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Mapping labour market attachment among vulnerable groups in European countries

Health-related and intersectional barriers before and after COVID-19 pandemic

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PATHS2INCLUDE

PATHS 2 INCLUDE

European Labour Markets Under Pressure – New knowledge on pathways to include persons in vulnerable situations

Title: Mapping labour market attachment among vulnerable groups in European countries. Health-related and intersectional barriers before and after COVID-19 pandemic

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Introduction

This working paper is part of PATHS2INCLUDE, a research project funded by the European Union's Horizon Europe (101094626). The overall objective of PATHS2INCLUDE is to disentangle the dimensions of discrimination and unequal opportunities in the labour market to gain knowledge on how to develop inclusive labour markets for persons in vulnerable situations. A key goal is to understand how contextual factors disproportionately expose certain groups to risk and vulnerability throughout their life course and during critical transitions. This working paper is part of work package 2, with the overarching goal to provide new knowledge on labour market attachment of persons in vulnerable situations.

The labour market attachment of individuals belonging to vulnerable groups in European countries has been a significant concern for many years. Although several European countries have experienced economic growth and more diversity in the workforces, numerous social groups, such as women, migrants, persons with health issues, and older workers, continue to face disadvantages in the labour market (OECD, 2020; European Commission, 2021). In this context, labour market vulnerability may arise from specific situations or crucