleagues, having autonomy in setting goals, participating in the improvement of the organization, and the presence of skill matches are all characteristics associated with a high incidence of good work ability.

For these reasons, managers and supervisors should try to provide adequate support to their teams, e.g. by ensuring that they provide clear and timely feedback. Also, supervisors should try to assess critical areas where there is a lack of cooperation between colleagues or where there is a mismatch of competencies, and then intervene with training courses or other tools as a further element that improves work ability.

It is also important to promote autonomy over the definition of work objectives and in the improvement of the organization and work processes, as these elements lead to a greater work ability. In fact, as found by previous works, autonomy and supervisor support are important job resources that help in dealing with work challenges (Brady et al., 2020; Kunz & Millhoff, 2023; McGonagle et al., 2015).

Another interesting element of this study concerns the identification of certain fragile employee groups. In particular, women have lower levels of work ability than men, and older individuals have lower work ability than younger ones. A novel element of this work is that, although these differences have also been noted by other works in the literature (Costa & Sartori, 2007; La Torre et al., 2021; Smyth et al., 2018), we attempt to explore them in more detail between specific departments. The analysis leads us to argue that, although these gender and age differences emerge in most hospital areas, they are only statistically significant in some of them. In relation to this point, it is argued that decreasing levels of work ability according to age group may depend on the type of profession and the workload required. In fact, work ability may remain fairly stable over the years for those professions characterized by high autonomy and low physical workload, such as physicians and biologists, while it may decrease more in professions characterized by heavy workload and low work autonomy, such as nurses (Costa & Sartori, 2007). These different effects depending on workload and work activities may vary in the hospital departments considered, thus helping to explain why these disparities are more critical in some areas than in others.

Finally, it is important to note that the departments in which we depict gender differences, at disadvantage of women, are also those in which we find significant age differences. At this point, we focus our attention on those departments characterized by these differences, that we define as “critical”, that are the emergency and medical wards.

These departments also have common characteristics that differ significantly from the other areas: in both we note a particular incidence of employees with a scarce work-life balance, that is a characteristic significantly associated with a low work ability (Table 3 and in La Torre et al., 2021; Smyth et al., 2018). The greatest difficulty in balancing work-life may be associated with the presence of night shifts, long hours shifts, holidays shifts. These are all work characteristics found with the highest incidence in these departments. Also, the emergency department registers a lower supervisor support than the other areas (Table 7), that is an element associated with a lower work ability (Table 4 and in Brady et al., 2020; McGonagle et al., 2015).

4. Conclusion

The contributions of this study are manifold. Firstly, the results suggest that certain individual characteristics are associated with poor work ability, such as increasing worker age and job tenure, the presence of specific diseases (e.g. musculoskeletal, cardiovascular, endocrine disorders), being female or having a BMI associated with obesity status.

Secondly, we shed light on a number of work resources that can contribute to improving and preventing the deterioration of WAI, including autonomy over work goals and over the departmental improvement, supervisor support and cooperation of colleagues. Furthermore, the tasks of nurses and nursing assistants are associated with lower levels of work ability.

Although the organizational conditions that influence WAI have already been assessed by the human resources discipline, the results on this topic are still at an early stage, so it is important to continue to pay attention to the more nuanced aspects related to working conditions that can improve or worsen work ability (Brady et al., 2020; Cadiz et al., 2019).

This study also focuses on aspects of the worker's social environment, in particular family composition and work-life balance. Evidence on the role of family and social networks is very scarce and recent studies suggest the need to focus more on these aspects as potential determinants of WAI (Ilmarinen, 2019; La Torre et al., 2021; McGonagle et al., 2022).

Finally, this study analyzes the presence of gender and age differences in work ability, comparing them across departments. In particular, emergency and medical departments are the areas where these differences are most pronounced. Preliminary analyses of these areas show that they are characterized by a poor work-life balance, as well as a greater presence of night shifts, holiday shifts, shifts with long hours and, in the case of the emergency department, less support from supervisors. In particular, the organizational characteristics mentioned could play a role in the worsening of work-life balance, which in turn could worsen work ability.

5. Limits and Future developments

These initial findings are useful to guide future developments in this field. In particular, future research could deeply investigate the role of socio-demographic and organizational elements that influence work ability. A further point of interest concerns the understanding of processes and ways in which the mentioned variables influence work ability, for example by investigating the presence of mediating or moderating effects. Specifically, an interesting development concerns the assessment of the presence of indirect mechanisms through which organizational dimensions such as autonomy, support or working long hours, can influence work ability through an effect on employees' work-life balance. We therefore believe that an interesting

development of this work is to assess the role of work-life balance as a possible mediator between job characteristics and work ability, particularly for women and older employees, as they are some of the most fragile categories.

However this work also has a number of limitations, including the use of a non-standardized questionnaire in the case of the section on working conditions and the socio-demographic section, the selection method for data collection, which relies on the physical presence and voluntary adherence of hospital workers during the administration of the questionnaire, and the sample size, which is relatively small for some of the departments considered, which could affect the statistical significance of our analysis across hospital departments. Finally, a critical point of this work concerns the lack of attention given to occupational risks, which are closely linked to specific hospital departments. In this respect, future studies should pay more attention to the relationship between such occupational risks and work ability.

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Supplementary file

Table A. Questionnaire and original variables

	Variables
Socio-demographic items	
Gender	0)Man 1)Woman
Age	[Number]
Bmi	[Number]
Height	[Number]
Are you a smoker?	0)No 1)Yes
Do you have a spouse/partner living in your household?	0)No 1)Yes
Are there children aged 0-5 living in your household?	0)No 1)Yes

Are there adults living with you or dependent on you in any way (e.g. art. 104)?	0)No 1)Yes
In general, how do you reconcile your working hours with family and personal commitments?	[1=Very bad; 6=Very well]
Job role:	1)Physician or healthcare manager 2) nurse, nurse's aide or other healthcare sector 3)Technical or administratives departments
Work Ability Index, dimensions	
1. The current ability to work compared to one's lifetime best	1 Variable (*General*) *"Assuming that your ability at its highest level has a value of 10, what score would you give to your current work ability?"* From 0 to 10 points, where 0 = unable to work, 10= completely able to work
2. One's ability to work in relation to the physical and mental demands of the job	2 Variables (*Physical and Mental*) - *What is your work ability in relation to the physical demands of the job?* - *What is your work ability in relation to the mental demands of the job?* From 1 to 5 points, where 1 very bad, 5 very good
3. Number of current illnesses diagnosed by a physician	1 Variable ranged 0-51 depending on the number of diseases (*Diseases*) *In the following list, please mark the diseases and/or injuries currently complained of by you; indicate whether a physician has diagnosed or treated such conditions.* List of 51 specific illnesses, where 0 means no disease.
4. Estimated reduction in ability to work due to diseases	1 Variable *(Obstacles*) *Does your health condition /illness obstruct your current work?* From 1 to 6 points, where: 1= No obstacles, 6= Competely unable to work

5. Number of days of sick leave in the past 12 months	1 Variable (*Sick_leaves*) *How many full days were you absent from work due to illness, treatment, examination, diagnostic tests in the last year (last 12 months)?* From 1 to 5 points, where 1= No days, 2=less than 10 days; 3= from 10 to 24 days; 4= from 25 to 99 days, 5= more than 100 days
6. One's prognosis of expected ability to work in two years	1 Variables (*Future_WA*) *Do you think that in relation to your current health condition you will be able to perform your current job in the next 2 years?* From 1 to 3 points, where 1=Not very likely, 3= Very likely
7. Personal resources	3 Variables: *In recent times have you been/are you able to perform your usual activities with satisfaction on a daily basis?* *Have you felt active and alert in recent times?* *Have you felt hopeful about the future in recent times?* From 1 to 5 points, where 1=Never and 5=Always

Working conditions

Supervisor and Coworker support:

Please express your degree of agreement/disagreement with the following statements:

My boss provides useful feedback to improve my work	[1=Totally disagree; 5=Totally agree]
My boss encourages and supports my development	[1=Totally disagree; 5=Totally agree]
My boss is effective in getting people to work together	[1=Totally disagree; 5=Totally agree]
My boss is helpful in carrying out daily work activities	[1=Totally disagree; 5=Totally agree]
My boss helps and supports me	[1=Totally disagree; 5=Totally agree]
My colleagues help and support me	[1=Totally disagree; 5=Totally agree]
There is good cooperation between me and my colleagues	[1=Totally disagree; 5=Totally agree]

Work intensification:

In general, in the course of your work, do you experience and how often do you…

Work under tight deadlines or deadlines	[1=Never; 4=Always]
Having to pay attention to several tasks/requests at the same time	[1=Never; 4=Always]
For a significant part of the working day not being able to distract oneself for even a moment	[1=Never; 4=Always]
Having to handle a lot of information at the same time	[1=Never; 4=Always]
Not having enough time to complete tasks/tasks	[1=Never; 4=Always]

A**utonomy/Discretion:**

As part of your work, you have the opportunity to:

Deciding objectives to be achieved in his work	[1=Never; 6=Always]
Participating in the improvement of the organization/work processes of his department or of the company	[1=Never; 6=Always]
Apply new ideas	[1=Never; 6=Always]
Influence decisions that are important for his/her work	[1=Never; 6=Always]
Taking a break when desired	[1=Never; 6=Always]
Choose/change work pace/speed	[1=Never; 6=Always]
Choose/change order and working methods	[1=Never; 6=Always]

The work ability of healthcare workers: a comprehensive overview of determinants with a focus on the mediating mechanism of work-life balance

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Abstract

The aging of the population has highlighted the need to promote sustainable employability. In this regard, work ability, which reflects the balance between personal and work demands/resources, can be a key indicator of sustainable employability, reflecting the health status of the worker. Using a sample of healthcare professionals from the Azienda Ospedaliero-Universitaria of Modena (Italy), this paper aims to i) investigate the work resources and demands that influence employees' work ability ii) investigate the role of non-work demands, iii) evaluate the role of work-life balance as a mediating mechanism, which influences the effect of work demands and resources on work ability.

The results reveal that the job resources of supervisor support and autonomy directly and positively influence work ability, whereas the demand for work intensification significantly and negatively influences work ability. Furthermore, this study finds that work-life balance is a significant mediator for different job resources (discretion, autonomy, supervisor support) and for the demand of work intensification. In particular, these results show that, while job discretion does not appear to have a direct effect on work ability, it turns out to be a significant determinant of it when the mediation mechanism is considered.

These findings have important implications regarding organizational practices that should be implemented within the workplace to promote work ability and well-being. On the one hand, it is crucial to promote a better quality of leadership, which include training programmes for supervisors and managers and mentoring programmes. Moreover, policies that positively influence work-life balance, such as the provision of flexible working arrangements, agile working, but also policies that foster greater inclusion in decision-making processes and work objectives, are particularly relevant. Finally, where possible, it is necessary to reorganize activities and job demands in order to reduce intensification, increasing rest time and limiting the overall amount of work that falls on the operator.

Keywords: work ability, work-life balance, job demands-resources model, healthcare professionals, population aging

Introduction

Governments in industrialized countries are increasing the official retirement age due to an aging working population. This is done to avoid the collapse of the pension system and to address labor shortages (United Nations, Department of Economic and Social Affairs 2017). Population aging in developed countries stems from post-World War II trends. The main factors include the influence of the baby boom generation (1946-1964), declining fertility rates and the resulting shift in age demographics. Furthermore, this aging phenomenon is powered by advances in science, improvements in health and social infrastructure, and the adoption of healthier lifestyles, all of which collectively contribute to increased life expectancy (Bal, Kooij, and Rousseau 2015). These social trends have led both academics and practitioners to focus on the concept of 'sustainable employability', which addresses the development of tools and policies, to enable workers to remain active and healthy throughout their working lives, gaining those skills required to make a valuable contribution at work (Van Der Klink et al. 2016). To promote a sustainable employability, organizations should provide structural opportunities and characteristics which help workers to maintain a healthy life and that enhances a positive attitude and motivation to work. Many authors agree that a crucial element to be analyzed for keeping a sustainable employability is the work ability of employees (La Torre et al. 2021; Smyth, Pit, and Hansen 2018; Cloostermans et al. 2015). The work ability concept was developed by Ilmarinen and Tuomi (1992) and refers to the ability of individuals to perform current and future work activities, through their physical and psychological resources, coping with work demands. Work ability is also an important criterion used for defining a "successful adjustment" in bridge employment (Bal, Kooij, and Rousseau 2015) and it is considered an important screening tool to evaluate the health of employees (Lundin et al. 2016; Bethge, Radoschewski, and Gutenbrunner 2012). This concept has been investigated through the use of a variety of indicators. Among these, one of the most commonly adopted is the "Work Ability Index" (van den Berg et al. 2008). This indicator comprises multiple dimensions, including self-reported evaluation of individuals' work ability, as well as characteristics relating individuals' state of health, such as the number of current diseases.

Work ability is an indicator of interest for both the employee and the employers. Organizations can benefit from having a high work ability among employees, since it predicts future long-term sickness absence and labor market withdrawal, such as early retirement or disability leave (Lundin et al. 2016; Tisch 2015; Sell 2009). For instance, Rashid et al. (2021) find that work ability predicts the likelihood of returning to work for women with long-term musculoskeletal

pain. Furthermore, work ability is also a significant predictor of absenteeism, job performance and productivity (van den Berg et al. 2008; Brady et al. 2020).

On the other hand, it is also in the interest of employees to maintain a good work ability, as it is a predictor of a health-related quality of life (Mokarami, Cousins, and Kalteh 2022) and work attitudes, including job satisfaction and commitment (Brady et al. 2020).

While early studies on work ability were mainly atheoretical, more recent research suggests incorporating specific theoretical frameworks to better understand the determinants of work ability and the mechanisms through which it is influenced. The Job Demands-Resources Model (rooted in the Karasek (1979) Job Demands-Control Model), was initially used to investigate burnout (Demerouti et al. 2001) and it was then applied for the first time by McGonagle et al. (2014) for studying work ability. According to this model, it is assumed that the demands of work require the use of energy and resources and, thus, negatively affect work ability. These can include physical, mental, psychosocial and emotional demands (Cadiz et al. 2019). On the other hand, work resources provide more energy and tools for the worker to cope with the pressures arising from work demands. Therefore, an increase in resources induces an increase in work ability.

Although this is a widely adopted theoretical framework, recent studies suggest incorporating more theories to better understand determinants and mechanisms through which work ability is influenced (Cadiz et al. 2019; McGonagle et al. 2022). Among these, some authors suggest incorporating the Selection, Optimization and Compensation Theory (SOC, Baltes and Baltes 1990) as a useful framework to understand work ability (McGonagle et al. 2015; Cadiz et al. 2019; Baltes and Baltes 1990). According to the SOC model, individuals can, in the course of their lives, maintain their well-being by adapting their strategies and resources to focus on optimized skills. Job resources, in particular autonomy and job control, can help individuals adopt specific strategies to achieve work goals despite age-related losses (Baltes and Baltes 1990; Cadiz et al. 2019). Furthermore, the Cognitive Appraisal Model of Work Stress has been adopted to investigate the process by which work demands and resources influence work ability (Lazarus and Folkman 1984; McGonagle et al. 2015). According to this theory, when individuals experience stressful situations without having sufficient resources to cope with them, they are subjected to strain, which, in the medium or long term, leads to a reduction in work ability.

A growing stream of literature has investigated the role of job demands and resources in influencing work ability. Specifically, job resources such as job autonomy (Cadiz et al. 2019; McGonagle et al. 2015; Pak et al. 2019), supervisor support and leadership quality (McGonagle

et al. 2015; 2014; Weber et al. 2021; Burr et al. 2022), or co-worker support, task resources and organizational climate (Cadiz et al. 2019; McGonagle et al. 2022), are all organizational features that enhance the work ability of employees. On the other hand, job demands represented by work intensification factors (Kunz and Millhoff 2023; van den Berg et al. 2008; Rostamabadi, Zamanian, and Sedaghat 2017), destructive leadership (Kunz and Millhoff 2023), or other elements such as being victims of violence (Converso et al. 2018) and verbal abuse (Marina Fischer et al. 2006), significantly reduce the work ability of employees.

Recently, however, attention has been turned to those elements that can influence the ability to work outside organizations. To this purpose, other theories have been proposed to integrate the analysis framework by including non-work demands and resources, such as the employee's family, community, or social networks. In this regard, the Conservation Of Resource Theory (COR, Hobfoll 1989) agrees that individuals' try to preserve and protect their personal resources. Nonetheless, demands arising from work and non-working spheres can generate difficulties in balancing work and life tasks, which may lead individuals to perceive the risk of losing their resources, or experiencing a net loss of resources. In this situation, individuals encounter various stressors, including role ambiguity and role conflict. A prolonged exposure to these stressors can lead to a deterioration of work ability (Hobfoll 1998; McGonagle et al., 2022). In particular, role conflict episodes arise from a poor work-life balance, when demands are too high and resources too scarce. They can lead to a worsening of malaise and a deterioration of work ability (Kahn et al. 1964; McGonagle et al. 2022).

Recent studies adopt new perspectives for investigating the work ability, such as the Work Ability House, according to which work ability depends on organizational and individual characteristics, metaphorically represented by the floors of the Work Ability House, and the external environment, represented by the family, the close community and the distant community (Ilmarinen 2019; Cadiz et al. 2019). This perspective values a holistic and comprehensive approach to studying the determinants of work ability. For example, Smyth et al.'s (2018) qualitative study of a sample of GPs finds that elements such as the close community of workers and work-life balance are significant determinants that are usually given little attention. Furthermore, the recent qualitative work of McGonagle et al. (2022) shows that non-work demands are usually under-investigated, despite playing a central role in influencing work ability. Finally, a small body of research has emphasized the fundamental importance of work-life balance in influencing work ability, highlighting the need to further investigate how this process occurs (Berglund et al. 2021; La Torre et al. 2021; Smyth, Pit, and Hansen 2018; McGonagle et al. 2022). In fact, work-life balance is not only a significant determinant of work

ability, but is also influenced by organizational conditions, such as autonomy resources, supervisor and colleague support (Rashmi and Kataria 2023; McCarthy et al. 2013; Amazue and Onyishi 2016; Baral and Bhargava 2010), or demands related to work intensity (Boxall and Macky 2014; Haar et al. 2019; Yu 2014). This suggests that work-life balance may play a mediating role, although to date no studies assess this relationship. Nevertheless, many papers evaluate the role of work-life balance as a mediator between working conditions and many work ability outcomes, such as job satisfaction, commitment, turnover intention, performance, and well-being (Nabawanuka and Ekmekcioglu 2022; Talukder and Galang 2021; Chiew, Hwa, and Teh 2018; Baral and Bhargava 2010)

This paper takes a holistic approach to investigate the work ability among a sample of healthcare professionals of the University Hospital of Modena and Reggio Emilia. The contributions of this work to the literature are of different kinds. First, it delves into the analysis of organizational characteristics, represented by work demands and resources, that influence work ability. In particular, indicators encompassing multiple aspects of working conditions are considered. Secondly, the role of non-work demands and work-life balance is explored, as little attention has been paid to this issue so far (McGonagle et al. 2022; Smyth, Pit, and Hansen 2018; Berglund et al. 2021). Third, this study investigates the mechanisms through which work-life balance may influence work ability. Specifically, work-life balance is evaluated as a mediator between working conditions and work ability, as previous empirical research suggests this relationship (Haar et al. 2019; Chiew, Hwa, and Teh 2018; McCarthy et al. 2013; Rashmi and Kataria 2023; McCarthy et al. 2013; Kumar and Mokashi 2020).

The choice of the healthcare sector is due to several reasons. Firstly, the health sector addresses citizens to preserve and promote their psychophysical health. It is of interest to the entire community to understand how to keep healthcare professionals healthy. Increased work ability promotes greater job satisfaction, work motivation and self-reported performance, which can increase the overall quality of public health services provided (Brady et al. 2020). Secondly, the health sector is typically characterized by a higher incidence of burnout and work-related stress, given the high amount of physical, psychological and emotional strain that professionals have to deal with on a daily basis (Ruitenburg, Frings-Dresen, and Sluiter 2012). Thirdly, the recent pandemic has put particular pressure on this sector, causing serious consequences on the well-being of the workforce, including post-traumatic stress disorders, depression and burnout (Stuijfzand et al. 2020; Chigwedere et al. 2021). This makes health professionals a particularly vulnerable group in which it is important to intervene in order to avoid an early deterioration of work ability.

The work is structured as follows. Section 1 presents the theoretical approaches adopted to investigate the mechanisms through which work ability is influenced by its demographic, organizational and family determinants. The empirical literature review and development of the research hypothesis are presented in Section 2, while Section 3 relates to data, methods and variables adopted for the analysis. Results are presented in Section 4 and discussed in Section 5. Finally, Section 6 covers the main conclusions of this research, practical implications, limitations and possibilities for future research.

1.Theoretical approaches to understand work ability

The Job Demands-Resources Model (JD-R), which originates from Karasek's (1979) Job Demands-Control Model, was initially used to study burnout (Demerouti et al. 2001), later McGonagle et al. (2014) proposed it to investigate the determinants of work ability in an organizational psychology framework. This model encompasses several determinants of work ability. In particular, besides individual resources, relating to physical and personality traits, it also focuses on organizational characteristics, classified as job resources and job demands.

Organizational conditions related to work demands have a negative effect on work ability, as they require the use of individual resources to be managed. Job demands include a number of job characteristics, relating to psychological, social and organizational aspects of the work environment. In this sense, they can include physical, mental, psychosocial and emotional demands (Cadiz et al. 2019).

On the other hand, job resources, such as job autonomy, coworker and supervisor support, can help in reducing the negative effect of work demands on work ability (Brady et al. 2020; McGonagle et al. 2015; Kunz and Millhoff 2023). In fact, job resources refer to all those physical, psychological, social and organizational characteristics of work activities that facilitate the achievement of goals and reduce the negative influence of work demands. Therefore, work resources are assumed to positively influence work ability (Cadiz et al. 2019).

Finally, elements relating personality characteristics and individual life-style, such as having a healthy lifestyle, a low BMI, being resilient or optimistic, are all personal resources which strictly relate to individuals and can help in preventing the negative effect of job demands (Brady et al. 2020; Cadiz et al. 2019).

The Cognitive Appraisal Model of Work Stress can be used to clarify the process by which job demands and resources influence work ability (Lazarus and Folkman 1984; McGonagle et al. 2015). According to this model, individuals evaluate stressful episodes through two cognitive appraisal processes, during the first process the worker evaluates whether the event really

represents a threat. In the case of a positive response, i.e. that the event is threatening, a second evaluation process is triggered, in which resources are invoked to deal with the problem. When these resources are not enough to deal with the problem, individuals feel strain, with negative effects on their psychophysical well-being. In that case, they may perceive that they are not sufficiently able to continue working, so a decrease in work ability may occur. According to this model, job resources have a positive effect on work ability because they facilitate the resolution of problems, tasks and activities, and they also serve to deal with job demands. In this respect, some studies consider that job resources may have a moderating role on job demands, reducing their negative effect on work ability (McGonagle et al. 2015).

Along with the JD-R Model, the Selection, Optimization and Compensation theory (SOC, Baltes e Baltes 1990) is adopted to understand strategies employed by individuals throughout life to cope with work-related goals in the face of age-related changes in individuals' resources and abilities.

The implementation of SOC strategies involves employees choosing and prioritizing work objectives that align best with their competencies. This optimization of resources and methods enables them to efficiently accomplish work tasks and objectives. In this way, they compensate for the loss of resources by employing alternative means According to this, the presence of some job resources, such as job control and autonomy, should enhance the adoption of SOC strategies, since employees have more freedom in choosing their own goals and strategies (Weigl et al. 2013).

Recent studies have emphasized the importance of including theoretical perspectives that also take into account the characteristics of the family household, the non-work demands and the work-life balance of individuals (McGonagle et al. 2022; Ilmarinen 2019; Berglund et al. 2021; Smyth, Pit, and Hansen 2018). The Resource conservation Theory (COR) proposed by Hobfoll 1989 argues that individuals seek to preserve their personal resources, which include many elements, such as time, skills and health to maintain their wellbeing. Demands can come from both the personal and work spheres. When individuals face difficulties in meeting these demands, and consequently, when they suffer from a scarce work-life balance, they may feel that their resources are threatened or reduced, leading to the incurrence of job stressors. Furthermore, additional resources are used when individuals encounter difficulties in balancing work and life roles. A net loss of resources, as well as perceptions of a threat of losing resources, generates job stressors; among these, role conflict can represent one of the possible outcomes.

In summary, the COR theory emphasizes that both work-related and non-work-related demands can influence the amount of resources individuals possess and their perception of threats to those resources. Increased demands from both work and non-work spheres impact the work-life balance of individuals, potentially worsening perceptions of threats or net loss of resources. These, in turn, have reverse effects on individuals' well-being, leading to a deterioration in work ability and increased job stressors, such as role conflict

The Role Conflict Theory is also linked to a decrease in work ability. It arises when simultaneous duties and responsibilities emerge from different roles, making compliance with one role more difficult, or even impossible, while trying to comply with the other (Kahn et al. 1964). Thus, pressures emerging from both and family spheres can make it more difficult to fulfill these dimensions. When resources are insufficient to cope with family and work demands, employees perceive conflicts between roles and, as a result, may feel unable to fully perform their work activities, resulting in reduced work ability (McGonagle et al. 2022).

Finally, the importance of taking an holistic approach in investigating work ability has been pointed out by the Work Ability House (Ilmarinen 2019; Smyth, Pit, and Hansen 2018; Cadiz et al. 2019). According to this model, the work ability is metaphorically represented by a house, where the foundation of the house, the first three floors, are represented by personal resources, including health (first floor), knowledge and skills (second floor), attitudes and behaviors (third floor). The last floor is composed of work characteristics, including job demands and resources (fourth floor). The Work Ability is represented at the roof of the house, which is the result of its foundation, the four floors, but also the external environment. In fact, the Work Ability House comprises the close environment, represented by the household's characteristics, as well as distal environment, represented by the society and culture in which individuals live. The work environment and the different floors interact with each other and influence the work ability. The Work Ability House is the most comprehensive model to study work ability, since it includes a multitude of factors in a dynamic process. Nonetheless, the theoretical frameworks presented can all be included in this conceptual model, since they help us to identify how working conditions, family characteristics and work-life balance interact with each other and influence the work ability.

2. Empirical literature review and research hypothesis development

Initially, the work ability was mainly investigated by occupational medicine and ergonomics disciplines, with a strong focus on individual health-related characteristics and lifestyle. In this regard, many contributions agree in supporting that work ability is positively influenced by

high intensity training (Calatayud et al. 2022), physical activity, health eating and non-smoking habits (Grimani, Aboagye, and Kwak 2019; Cadiz et al. 2019; Rieker et al. 2023), having an active social life (Rieker et al. 2023; Mokarami, Kalteh, and Marioryad 2020). On the other hand, a scarce sleep quality (Marina Fischer et al. 2006; Mokarami, Kalteh, and Marioryad 2020), having an high BMI (Marina Fischer et al. 2006; van den Berg et al. 2008; Rostamabadi, Zamanian, and Sedaghat 2017), reported disease and musculoskeletal disorders (Amirmahani et al. 2022; El Fassi et al. 2013), lack of leisure time (van den Berg et al. 2008), are all characteristics negatively associated with work ability. In relation to age, empirical studies provide different conclusions, since some work note that increasing age is associated to a deterioration of work ability (El Fassi et al. 2013; van den Berg et al. 2008), other find a nonsignificant relation (Marzuca-Nassr et al. 2021), while someone suggest that a negative relation between increasing age and work ability is found only in specific job roles, characterized by high physical efforts and low job autonomy, such as nurses or blue collar (Costa and Sartori 2007; Garzaro et al. 2022).

With the increasing attention of the organizational psychology and human resources disciplines to work ability, many contributions have begun to focus on the organizational determinants. Among job resources, job control and supervisor support are the most frequently mentioned as significant predictors of work ability (Cadiz et al. 2019; McGonagle et al. 2015; Pak et al. 2019; McGonagle et al. 2014). Recent studies emphasize the key role of leadership quality and highlight the need to further study this aspect (Kunz and Millhoff 2023; Weber et al. 2021).

For instance, the work of Burr et al. (2022) highlights that working conditions related to leadership quality, opportunities for development and job control are important for improving the work ability of the most vulnerable groups of the population. Other job resources which positively influence work ability are skill discretion (McGonagle et al. 2014; Pak et al. 2019), co-worker support, task resources and organizational climate (Cadiz et al. 2019; McGonagle et al. 2022).

On the other hand, job demands are supposed to have a negative effect on work ability. Kunz and Millhorf (2023), using a composite indicator of work demands, comprising aspects such as time pressure, work interruption, hiding feelings, find that these elements significantly reduce work ability. Other characteristics has been considered, such as increased workload (Rostamabadi, Zamanian, and Sedaghat 2017; van den Berg et al. 2008), destructive leadership (Kunz and Millhoff 2023), thermal discomfort (Marina Fischer et al. 2006), being victims of violence (Converso et al. 2018) and verbal abuse (Marina Fischer et al. 2006). All of these elements present significant adverse effects on work ability. Focusing on psychosocial work

demands, lack of autonomy, poor management and high mental demands result in a negative influence on work ability (van den Berg et al. 2008). Some studies focus on work schedule, in particular on the influence of shift work, which seems to have an adverse effect on work ability. In fact, shift work can have a negative effect on psychophysical rhythms and social relationships, which can lead to a deterioration of individuals' ability to work (Costa and Sartori 2007; Pak et al. 2019). Interestingly, the study of McGonagle et al. (2015) found that resources are the strongest predictor of work ability, whereas job demands seem to have a non-significant effect on work ability in the short time frame. Conversely, if a longer time span is considered, the negative effect of job demands on work ability turns out to be significant. According to them, the negative effect of job demands can manifest itself more strongly in the medium or long term, as the persistence of specific demands over time can trigger a strain process that induces a deterioration of work ability.

In this study, several job resources are considered, including supervisor support, work autonomy and discretion.

Specifically, it is important to distinguish between job discretion, which pertains to the possibility of choosing when, where, and how to perform work tasks (Albano et al. 2018; Curzi, Fabbri, and Pistoresi 2020), and job autonomy, which, instead, refers to the freedom and self-governance an employee has in carrying out tasks and responsibilities. In other words, job discretion allows individuals to determine the methods, timing and means of performing tasks, seeking to achieve predetermined goals within the confines of established guidelines and policies. Autonomy, on the other hand, entails a higher level of freedom and responsibility to make significant work-related decisions that impact on processes, organizational structures and the fundamental rules governing activities (Curzi, Fabbri, and Pistoresi 2020).

According to the JD-R model (Demerouti et al. 2001), these resources should positively influence work ability as they facilitate the achievement of assigned tasks and goals, reducing adverse effects generated from job demands. Furthermore, according to SOC theory (Baltes e Baltes 1990), autonomy and discretion should enable the employee to choose goals and strategies that better match with his or her skills and capabilities. This should enable the employee to optimize energies and to compensate for any lack of resources related to the individual's lifespan.

H1A: The job resource of supervisor support is positively and significantly related to WAI

H1B: The job resource of work discretion is positively and significantly related to WAI

H1C: The job resource of work autonomy is positively and significantly related to WAI

H1D: The job resource of coworker support is positively and significantly related to WAI

In relation to work demands, this study includes the dimension of work intensification, comprising a multiplicity of aspects of work intensity, such as working at tight deadlines, not having sufficient time to finish tasks, managing too much information at the same time. According to the JD-R Model (Demerouti et al., 2001) and to the Cognitive Appraisal Theory of Work Stress (Lazarus and Folkman 1984), these elements represent demands that create strain on the employee, increasing difficulties in achieving priorities and goals. The Cognitive Appraisal Theory supports the idea that specific events can generate stress in individuals, depending on how they evaluate these events. Specifically, when individuals assess a situation as a dangerous or threatening one, a second appraisal process occurs, in which they evaluate their resources in relation to the demands required. When individuals evaluate demands as too high in relation to the resources they have, they perceive stress. In the long run, this can lead to the perception of not being able to work fully, resulting in a decrease in work ability. In this perspective, an increase in job demands should lead to a deterioration of work ability. It is hypothesized, therefore, that the work intensification factor has a negative and significant effect on the work ability of employees.

H2: The job demand of work intensification is negatively and significantly related to WAI

Family and social determinants of work ability

A growing interest is addressed toward those elements which may influence the work ability and that result to be outside the organization, such as the close community in which the employee live (Smyth, Pit, and Hansen 2018), non-work demands resulting from family obligations or lack of financial resources (McGonagle et al. 2022), work-family conflict (La Torre et al. 2021), social life, network of friends and having an helpful neighborhood (Peters et al. 2018).

In fact, recent studies highlight the importance of providing a more comprehensive frame of those factors influencing work ability. These include those elements which are not closely related to the organization in which the employee works, as emphasized by the Work Ability House. According to this model, work ability is also influenced by the surrounding environment, which includes the family, the social network, the neighboring community but

also the distant environment, such as institutions, social services, infrastructure and labor market characteristics. These factors interact with the characteristics related to the organization and the individual, represented by the house floors (Ilmarinen 2019). According to this approach, elements belonging to the external environment may represent non-work demands, which are thus added to work demands, increasing the overall load of demands. Conversely, these elements may also represent additional resources and, in this second case, may help the employee to better manage the amount of tasks, duties and demands. Of course, it is also crucial to consider these factors when investigating work ability, providing a broader picture of its antecedents.

With regard to the worker's distant environment, some studies agree that the role of institutions and the legislative context of the country in which the worker lives are largely unknown and currently not taken into account, although it is intuitive to assume that the role of these elements is crucial in influencing work ability (van den Berg et al. 2008; Smyth, Pit, and Hansen 2018). The role of the close social community is also scarcely investigated, even if some studies point more attention to this topic. For instance, scarce social support outside the workplace, resulting from a small number of contacts in case of problems and absence of help from the neighborhood, are elements associated with a poor WAI (Peters et al. 2018). The close community is also important because it is linked to an individual's reputation due to the job role held. In relation to this, the close community can generate additional pressures stemming from the reputational role, as shown, for example, by Smyth et al. 's (2018) study of Australian GPs. According to their findings, the GPs interviewed felt they were recognised as public figures to the local community and this generated an increase in job demands and lack of anonymity.

Only some studies consider the role of the most close environment linked to the individual, that is represented by the family composition. In particular, it is underlined that this environment can generate personal demands from family members, and this is of course an element that should be taken into consideration when investigating the work ability (McGonagle et al. 2022; Smyth, Pit, and Hansen 2018). The work of McGonagle et al. (2022) notes that personal demands from family members, such as children or dependent adults, as well as other non-work demands, including the scarcity of financial resources, have a significant influence on work ability. In agreement with the authors, these are aspects that significantly influence perceived work ability and should be included more carefully in future studies.

The composition of the household is particularly relevant as it is related to the work-life balance of employees, which, according to some inductive studies, is also a crucial characteristic in

influencing work ability (McGonagle et al. 2022; Smyth, Pit, and Hansen 2018). In this regard, work-life balance appears to be an indirect strategy that helps individuals to preserve work ability through its effects on work and non-work demands (McGonagle et al., 2022). Also, the study of La Torre et al. (2021), that is focused on a sample of employees of a Teaching Hospital, finds a significant correlation between low work-family conflict and high work ability.
However, only a few studies investigate the relationship between work-life balance and work ability and, moreover, the mechanisms through which work-life balance influences work ability should be examined (La Torre et al. 2021; McGonagle et al. 2022; Berglund et al. 2021).
It is hypothesized that non-work demands negatively influence individuals' work ability while work-life balance positively enhances it. According to COR theory (Hobfoll 1989), increased demands, stemming from both the work and non-work environment, threaten individuals who feel they may lose their resources, generating negative effects on their well-being and ability to work. On the other hand, a good level of work-life balance means that employees can equally address resources to both private and working spheres, resulting in lower role conflict episodes. In turns, role conflicts can increase when demands from domestic and working dimensions are not fully met through the amount of resources belonging to the individual, and work-life balance is scarce. An increase in role conflicts can lead to lower levels of psychophysical well-being and a reduced work ability.
In sum, the following hypotheses are proposed:

H3: Non-work demands are significantly and negatively related to work ability

H4A: Work-life balance significantly and positively influence work ability

The impact of working conditions on work-life balance

Work-life balance is broadly defined as satisfactory functioning at work and non work spheres, without incurring in role conflicts (Clark 2001; McCarthy et al. 2013). Although this notion may seem very intuitive, some authors propose different interpretations of the meaning of balance, where some consider balance as an equal distribution of energy and time between the private and working spheres, while others emphasize more the subjective nature of assessing the presence of an effective balance. According to the latter approach, evaluations are closely linked to individual circumstances and perceptions (Kelliher, Richardson, and Boiarintseva 2019). This dimension is of particular interest, because it is part of the overall quality of work

(Drobnič 2011), and, in relation to work ability, recent studies emphasized its role as important predictor (La Torre et al. 2021; Smyth, Pit, and Hansen 2018; McGonagle et al. 2022). Although the literature indicates that work-life balance is an important determinant of work ability, it should be noted that work demands and resources also play a key role in influencing work-life balance, thus affecting overall work ability.

Job demands are supposed to generate a loss of resources, this leads to greater difficulties for employees' in balancing work and domestic spheres. According with this, it is found that higher level of work intensity, resulting from role overload and time demands (Boxall and Macky 2014), intensity of work and tight deadlines (Allan, O'Donnell, and Peetz 1999), working to frequent pressures for longer working hours (Macky and Boxall 2008), work overload and number of hours worked per week (Haar et al. 2019), increased workload and demands for equal pay (Yu 2014), are all elements related to work intensification, which negatively and significantly influence individuals' work-life balance. In this regard, demanding works cause an over utilization of resource and an energy shortage, this can lead to different negative outcomes including health problems, a scarce work ability (Demerouti et al. 2001; Cadiz et al. 2019) and a worse work-life balance (Haar et al. 2019; Macky and Boxall 2008; Omar, Mohd, and Ariffin 2015; Chiew, Hwa, and Teh 2018).

On the other hand, work resources, such as support and autonomy, should increase the individual's ability to fulfill one's self in both work and private life, improving not only individuals' work ability but also work-life balance. For instance, the study of Rashmi and Kataria (2023), carried out on a sample of nursing professionals, found that the job resources of autonomy, supervisor and colleagues support, are all significantly and positively related to work-life balance. Other studies confirm similar results, through the adoption of composite indicators of work resources, including autonomy, task significance, feedback from job (Baral and Bhargava 2010), perceived organizational support (Amazue and Onyishi 2016), having a supportive supervisor (McCarthy et al. 2013; Kumar and Mokashi 2020). These are all key elements that not only influence work ability (Cadiz et al. 2019), but also have a significant influence on work-life balance issues, as well as on other job-related outcomes, including job satisfaction, commitment and organizational citizenship behaviors (McCarthy et al. 2013; Baral and Bhargava 2010).

In synthesis, this research posits that increasing job demands negatively impact work-life balance, since their increases should create more difficulties to individuals in balancing and distributing energy and resources between domestic and working spheres, with the risk of incurring in role conflict episodes. Concurrently, job resources should improve the individual

work-life balance, since they should facilitate the achievement of tasks and duties among these two dimensions, in contrast to job demands, improving the overall balance between work and life.
Therefore, the following hypotheses are proposed:

H4B: Job resources (job autonomy, supervisor support, job discretion, colleagues support) significantly and positively influence individuals' work-life balance

H4C: Job demands (work intensification) significantly and negatively influence individuals' work-life balance

The mediating role of work-life balance

Although the mentioned empirical papers related to hypothesis (4A),(4B), (4C), suggest that work-life balance may have a mediating role between working conditions and work ability, there are no studies which test these mediating mechanisms. However**,** different studies demonstrate that work-life balance is a significant mediator between organizational conditions and work ability outcomes, including job satisfaction, well-being and performance. Applying the JD-R model, it is found that work-life balance mediates the relationship between the job resource of supervisor support and the employees' well-being (Nabawanuka and Ekmekcioglu 2022). Other studies find that work-life balance significantly mediates the relationship between supervisor support and performance (Talukder and Galang 2021), work intensification and turnover intention (Chiew, Hwa, and Teh 2018). Furthermore, the study of Baral and Bhargava (2010) find that work-family enrichment mediates the relation between the job resources of support and autonomy and several job outcomes, including job satisfaction, affective commitment and organizational citizenship behaviors. Similarly, the study of Rashmi and Kataria (2023) supports that, in a sample of nursing professionals, work-life balance mediates the relationship between multiple job resources, including job autonomy and supervisor support, and job satisfaction.
Recent studies, such as those by Samroodh et al. (2022), who examined teleworkers, and Al Dilby and Farmanesh (2023), who focused on the pandemic period, use work-life balance in sequential mediating relationships. For example, Samroodh et al. found that organizational variables such as job autonomy and perceived organizational support positively influence

employees' intention to stay, mediated by the dual channel of work-life balance and psychological capital. Similarly, Al Dilby and Farmanesh found a significant positive effect of being a good virtual leader on job satisfaction, mediated by the dual channels of trust in leaders and work-life balance.

In sum, many works among the literature find evidence that work-life balance is a significant mediator between job resources, demands and several work ability outcomes. Many of these studies rely on the JD-R framework to justify this mediating mechanism, supposing that job demands and resources can represent, respectively, hindrances or facilitators in achieving a good work-life balance. In fact, increased work demands lead to greater difficulties in balancing work and private life, reducing work-life balance. This, in turn, can increase the risk of losing one's resources, causing episodes of tension and role conflicts, which deteriorate work ability. On the other hand, increased job resources allow for a better resolution of both domestic and work duties, resulting in a better work life-balance that leads to higher levels of well-being and work ability (Hobfoll 1989; Kahn et al. 1964).

Given the mentioned theories and the findings provided in the empirical studies related to hypothesis (4A), (4B), (4C), the following assumption is developed:

H5: WLB is a significant mediator of the relationship between working conditions of job resources and job demands and work ability

3. Data, Methods and Variables

The dataset includes 443 professionals from the Azienda Ospedaliero-Universitaria di Modena (AOU-Modena) who attended a medical examination between 1 August 2022 and 30 September 2022. To participate in the study, they voluntarily completed an online questionnaire using Lime Survey. As the sample was limited to employees who were physically present and underwent a medical examination, it resulted in a convenience sample.

It is important to note that the socio-demographic characteristics of the sample are very similar to those of the entire population, as demonstrated in Table 1 of Chapter 3.

Chapter 3 provides detailed information on the questionnaire, sample description, and data collection procedure.

Methodology

As a first step in the analysis, the Categorical Analysis of Principal Components (CATPCA) was performed. This technique is suggested when the researcher wants to estimate composite indicators that originate from categorical variables. In fact, CATPCA makes it possible to discover and handle non-linear relationships and is particularly suitable when dealing with a large number of variables, as it allows the data set to be simplified by estimating latent factors (Linting et al., 2007).

In this case, this technique was directed towards the variables relating to working conditions, as these were originally likert-scale measures and, in order to avoid over parameterisation of the models and to simplify the set of variables, the adoption composite indicators comprising groups of coherent and consistent variables, as suggested by CATPCA, can be more suitable.

Specifically, the variables calculated by means of CATPCA are presented in Table 2 with their component loadings, while the eigenvalues for each factor are presented in Table 3. As selection criteria for the number of factors, eigenvalues greater than 1 (Kaiser criterion) are considered, as well as the maximization of the variance represented by the factors, which in the end was 70% of the variance of the original variables.

After estimating the working conditions through the CATPCA, the baseline models are estimated using the Work Ability Index (WAI) as dependent variables in Table 7, from Model (1) to (3). Model (1) only includes demographic variables (age, gender...), characteristics related to individuals' health (having an obesity status, being a smoker...) and characteristics related to the family composition and non-work demands (having a small child, having a dependent adult...). Model (2) also comprises the work-life balance variable, in order to evaluate the contribution of this variable to the variance accounted for in the Model. Model (3), finally, includes the factors relating the working conditions estimated through CATPCA. Specifically, these factors are divided between job resources (job autonomy, job discretion, supervisor support, coworker support) and job demands (work intensification).

As the third step of analysis, a mediation analysis is performed by adopting the work-life balance as a mediating variable (Table 8). To this aim, three different steps have been advanced.

In step (1) work-life balance (WLB) is adopted as a dependent variable, which allows to get *path a* related to the indirect effect of job demands and resources on work ability. Step (2) considers WAI as a dependent variable, while the organizational conditions and work-life

balance are included among the regressors. This allows to get the *path b* of the indirect effect, which relates to the impact of work-life balance on work ability. In step (2), it is also possible to observe the direct effect of each working condition on work ability (*path c'*).

In step (3) WAI is still adopted as dependent variables, while among the regressors only organizational variables are included, without considering the work-life balance. This provides the total effect of the organizational variables on WAI (*path c*).

In order to compute the indirect effect, for each organizational variable, *path a* is multiplied per *path b*. Then, the indirect effect can be compared with their direct effect, presented in step (2). The sum of the indirect effect (*path a* × *path b*) and the direct effect (*path c'*) is equal to the total effect (*path c*), that can be observed in step (3). The three steps of analysis are represented in the equations below. For every model, variables related to individuals' health, demographic and family characteristics are considered as control variables. The mediation model is presented in the path diagram in Figure 1, below.

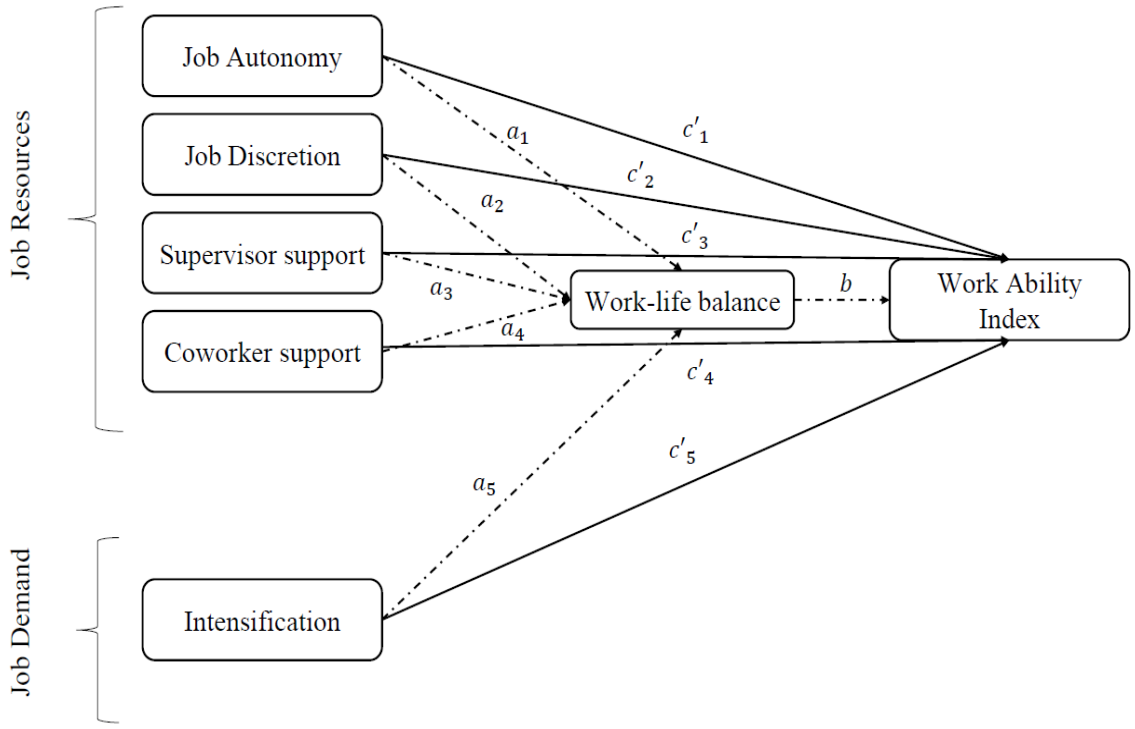
$$(1) WLB = \beta_0 + \beta_{1,..4} Job\ resources\ (Autonomy..coworker\ support) + \beta_5 Intensification + controls$$

$$(2) WAI = \beta_0 + \beta_{1,..4} Job\ resources\ (Autonomy..coworker\ support) + \beta_5 Intensification + \beta_6 WLB + controls$$

$$(3) WAI = \beta_0 + \beta_{1,..4} Job\ resources\ (Autonomy..coworker\ support) + \beta_5 Intensification + controls$$

To test the significance of the indirect effects, both Sobel Test and Monte Carlo confidence intervals have been estimated and presented in Table 9. The Sobel test is a traditional method for assessing the significance of an indirect effect in a mediation model. However, this test may have some limitations for small sample sizes, for which Monte Carlo confidence intervals may be more suitable. Specifically, the Monte Carlo method is a simulation-based approach to estimate statistical quantities by generating random samples. Monte Carlo confidence intervals provide a more robust and flexible method for assessing the significance of indirect effects, especially when assumptions of normality are not met (Sobel, M. E.,1982; MacKinnon, D. P., Lockwood, C. M., and Williams, J., 2004).

Figure 1. Path Diagram of the mediation analysis



Missing values

From the initial sample of a sample size of 443, about 22% were missing values (100 observations), so the final sample was equal to 343 employees, since missing observations are deleted. Specifically, the variables with more missing values are children with less than 5 years old (50 missing, 11% of the sample), WAI (21 missing, 5% of the sample), dependent adult (14 missing, 3% of the sample), supervisor support in daily activities (12 missing, 3% of the sample). All the other missing values for variables were in every case less than 2% of the sample. Detailed on missing values are presented in Table 1.

Table 1. Missing values

Variables	Missing	No Missing
WAI	21	422
Smoker	7	436

Shiftwork	4	439
Partner	4	439
Children	50	393
Dependent adult	14	429
Supervisor efficacy in team	7	436
Supervisor feedback to improve my work	6	337
Supervisor support in daily activities	12	431
Supervisor development	7	436
Supervisor support general	6	437
Tight deadlines	5	438
Simultaneous tasks	4	439
No distractions	4	439
Many information	8	435
No sufficient time	7	436
Unscheduled tasks	5	438
Autonomy in decision making	5	438
Autonomy over work goals	6	437
Autonomy to company improvement	4	439
Discretion in breaks	4	439
Apply your own ideas	4	439
Discretion in work pace	4	439
Discretion in work method	4	439
Colleagues collaboration	5	438
Coworker support	5	438
Work-life balance	2	441

Variables

WAI:

The Work Ability Index is a validated composite indicator that assesses a worker's present and future capacity to fulfill physical and mental job requirements. It yields a final score within the range of 7 to 49 points.

Organizational variables:

Organizational variables are divided between job resources and job demands, according to the JD-R Model (Demerouti et al. 2001; Brady et al. 2020). Variables have been estimated through the Categorical Principal Component Analysis (CATPCA) which quantify categorical data and extract latent factors that summarize the variance expressed by the quantified variables. This is an exploratory technique used to aggregate variables, particularly suitable for the present case since all the organizational variables included among factors were originally measured in likert scale.

Job Resources

Supervisor Support is a factor comprising several aspects which characterize a good leadership, such as the supervisor ability to provide feedback that improve the employee work ("*Supervisor feedback to improve my work"*), the supervisor support on the employee professional development (*"Supervisor development")*, the supervisor efficacy on making employees' working together (*"Supervisor efficacy in team"),* the supervisor helpfulness in the development of daily tasks (*"Supervisor support in daily activities"),* and an overall assessment of the supervisor's quality of support (*"Supervisor support general"*) (Eigenvalue = 6,447).

Job Autonomy comprises autonomy over work goals ("*Autonomy in work goals"),* autonomy in decision making (*"Autonomy in decision-making"),* autonomy in improving the organization (*"Autonomy to company improvement"),* having the possibility of applying new ideas to work (*"Apply your own ideas")* (Eigenvalue=1,607).

Job Discretion is composed of having the freedom in taking a pause when you want (*"Discretion in breaks"),* deciding your own pace of work (*"Discretion in work pace"),* deciding your method of work (*"Discretion in work method")* (Eigenvalue = 1,138).

Coworker Support comprises having a good support from colleagues (*"Colleagues support"*) and having a good collaboration among colleagues (*"Colleagues collaboration"*) (Eigenvalue = 1,061).

Job demands

Intensification is a job demand comprising many aspects, such as working on tight timeline (*"Tight deadlines")* , making more tasks at the same time ("*Simultaneous tasks*") , not having the possibility of taking a break during the most of the working day (*"No distractions"*),

managing many information (*"Many information"*), not having sufficient time to finish the work (*"Not sufficient time"*) , being forced to interrupt your work for unscheduled tasks (*"Unscheduled tasks"*) (Eigenvalue = 3,801).

Family compositions

Non-work demands

Children is a dummy variable equal to 1 when the worker has, at least, one child with less than 5 years old, 0 otherwise. *Dependent adult* is a dummy variable equal to 1 when the worker has, at least, one dependent adult, 0 otherwise

Other variables related to household characteristics

Partner, dummy variable =1 when the worker has a spouse or a partner, 0 otherwise. *Work-life balance*, variable in likert scale from 1 (= scarce work-life balance) to 5 (=very good work-life balance)

Control variables

Control variables relate to other work characteristics, including *Shiftwork*, =1 when the worker works in shift, =0 otherwise and *Job roles*, represented by the occupational dummies of physicians, nurses and nurse aides and administratives.

Other control variables relate to individual characteristics, such as *Female*, equal to =1 for women, *Age*, indicating the number of years, and personal resources relating individuals' lifestyle and health, including the variable *Smoker*, =1 for employees who smoke, and *Obesity*, =1 when the individual has a BMI associated to an obesity status.

Table 2. CATPCA and Rotated component loadings

	Supervisor support	Intensification	Job Autonomy	Job Discretion	Coworker support
Supervisor feedback to improve my work	**,878**	-,102	,198	,129	,119
Supervisor development	**,849**	-,070	,261	,140	,157
Supervisor efficacy in team	**,867**	-,127	,146	,140	,161
Supervisor support in daily activities	**,854**	-,084	,173	,124	,120
Supervisor support general	**,817**	-,092	,180	,089	,276

Tight deadlines	-,104	**,782**	,011	-,019	,061
Simultaneous tasks	-,146	**,797**	,149	,039	,005
No distractions	-,066	**,681**	,004	-,144	,069
Many information	-,102	**,735**	,084	,034	,095
Not sufficient time	-,009	**,775**	,028	-,017	-,098
Unscheduled tasks	,041	**,720**	,048	,041	-,260
Autonomy in work goals	,140	,134	**,765**	,019	-,091
Autonomy to company improvement	,228	,040	**,820**	,066	,076
Apply your own ideas	,283	,067	**,725**	,168	,177
Autonomy in decision-making	,164	,058	**,697**	,260	,193
Discretion in breaks	,162	-,209	-,102	**,662**	-,019
Discretion in work pace	,117	,054	,326	**,723**	,084
Discretion in work method	,185	,119	,341	**,715**	,085
Colleagues collaboration	,354	-,024	,139	,059	**,824**
Colleagues support	,332	-,016	,111	,069	**,857**

Notes. Varimax rotation

Table 3. Factors and eigenvalues

Factor	Eigenvalue	Percentage of variance accounted for
Supervisor support (1)	6,447	32%
Intensification (2)	3,801	19%
Job Autonomy (3)	1,607	8%
Job Discretion (4)	1,138	6%
Coworker support (5)	1,061	5%
Total	14,054	70%

4. Results

4.1 Preliminary results

Table 4 shows the main variables used, their specific questions and their relative summary statistics of means and frequencies.

Table 4. Questions and variables used for the analysis

Averages and standard deviations	Average	Min	Max
WAI	38.17 (6.240)	7	49
Age	46.98 (11.135)	23	67
BMI	25.02 (4.650)	16.9	45.91
In general, how do you reconcile your working hours with family and personal commitments? [1=Very bad; 6=Very well]	3.71 (0.708)	1	6
My boss helps and supports me [1=Totally disagree; 5=Totally agree]	3.81 (1.046)	1	5
My boss provides useful feedback to improve my work [1=Totally disagree; 5=Totally agree]	3.66 (1.086)	1	5
My boss encourages and supports my development [1=Totally disagree; 5=Totally agree]	3.72 (1.084)	1	5
My boss is effective in getting people to work together [1=Totally disagree; 5=Totally agree]	3.58 (1.104)	1	5
My boss is helpful in carrying out daily work activities [1=Totally disagree; 5=Totally agree]	3.57 (1.165)	1	5
Work under tight deadlines or deadlines [1=Never; 4=Always]	3.17 (0.832)	1	4
Having to pay attention to several tasks/requests at the same time [1=Never; 4=Always]	3.49 (0.715)	1	4
For a significant part of the working day not being able to distract oneself for even a moment [1=Never; 4=Always]	3.09 (0.791)	1	4
Having to handle a lot of information at the same time [1=Never; 4=Always]	3.59 (0.613)	1	4

Not having enough time to complete tasks/tasks [1=Never; 4=Always]	2.78 (0.807)	1	4
Having to interrupt to move on to other unplanned tasks [1=Never; 4=Always]	3.12 (0.835)	1	4
Deciding objectives to be achieved in his work [1=Never; 6=Always]	3.01 (1.034)	1	6
Participating in the improvement of the organization/work processes of his department or of the company [1=Never; 6=Always]	3.12 (1.110)	1	6
Influence decisions that are important for his/her work [1=Never; 6=Always]	2.83 (0.845)	1	6
Apply new ideas [1=Never; 6=Always]	2.93 (0.959)	1	6
Taking a break when desired [1=Never; 6=Always]	3.25 (0.891)	1	6
Choose/change work pace/speed [1=Never; 6=Always]	3 (0.976)	1	6
Choose/change order and working methods [1=Never; 6=Always]	2.78 (0.975)	1	6
There is good cooperation between me and my colleagues [1=Totally disagree; 5=Totally agree]	4.07 (0.778)	1	5
My colleagues help and support me [1=Totally disagree; 5=Totally agree]	3.94 (0.825)	1	5

Frequencies	**%**		
Gender [=1 for Women]	82%	0	1
Obesity [=1 for BMI>30]	14%	0	1
Are you a smoker? [=1 for “Yes”]	18%	0	1
Do you have a spouse/partner living in your household?	68%	0	1

[=1 for “Yes”]			
Are there adults living with you or dependent on you in any way? [=1 for “Yes”]	25%	0	1
Are there children aged 0-5 living in your household? [=1 for “Yes”]	22%	0	1
Physicians [=1 for “Yes”]	18%	0	1
Nurses and nurses’ aides [=1 for “Yes”]	63%	0	1
Administrative [=1 for “Yes”]	19%	0	1

Tables 5 and 6 provide an overview of the descriptive statistics comparing the population, the entire sample and the final sample without missing values. As already pointed out, this sample has a fair proportion of missing values, specifically 22% of the sample is missing. However, when comparing the descriptive statistics, it is clearly visible that most of the main characteristics, which concern the distribution across age groups, departments, job roles and gender, are still very similar to the sample of 443 employees. For instance, women still represent about 80% of the sample, the distribution across age groups is still rather homogeneous, as found in both the total sample and in the target population. The distribution between departments and job roles is almost the same between the sample without missing values and the original sample, in both cases there is a small difference from the population, where there is a higher concentration of employees in the surgery department and a lower concentration in the outpatient area. The distribution among the other departments and among job roles is very similar to that of the population.

Detailed descriptions of the questionnaire and the sample are presented in Chapter 3.

Table 5. Socio-demographic and occupational characteristics of the sample and population

	Population		Sample		Sample no missing	
	N	%	N	%	N	%
Total	4217	100%	443	100%	343	100%

Gender

F	3118	74%	363	82%	279	81%
M	1099	26%	80	18%	64	19%
Age group						
< 35	894	21%	86	19%	71	21%
35-45	1047	25%	84	19%	78	23%
45-55	1163	28%	129	29%	98	28%
> 60	1113	26%	144	33%	96	28%
Departments						
Outpatient	221	5%	46	10%	35	10%
Administrative	573	14%	69	16%	53	16%
Surgery	864	21%	40	9%	31	9%
Medical ward	1444	34%	170	38%	135	39%
Emergency	517	12%	40	9%	34	10%
Health Services	598	14%	78	18%	55	16%
Job roles						
Physicians	824	20%	78	18%	65	19%
Nurses	2923	69%	281	63%	217	63%
Administrative	470	11%	84	19%	61	18%

Table 6. Job roles and distribution of occupational risks between departments

	Outpatient	Administrative	Surgery	Medical ward	Emergency	Health Services
Job roles, N=443						
Physicians	10 (13%)	1 (1%)	8 (10%)	28 (36%)	8 (10%)	23 (30%)
Nurses	34 (12%)	5 (2%)	31 (11%)	132 (47%)	32 (11%)	47 (18%)
Administrative	2 (2%)	63 (75%)	1 (1%)	10 (12%)	0 (0%)	8 (10%)
Total	46	69	40	170	40	78
Job roles, N=343						
Physicians	9 (13%)	1 (1%)	6 (9%)	24 (37%)	8 (12%)	17 (26%)
Nurses	25 (11%)	5 (2%)	24 (11%)	104 (48%)	26 (12%)	33 (15%)
Administrative	1 (1%)	47 (77%)	1 (1%)	7 (11%)	0	5 (8%)
Total	35	53	31	135	34	55
Occupational risks						
Biological	Low	-	High	High	High	Low
Work-related stress	-	-	Low	-	High	-

Shift/night work	-	-	Yes	Yes	Yes	-
Manual patient handling	-	-	High	High	High	Low
Violence	-	-	-	-	High	-
Ionizing radiations	-	-	-	-	-	Yes
Video display terminals	-	Yes	-	-	-	-

4.2 Main results

Work ability determinants and evaluation of a moderating effects from job resources

Models (1), (2), and (3) in Table 7 progressively incorporate the variables that, according to the literature, influence work ability. Model (1) only considers socio-demographic variables. This first model shows that an increase in age is associated with a decrease in work ability. Specifically, each additional year leads to a 0.16 points decrease in work ability (p-value < 0.05).

This is largely supported by other empirical papers (Costa and Sartori 2007; El Fassi et al. 2013; van den Berg et al. 2008), although some evidence suggests that the decline in work ability due to aging depends to a large degree on the job role held and the type of tasks performed, where jobs requiring great physical effort and low autonomy should be characterized by a greater deterioration in work ability (Costa and Sartori 2007). Having a BMI associated with an obesity status is significantly correlated with a decrease in work ability (p-value < 0,10, Model 1, Table 7), this result is also confirmed by many empirical papers, according to which having a healthy lifestyle, making sport activity and eating health food are associated with higher values of work ability (Marina Fischer et al. 2006; Rostamabadi, Zamanian, and Sedaghat 2017; van den Berg et al. 2008; Rieker et al. 2023).

In relation to the type of job role, the category of nurses and nursing assistants is not included, so the coefficient for the other categories (physicians and administrative staff) refers to the latter removed from the models.

In particular, the coefficients of physicians and administrative staff are both positive and significantly higher than the nurses and nurses' assistant roles, suggesting that this last is the job occupation that suffers from the lowest work ability. This result is also supported by previous works (Garzaro et al. 2022; Costa and Sartori 2007; La Torre et al. 2021; Romero-

Sánchez et al. 2022). For example, the systematic review by Romero-Sánchez et al. (2022) points out that almost one in four nurses suffer from inadequate work ability.

Variables relating to household composition, such as having a partner or a dependent adult, seem not to be significantly related to work ability (p-value > 0,10, Model 1, Table 7). Specifically, hypothesis (3) according to which non-work demands are negatively related to work ability, can't be supported. In fact, this study considers non-work demands related to having dependent adults and young children less than 5 years old, which show a negative but non-significant impact on work ability.

The overall variability explained by these variables is 15%. Note that, in Model (2), the inclusion of the work-life balance variable alone leads the adjusted R-square to increase almost to 20%. This means that the work-life balance variable increases the explained variance of work ability by 5 percentage points more than the socio-demographic variables. Furthermore, this variable is significantly and positively related to work ability, at 1% of significance level (p-value < 0,01; Model 2, Table 7). This suggests that higher levels of work life balance improve the work ability of employees, as confirmed by other recent studies (Berglund et al. 2021; Smyth, Pit, and Hansen 2018; McGonagle et al. 2022). Therefore, it is possible to support hypothesis (4A), indicating that work-life balance has a significant and positive impact on work ability. In fact, high levels of work-life balance are achieved through a satisfactory allocation of resources between personal and professional spheres. This enhances the worker efficiency and reduces roles conflicts and stress (Hobfoll 1989; Kahn et al. 1964; McGonagle et al. 2022).

Model (3) includes organizational variables which can be divided between job resources and job demands, as suggested by the JD-R Model (Demerouti et al. 2001; Brady et al. 2020). Specifically, it includes the job resources of supervisor support, job autonomy, discretionality, coworker support and the job demand of work intensity.

Among job resources, all of them have a positive effect on work ability, although only job autonomy and supervisor support have a statistically significant effect. Specifically, job autonomy has a positive and significant impact at 1% of significant level (Model 3, Table 7), while supervisor support has a positive and significant impact on work ability at 5% of significant level (Model 3, Table 7).

It should be noted that supervisor support and autonomy have the same positive relationship with work ability, as the supervisor support factor includes a number of characteristics related to an empowering leadership style. This style is effective in helping and supporting employees' work, while also promoting employee development and teamwork by providing autonomy and

responsibility. Therefore, supportive leadership is positively correlated with greater job autonomy. This is because supportive leadership aims to empower and develop employees.

Some studies pay attention to the characteristics of leadership (McGonagle et al. 2015; 2014; Pak et al. 2019), such as Kuns and Millhoft (2023), who address the effect of destructive leadership, highlighting the importance of investigating the role of leadership in future studies. In this logic, the present results are based on a composite measure of leadership support, which encompasses a wide range of characteristics, including support for daily routine activities and features related to relationship-oriented leadership, such as support for employee development. With regard to autonomy, again a variable that comprises several characteristics is employed, including autonomy over work objectives, work processes and autonomy in decision-making, in order to capture a whole range of issues on which the employee can be autonomous.

The results are consistent with other works, according to which autonomy is particularly relevant for increasing work ability (Cadiz et al. 2019; McGonagle et al. 2015; Pak et al. 2019). Furthermore, according to SOC (Selective Optimisation, Compensation) theory, autonomy plays a key role in optimizing employees' resources. It provides them with the freedom to choose the goals in which they feel most confident and efficient. This allows employees to maximize their skills and energy, compensating for any lack in tasks or objectives in which they might not be as capable at certain stages of their lives (Baltes and Baltes 1990; Weigl et al. 2013). As mentioned before, the resources of job discretion and coworker support result to have a positive but non-significant effect, while the job demand of work intensity, which comprise several characteristics considered as intensification factors, is significantly and negatively related to work ability (p-value < 0,10; Model 3, Table 7). Many other papers consider work intensification adopting different variables and find support for this evidence (Kunz and Millhoff 2023; van den Berg et al. 2008; Rostamabadi, Zamanian, and Sedaghat 2017). In the present study, a number of characteristics are included, such as tight deadlines, insufficient time to complete the required tasks. These elements constitute demands that put pressure on workers' energies, leading to over utilization of resources. In fact, when faced with increased intensification of work tasks, individuals may evaluate a situation as dangerous or threatening to their well-being. In the case of judging that they do not have enough resources to deal with the demands arising from this situation, they experience stress, which, over time, deteriorates work ability (Lazarus and Folkman 1984).

According with these results, hypotheses (1A) and (1C), relating the positive and significant effect of the job resources of supervisor support and job autonomy can be supported, while hypotheses (1B) and (1D) can’t be supported, since skill discretion and coworker support show

a positive but non-significant effect. In relation to job demands, hypothesis (2) is supported, since work intensity has a negative and significant effect on work ability.

In sum, the overall results suggest that, in relation to working conditions, the job resources of autonomy and supervisor play a significant role in positively enhancing the work ability of employees, as supported by previous empirical research (Cadiz et al. 2019; Pak et al. 2019; McGonagle et al. 2015; 2014; Kunz and Millhoff 2023). In particular, the present research investigates these dimensions by including many aspects. In relation to leadership, several characteristics of a good leader are considered, and, with regard to job autonomy, it is evaluated by considering multiple dimensions, such as overwork goals and processes. Moreover, these results show that work intensification negatively and significantly influences work ability, consistent with previous works (Kunz and Millhoff 2023; van den Berg et al. 2008; Rostamabadi, Zamanian, and Sedaghat 2017). Work intensification is also characterized by several dimensions that contribute to 'intense' work activities, such as working under tight deadlines, handling large amounts of information at the same time.

Finally, this research emphasized the relevant role of work-life balance, which is significantly and positively related to work ability and whose inclusion discretely improves the variance explained by the model. According to suggestions for future research, the role of work-life balance should be investigated more (Berglund et al. 2021). For this reason, it is important to understand the mechanisms through which work-life balance enhances the work ability. This aspect will be investigated in detail in the subsequent paragraph.

Table 7. The Effects of Job Demands, Resources, and Work-Life Balance on Work Ability Index

	(1)	(2)	(3)
Independent variables	Y=WAI	Y=WAI	Y=WAI
Female	-1.069	-0.996	-0.738*
	(0.473)	(0.585)	(0.214)
Age	-0.158**	-0.156***	-0.163**
	(0.0243)	(0.0156)	(0.0185)
Obesity	-2.623*	-2.170*	-2.375*
	(0.630)	(0.639)	(0.692)
Smoker	0.342	0.273	0.393
	(0.951)	(0.963)	(1.028)
Physicians	2.618***	3.109***	2.562***
	(0.0331)	(0.0224)	(0.149)
Administratives	2.720***	2.244***	2.228**
	(0.187)	(0.183)	(0.365)
Shiftwork	-1.551	-0.999	-0.656

	(0.902)	(0.677)	(0.556)
Partner	0.148	0.0403	0.182
	(1.079)	(0.936)	(0.646)
Children	-0.957	-0.826	-0.888
	(0.360)	(0.527)	(0.319)
Dependent adult	-1.104	-0.815	-0.869
	(0.590)	(0.699)	(0.577)
Work-life balance		2.048***	1.445***
		(0.0934)	(0.0835)
Supervisor support			0.756**
			(0.123)
Job Autonomy			1.223***
			(0.0903)
Job Discretion			0.334
			(0.301)
Coworker support			0.738
			(0.301)
Intensification			-0.458*
			(0.117)
Constant	46.93***	38.82***	41.04***
	(0.860)	(0.257)	(0.784)
Observations	343	343	343
Adjusted R-squared	0.150	0.195	0.256

Notes. Robust standard errors clustered by job title in parentheses.
*** p-value < 0,01. ** p-value < 0,05. * p-value < 0,10.

The mediation model

Models evaluating the presence of a mediating mechanism related to the impact of job resources and demands on work ability through work-life balance are presented in Table 8.

From Model (1) it is possible to obtain the *path a* of the mediation process. Specifically, Model (1) evaluates the effect of job resources and demands on work-life balance, including socio-demographic characteristics as controls. Work-life balance (WLB) is thus adopted as a dependent variable in this first step of analysis. In Model (2) and (3) the Work Ability Index (WAI) is adopted as a dependent variable. Model (2) includes work-life balance as a regressor, in order to get the direct effect of organizational variables, while Model (3) does not include work-life balance among the independent variables, in order to get the total effect of job resources and demands on the Work Ability Index.

From Model (1), it is possible to note that the job role of physician is the one that suffers more issues related to work-life balance (p-value < 0,01), while the administrative category is the one with the best values (p-value < 0,05). Some studies agree that physicians register the worst

levels of work-life balance, finding that this is particularly strong for women physicians (La Torre et al. 2021; Treister-Goltzman and Peleg 2016). Shift work is negatively and significantly associated with work-life balance (p-value < 0,10, Model 1, Table 8), indicating that shift workers have, on average, a lower level of work-life balance than full-time workers. Surprisingly, variables relating household composition, e.g. having a partner, having at least a child less than 5 years old, having at least a dependent adult, do not register any significant impact on work-life balance (p-value > 0,10 for all these variables, Model 1, Table 8). With respect to organizational variables, only the job resources of autonomy and discretion have a significant and positive effect on work-life balance (respectively, p-value<0,05; p-value < 0,01, Model 1, Table 8), while the job resources related to supervisor support and coworker support only have a positive but non-significant effect. On the other hand, work intensification registers a significant and negative impact, meaning that higher levels of work intensity worsen the employees' work-life balance. In other words, it appears that work resources that allow for greater autonomy or discretion in the workplace play a significant role in improving the work-life balance of individuals, while support provided by a supervisor or colleagues, that register a positive effect, does not appear to be statistically significant in determining a better work-life balance. In sum, hypothesis (4B) is only partially supported, in particular, it is possible to support this hypothesis only when considering the job resources of autonomy and discretion. Previous research confirms the significant effect of autonomy on work-life balance (Rashmi and Kataria 2023), although supervisor and organizational support usually also have a significant and positive effect (Rashmi and Kataria 2023; McCarthy et al. 2013; Amazue and Onyishi 2016; Baral and Bhargava 2010). In relation to the job demand of work intensity, hypothesis (4C), according to which this job demand significantly and negatively influences work-life balance, can be supported. The negative effect of work intensity on work-life balance has also been found by previous studies (Macky and Boxall 2008; Allan, O'Donnell, and Peetz 1999; Haar et al. 2019; Yu 2014).

It is now possible to focus only on variables related to working conditions and their impact on work ability. Specifically, the total effect of job resources and demands in Model (3), where the work-life balance variable is not included, can be compared with the direct effect of organizational variables in Model (2), that also includes work-life balance among the regressors. Results are still similar to those analyzed in Table 7. A point of interest is that, for variables such as coworker support, the coefficient seems to be rather stable among Models (2) and (3), suggesting that work-life balance does not result to be a significant mediator. For other variables, such as discretion and work intensification, the coefficients register a moderate

decrease when moving from Model (3), where the total effect of them is considered, to Model (2), where only their direct effect is considered. This suggests that work-life balance may be a significant mediator for these variables. Table 9 delves deeper into this analysis.

Table 8. The mediating role of WLB in the relation between job resources, job demands, and WAI

	(1)	(2)	(3)
Independent variables	Y=WLB	Y=WAI	Y=WAI
Female	0.0284	-0.738*	-0.697*
	(0.173)	(0.214)	(0.183)
Age	-0.00265	-0.163**	-0.167**
	(0.00432)	(0.0185)	(0.0245)
Obesity	-0.198*	-2.375*	-2.662*
	(0.0505)	(0.692)	(0.696)
Smoker	0.0505	0.393	0.466
	(0.0302)	(1.028)	(1.012)
Physicians	-0.261***	2.562***	2.185***
	(0.0227)	(0.149)	(0.147)
Administrative	0.163**	2.228**	2.464**
	(0.0221)	(0.365)	(0.342)
Shiftwork	-0.199*	-0.656	-0.944
	(0.0588)	(0.556)	(0.649)
Partner	0.0703	0.182	0.284
	(0.0436)	(0.646)	(0.706)
Children	-0.0318	-0.888	-0.934**
	(0.109)	(0.319)	(0.167)
Dependent adult	-0.0806	-0.869	-0.985
	(0.0625)	(0.577)	(0.480)
Work-life balance		1.445***	
		(0.0835)	
Supervisor support	0.0519	0.756**	0.831**
	(0.0297)	(0.123)	(0.159)
Intensification	-0.159**	-0.458*	-0.688**
	(0.0173)	(0.117)	(0.108)
Job Autonomy	0.0845**	1.223***	1.345***
	(0.0149)	(0.0903)	(0.0721)
Job Discretion	0.151***	0.334	0.552
	(0.0142)	(0.301)	(0.280)
Coworker support	0.0192	0.738	0.765*
	(0.0532)	(0.301)	(0.235)
Constant	3.920***	41.04***	46.70***
	(0.209)	(0.784)	(1.293)
Observations	343	343	343

Adjusted r-squared	0.195	0.256	0.237

Notes. Robust standard errors clustered by job title in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 9 summarizes the percentage of indirect effects represented by the job resources and demands of supervisor support, autonomy, discretion, coworker support, work intensity.

Sobel's significance test and Monte Carlo confidence intervals evaluate whether the work-life balance variable plays a significant mediating role with respect to the organizational characteristics considered. It is clearly visible, as anticipated in the previous analysis, that the work-life balance results to be a significant mediator for the job resources of job discretion, job autonomy, supervisor support and for the job demand of work intensity, since both the Sobel Test and Monte Carlo confidence intervals confirm a significant effect. Nonetheless, work-life balance seems to account for a higher share of the indirect effect in the case of discretion (40%) and work intensity (33%). Therefore, having a high discretion at work seems to have a positive effect on work ability through its effect on work-life balance. Interestingly, work discretion is a variable that does not record a significant direct effect on work ability, but through this analysis it is possible to conclude that its role is also relevant in increasing the work ability of individuals, and its relevance is attributed to the mediating effect of work-life balance. In other words, although discretion does not significantly influence the work ability directly, it does so indirectly through its positive influence on work-life balance, which, in turn, has a strong impact on work ability. In particular, this indirect mechanism accounts for 40% of the total effect of discretionality. On the other hand, the negative effect of work intensification is, for a discrete share, determined by its negative impact on work-life balance. This means that higher levels of work intensification induce a significant worsening in work-life balance, which, in turn, induces a decrease in work ability. This indirect effect accounts for 33% of the total effect. In relation to job autonomy, the share for the indirect effect of work-life balance is only 9%. Nonetheless, the role of work-life balance as mediator is still significant, as confirmed by the Sobel Test and Monte Carlo intervals. This suggests that employees with more autonomy also have higher values of work-life balance, this in turn, positively impacts on their work ability. In relation to supervisor support, the share of indirect effect accounted by work-life balance in only 9% of the total effect, the significant level is relevant only at 10% of significance, suggesting that, even in this case work-life balance has a rather important role as mediator in influencing the impact of the supervisor support on work ability. The only variable in which work-life balance does not result to be a significant mediator is the job resource of coworker support.

In sum, the most relevant variables for which work-life balance covers an important role in an indirect mechanism of influence are the job resource of discretion and the job demand of work intensification. Secondly, even if in a minor measure, work-life balance is a relevant mediator for the job resources of autonomy and supervisor support. In conclusion, these results lead to the partial support of hypothesis (5): work-life balance is a significant mediator only for the job resources of discretion, autonomy and supervisor support. While it is a significant mediator for the job demand of work intensity. These results highlight the perspective provided by the Work Ability House, according to which personal and working conditions, representing the foundations of the work ability, interact with each other and with the environment outside the organization. These elements, and their interactions, determine the employees' ability to work. In fact, these findings point out that, for providing a complete perspective of the work ability determinants, it is important to consider the effect of the working conditions on other characteristics, not strictly related to the organization, such as the work-life balance of individuals. According to this approach, for example, an increase in work intensity leads to a worsening of work ability. However, this worsening is also due to the negative effect that intensification has on work-life balance. Increasing the amount of workload to the worker not only worsen its ability to work, but also its ability to manage family tasks, with negative repercussions on work-life balance that, in turn, amplify the negative impact of work intensification on work ability. On the other hand, it is possible that work resources, as in the case of discretion, do not have a significant direct effect in influencing work ability. However, when their effect is considered in relation to variables outside the organization, as in the case of work-life balance, their influence may become significant through indirect mechanisms that are activated. More discretion probably allows the employee to achieve a better work-life balance, which has a positive effect on the ability to work. Similar but smaller effects are found for the job resources of autonomy and supervisor support.

Table 9. Direct, indirect and total effects of working conditions on WAI through WLB

	Total effect	Direct effect	Indirect effect	Indirect effect	Significance testing of indirect effects P-value [confidence intervals]	
	(*path c*)	(*path c'*)	(*path a *path b*)	%	Sobel Test	Monte Carlo
Supervisor support	0.831** (0.159)	0.756** (0.123)	0,073	9%	0.076 [-0.008;0.158]	0.080 [-0.002;0.173]

Job Autonomy	1.345*** (0.0721)	1.223*** (0.0903)	0,12	9%	0.000 [0.079;0.165]	0.000 [0.081;0.174]
Job Discretion	0.552 (0.280)	0.334 (0.301)	0,22	40%	0.000 [0.172;0.264]	0.000 [0.170;0.273]
Coworker support	0.765* (0.235)	0.738 (0.301)	0,03	4%	0.712 [-0.120;0.175]	0.658 [-0.105;0.202]
Intensification	-0.688** (0.108)	-0.458* (0.117)	-0,23	33%	0.000 [-0.284;-0.175]	0.000 [-0.278;-0.171]

Notes. Confidence Intervals are at 5% significance level

5. Discussion

The results of this work adopt the perspective of the Work Ability House to provide a comprehensive overview of the determinants of work ability. This approach considers not only the organization but also elements related to the external environment. Thus, it investigates organizational characteristics, taking into account the JD-R approach, besides the SOC (Baltes and Baltes 1990) and the Cognitive Appraisal Model of Work Stress (Lazarus and Folkman 1984), as well as elements related the non-work environment and the work-life balance, integrating the JD-R model with other theories, including the COR (Hobfoll 1989) and Role Conflict (Kahn et al. 1964) theories. In sum, this research contributes to the literature on the topic of work ability in different ways. First, it provides further evidence on those organizational characteristics which can influence work ability, as theorized by the JD-R Model (Demerouti et al. 2001; Cadiz et al. 2019). Second, it evaluates the role of elements outside the work environment, still little investigated by the literature (McGonagle et al. 2022), specifically, the non-work demands related to having a small child and a dependent adult. Finally, it delves into the still-underexplored role of work-life balance (Berglund et al., 2021), testing its involvement for the first time as a mediating mechanism between job resources, job demands, and work ability. With regard to the first contribution, concerning the in-depth analysis of the organizational determinants of work ability, indicators of job resources comprising multiple aspects of autonomy, discretion, supervisor and coworker support, and the job demand of work intensity are included. The impacts of job resources are consistent with those hypothesized by the JD-R Model, even though a significant effect only for job autonomy, supervisor support, and, in some cases, for job discretion is observed. The dimension of autonomy is one of the most investigated among the job resources which influence work ability

(Cadiz et al. 2019; Pak et al. 2019). Furthermore, autonomy in the workplace is crucial as it provides individuals with greater flexibility in choosing their goals, optimizing their abilities and maximizing available resources. This process fosters greater work ability, in line with the principles of SOC theory (Baltes and Baltes, 1990). In sum, the important role of autonomy is robust, since it is validated by this work and by previous empirical papers. Human resource management departments should seek to empower employees by giving them more autonomy in setting priorities, improving organizational and work processes and promoting inclusive processes. This includes enabling workers to contribute with their ideas and participate in the decision-making processes. Another important variable is the supervisor support. Specifically, the recent study of Kunz and Millhoff (2023) highlights the need to continue investigating the effect of leadership quality on work ability. The present work responds to this request by adopting a supervisor support variable that includes many elements that indicate good quality leadership, including the ability to provide adequate and useful feedback, a relationship-oriented leadership that promotes employee development, the ability to make employees work in teams, an overall evaluation of the quality of support, and the ability to support employees in daily activities. The results confirm that high-quality leadership is a relevant element for increasing the work ability of employees. Therefore, supervisors and line managers should be trained in order to get adequate skills to provide effective leadership and support. In addition, training programmes should aim to teach supervisors and managers tools and practices to ensure greater autonomy and inclusion in decision-making processes. Thus, it is possible to support hypothesis (H1A) related to the positive and significant role of supervisor support and (H1C) related to the positive and significant role of job autonomy. Hypotheses (H1B) and (H1D) can't be supported, since both job discretion and coworker support register a positive but non-significant effect. With regard to work intensity, the results suggest that characteristics such as working under tight deadlines, handling simultaneous tasks without having sufficient time, or dealing with unscheduled tasks are all elements that may induce a strain on the worker. In particular, the worker may evaluate situations with these characteristics as dangerous or threatening in terms of the risk of resource loss. If the workers feel they do not have sufficient resources to cope with the demands, they may experience stress and decreased work ability, especially when faced with work-intensive situations over time (Lazarus and Folkman 1984). This leads to support hypothesis (2). In this regard, companies should try to avoid an excessive amount of demands over the worker, or, at least, should try to provide adequate resources so that the worker can have the instruments to deal with demands. According to these first results, the JD-R Model (Demereouti et al 2001) appears to be an adequate theoretical framework for

investigating the determinants of work ability, even if it should be integrated by other models which include non-work characteristics. Furthermore, another significant contribution of this paper is to explore the determinants of work ability beyond the work environment. Specifically, this research delves into the role of non-work demands, such as caring for children under 5 years old and having a dependent adult. The qualitative research of McGonagle et al. (2022) finds that non-work demands regarding family issues have a relevant role in influencing work ability perceptions. Nonetheless, this study only finds a negative but non-significant effect, which leads to the rejection of hypothesis (H3). Moreover, many authors suggest deepening the investigation of work-life balance, which is a still under-studied topic that seems to be particularly relevant (Berglund et al. 2021; Smyth, Pit, and Hansen 2018; La Torre et al. 2021). In this relation, a third contribution of this paper is to analyze the mechanism through which work-life balance influences the work ability of individuals. While many authors find that work-life balance has a positive and significant effect on work ability (Smyth, Pit, and Hansen 2018; Berglund et al. 2021; McGonagle et al. 2022) and that the working conditions related job demands and resources influence work-life balance (Thilagavathy and Geetha 2023; Macky and Boxall 2008; Rashmi and Kataria 2023; McCarthy et al. 2013; Haar et al. 2019), there are no studies investigating its mediating effect. Nonetheless, job resources and demands have an influence on the work-life balance of individuals. In case of increased job demands and scarce job resources, employees may face difficulties in balancing work and non-working life. Difficulties in balancing work and life spheres lead individuals to worry about their amount of resources or to experience a net loss of resources. According to the COR theory, this leads to stress reactions, including role conflicts. Facing these stressors in the long run induces individuals to believe they are not sufficiently able to perform their work well or to suffer from physical diseases arising from a prolonged imbalance between demands and resources. Thus, a decrease in work ability can occur. Hypothesis (H4A) and (H4C) are supported, while hypothesis (H4B) can only be partially supported. Specifically, according with other papers (Smyth, Pit, and Hansen 2018; Berglund et al. 2021; McGonagle et al. 2022; La Torre et al. 2021), the results of this study suggest that good levels of work-life balance positively and significantly increase the individual's work ability, supporting (H4A). Also, the job demand of work intensification has a significant and negative impact on work-life balance, supporting (H4C). This is a very intuitive relation, since higher levels of demands can cause major difficulties in balancing work and private spheres, worsening the levels of work-life balance, as found by other papers (Macky and Boxall 2008; Allan, O'Donnell, and Peetz 1999; Macky and Boxall 2008; Yu 2014), such as those of Haar et al. (2019), which find that increasing the

number of hours worked and work overload have a negative and significant effects on work-life balance. On the other hand, the results of this work partially support the hypothesis (H4B), as only the work resources of autonomy and discretion have a significant and positive effect on work-life balance. Moreover, supervisor and coworker support only have a positive but non-significant effect on work-life balance, while other work suggest a significant relation between these dimensions (McCarthy et al. 2013; Amazue and Onyishi 2016; Baral and Bhargava 2010). Finally, this work tests the mediating effect of work-life balance in relation to the working conditions considered, finding that it is a significant mediator for the job resources of autonomy, discretion, supervisor support, and for the job demand related work intensification. These results lead to a partial support of hypothesis (H5). Specifically, the variables whose impact is determined in a greater measure by their indirect effect on work-life balance are discretion, where the indirect role of work-life balance covers 40% of the total effect, and work intensity, where the indirect role of work-life balance covers 33% of the total effect. Interestingly, while discretion, in relation to the first hypothesis, seems to have a non-significant direct effect on work ability, it turns out to have a significant effect when considering its indirect path through work-life balance. In other words, discretion is also an important characteristic that should be promoted by HR departments, as higher levels of discretion allow for a better work-life balance which, in turn, promotes a higher level of work ability. On the other hand, 33 percent of the negative effect of work intensity on work ability is determined by its negative impact on work-life balance, where greater work intensity increases the amount of demands, so that individuals find it more difficult to balance work and domestic duties, which, in turn, negatively affects work ability. With regard to job autonomy and supervisor support, this study still finds a significant effect, even if the amount of indirect effect covered by work-life balance is lower, about 10% in both cases. Finally, coworker support is not mediated by work-life balance. These last results emphasized the central importance of work-life balance, not only for its direct and positive effect on work ability, but also as a significant mediator of a part of some job resources and demands. In this sense, human resource managers should seek to promote, besides autonomy and inclusion in decision-making processes, greater levers of discretion, such as greater freedom in establishing work rhythms and breaks, working hours and methods, as these elements can foster a greater work-life balance, with positive effects on work ability and general well-being.

6. Conclusions, implications and limits

The goal of this paper is to provide a holistic view of the determinants of work ability, focusing not only on the characteristics of the organization but also on non-work demands and on work-life balance, the latter of which can be considered as a bridge connecting the family and working environment (Smyth, Pit, and Hansen 2018). According to the Work Ability House Model (Ilmarinen 2019), the foundations of work ability are determined by individual resources, represented by the first three floors of the Work Ability House, and by the fourth floor, that relates to organizational dimensions. This last includes job demands and resources, the type of occupation held, the working schedule and other possible work-related features. As shown by the results, individual resources, such as having a high BMI and increasing age, are elements that can reduce work ability. Nonetheless, organizations can do many interventions for avoiding an early deterioration of work ability, specifically, human resources departments should implement policies that enables workers to have greater autonomy in selecting their work goals, this, for instance, should also facilitate the adoption of Selection, Optimization and Compensating behaviors (Baltes and Baltes 1990). Promoting inclusion in decision-making processes through teamwork, increased social activities and opportunities for sharing personal ideas on organizational improvement, are elements that promote higher autonomy, empowerment and work ability. In fact, greater autonomy requires employees to be empowered through the development of an inclusive culture that makes workers feel valued and encouraged to contribute with their own ideas, regardless of the role they hold. Besides these kinds of interventions, it is important to provide adequate training to managers and supervisors, who should have the instruments and the skills for implementing initiatives and for developing new ones. In this regard, this study supports the importance of high-quality leadership as a key element in increasing work ability. A good supervisor should be able to provide support not only in day-to-day activities, but also to encourage the development of employees, offer useful feedback to enhance work and make colleagues work together efficiently. All these elements are relevant, but, to ensure that the supervisor has all these capabilities, it is important to provide adequate training on several aspects, including mentorship abilities, conflict management and communication skills. Specifically, supervisors should implement mentorship programs to assist employees in developing new skills, gaining confidence, and becoming autonomous in achieving assigned goals. Moreover, effective supervisors should have the ability to promote a positive working environment that encourages teamwork. In this regard, conflict management and communication skills are crucial. Lastly,

an important aspect involves the leader's ability to distribute workload fairly among employees in the same role, fostering a climate of fairness and equity. On the contrary, issues of work intensification must be adequately considered in order to avoid the creation of work overload, which could lead to an early deterioration of work ability. Finally, according to the Work Ability House, elements that can influence the work ability are also found outside the organization. To this regard, the non-work demands considered by this work seem not to have a significant effect on work ability. Nonetheless, work-life balance, arising from demands in both home and work dimensions, result to be a significant factor in influencing work ability. Given its key role, especially as a mediator between specific job resources, such as discretion, autonomy and support, and the job demand associated with work intensification, it is crucial to design policies that facilitate worker balance. The influence of work-life balance is particularly strong for work discretion, that has not a significant direct effect on work ability, but significantly affects it through its positive influence on work-life balance. This means that a higher discretion is key for increasing the level of work-life balance, which, in turn, increases work ability. For this reason, human resources policies that ensure greater freedom in determining working pace, hours, breaks, instruments, and methods are crucial, as they can enhance greater discretion. This, in turn, has a significant effect on work-life balance, which subsequently influences work ability. To foster greater discretion, it is also important to introduce flexible work arrangements, through the implementation, for example, of flexible shift work through staggered start and finish times or forms of remote medical consultation. Also, leaders and supervisors should be trained for acquiring those skills necessary to manage teams with flexible work arrangements. On the other hand, the reduction of work intensification is relevant not only for its direct effect on work ability, but also for its indirect effect on work-life balance. Higher levels of job demands make it more difficult for the worker to comply with both domestic and working tasks, causing a decrease of resources, episodes of role conflict and a lower work ability. The mediating mechanism of work-life balance clearly points out the logic of the Work Ability House, according to which all the floors interact with each other and with the external environment, influencing the overall work ability. In particular, this study points out that work resources and demands can interfere with the private activities and responsibilities of individuals, creating a worsening or an improvement in work-life balance. This, in turn, influences the impacts of these working conditions on work ability. In this logic, future studies should aim to investigate the determinants of work ability by including more non-work determinants and examining the potential mediating role of work-life balance.

This work has some limitations. In particular, the nature of the dataset, being a cross section and convenience sample, makes it more difficult to draw conclusions related to causal effects. For this reason, future studies should try to investigate this mechanism by adopting a longitudinal dataset. Moreover, a limitation of the sample pertains to the presence of a fair amount of missing values, which reduces its numerosity. Therefore, it is important to test this mediation effect, as well as the role of non-work demands, on a larger sample size, which may improve the significance of some results. Finally, the mediation model may be subject to endogeneity problems arising from the bidirectional relationship between working conditions and work-life balance.

A future development of this work will evaluate a policy intervention to be implemented in the emergency departments of all hospitals in the Emilia Romagna region, including the University Hospital of Modena, in 2023-2024.

New external centers, called 'Centri di Assistenza e Urgenza' (CAU), will be established in the main provinces of the region. These centers, comprising general practitioners and medical guards, will receive patients with minor emergency codes (referred to as 'blue' or 'green'), ensuring that emergency departments within hospitals only receive severe and time-dependent emergency codes. This intervention is expected to reduce the overall workload of emergency department professionals and distinguish work activities between emergency departments and CAU. A further questionnaire will be administered to the University Hospital of Modena in order to assess whether this intervention leads to an improvement in the work ability of employees and related well-being measures.

In this context, we will use a longitudinal dataset that includes pre-intervention and post-intervention time periods. We will also use estimation techniques, such as 2SLS estimation, to address endogeneity problems.

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Conclusion and final remarks

The research focuses on evaluating methods and practices aimed at promoting a sustainable society, addressing various issues related to this overarching goal. The first chapter focuses on the issue of gender equality in decision-making, which is considered key for promoting a more sustainable society. Specifically, it seeks to evaluate the effectiveness of gender quotas in reducing the glass ceiling among boards of directors in Italian top companies. Additionally, it explores the presence of gender stereotypes that may obstruct women's career progression. Findings from this first chapter indicate, on one hand, that gender quotas serve as a crucial tool in enhancing the representation of women on boards, not only within the companies directly affected by this law but also across companies not directly influenced, thanks to the presence of horizontal spillover effects. These effects are more pronounced in the financial sector, typically characterized by a higher glass ceiling and gender stereotypes. This underscores the significant importance of this normative tool, which should also be extended to other decision-making roles, such as executive positions. In this regard, the results suggest that having women in executive positions contributes to an increased presence of women on boards. Consequently, implementing quotas for women in executive roles could potentially generate a dual spillover effect: horizontally toward companies not directly subject to quotas and vertically by fostering the increase of women in other job roles, thanks to the appointment of women executives. On the other hand, evidence suggests that the glass cliff phenomenon still exists in underperforming companies. This implies that women may face challenges in advancing their careers, as they are more likely to be appointed in precarious and demanding conditions for certain companies. Thus, to support governmental affirmative action and diversity policies, such as the introduction of gender quotas, human resources departments, supervisors, and line managers should implement inclusive policies and tools at the organizational level. These policies and tools should prevent women from leaving management roles when they find themselves in challenging positions. This can be achieved through initiatives such as mentoring programs or specific forms of social support and networking. Training programs designed to increase awareness of gender stereotype processes and collaboration among team members are also crucial. Furthermore, merit-based promotion policies can help avoid gender discrimination practices and choices based on implicit stereotypes.

The promotion of a more equitable and sustainable society is also closely linked to the prevention and promotion of citizens' well-being, particularly during periods of crisis and instability, such as the ongoing pandemic. In this context, the second chapter reveals that the significant reduction in mental health observed during the pandemic, especially among younger generations, is closely linked to a perceived inadequacy of government support measures. Negative perceptions of these measures lead to a decline in trust in both people and institutions, further exacerbating the impact on mental health. The results also affirm that trust in institutions plays a more significant role for the over-35 age group, whereas for younger generations, this mediating channel is less relevant. The findings in Chapter 2 underline the importance of the perception of government support policies in improving the overall well-being of the population. It is crucial to adhere to the principles of fairness, integrity, reliability, and responsiveness when designing support policies. Furthermore, communication channels and messages, as well as the provision of differentiated instruments and tools for diverse age groups, are other essential elements to consider. While this chapter discusses the measures taken by governments and institutions to protect citizens' mental health, the third and fourth chapters focus on the organizational levers that human resources departments can adopt to preserve employee well-being and work ability. The work ability indicator is used for promoting sustainable employability as it evaluates whether an employee's demands are balanced with the resources provided. Specifically, the focus is on the healthcare professionals of the University-Hospital of Modena (Italy). This sector is important because promoting higher work ability leads to greater employee well-being and better quality healthcare services for the community. As a result, it plays a significant role in enhancing sustainability in society. Chapter 3 has a preliminary and exploratory nature as it provides initial analysis to contextualize the results presented in Chapter 4. The latter focuses on organizational levers and other psychosocial conditions affecting work ability. The findings in Chapter 4 reveal that job resources, such as autonomy and supervisor support, can significantly improve work ability, while job demands, specifically work intensification, significantly reduce it. Furthermore, this chapter shows that work-life balance is an important mediator between certain working conditions, especially discretion and intensification. This suggests that these organizational factors affect work ability not only directly, but also through their influence on work-life balance. In this regard, the introduction of working practices that enhance greater discretion to the employee, such as staggered start and end times for flexible shifts or the option of remote medical consultations, can be crucial, since these elements can have a potential positive impact on work-life balance that, in turn, enhance work ability. Another crucial aspect pertains to the

development of effective supportive leadership. Managers should support employee career advancement through practices such as mentoring and sponsorship, while also allowing employees greater autonomy in establishing priorities and contributing their own ideas. These actions contribute to improving employee empowerment. Autonomy is a crucial aspect that involves not only the leadership style but also the overall organizational structure. Therefore, it is important to design processes that allow employees to be involved in decision-making and contribute to organizational improvement. Training courses directed towards managers and supervisors are also requested so that they can gain the required skills to implement leadership that aligns with these important factors. Redistributing work activities equally among team members is also important to minimize overall workload. This may reduce work intensification on specific groups of employees, improving work ability and contributing to a better work-life balance. An added value of this work is its multi-thematic perspective. In this sense, it engages with the analysis of various research areas, enabling the formulation of comprehensive conclusions regarding the promotion of a sustainable society. In this regard, the promotion of greater gender equality within decision-making bodies, such as boards of directors, and the dismantling of entrenched gender stereotypes is one of the key areas of interventions emphasized. Another critical aspect related to the development of a sustainable and equitable society pertains to the promotion of mental health, particularly during critical periods such as the ongoing pandemic. Finally, an important area of relevance that is closely linked to health is the promotion of work ability - a key aspect of sustainable employability. Another significant aspect of this study is its approach to promoting a sustainable society through the adoption of multiple analytical perspectives. In particular, this study emphasizes the importance and complementarity of public action, taken by governments and institutions, and organizational action, taken by human resource departments and managers. Governments and institutions can promote diversity in the workforce by implementing affirmative actions, such as gender quotas. Furthermore, effective social support policies are crucial for enhancing employee well-being during crises and fostering trust. Although interventions to improve diversity and well-being are important, it is equally crucial for human resources departments and managers to participate in organizational interventions. This will complement public interventions. In this regard, an important aspect is the development of effective and empowering leadership that fosters greater workplace inclusion, mitigating the negative impact of gender stereotypes such as the glass cliff phenomenon. Further, such leadership can improve employee work ability, preventing early deterioration and contributing to sustainable employability. Along with leadership interventions, the introduction of practices that enhance discretion and autonomy are also

relevant. These practices are important resources for employees to manage work demands, which can improve work-life balance and work ability. They also facilitate the implementation of an inclusive culture. Finally, the design of formative training courses for both managers and employees is crucial. Such courses can help reduce the presence of bias and implicit stereotypes, as well as improve employees' abilities to work. In conclusion, this thesis highlights the joint role of public and private actors in promoting a sustainable society. It suggests that inclusive working practices are key to accompanying public interventions, reducing the presence of gender stereotypes, and improving work ability and well-being. This type of policy, particularly when implemented in the healthcare sector, promotes well-being for individuals working in the organization and citizens belonging to the community. This results in higher quality health services delivered by a workforce that is protected and benefits from sustainable working practices.

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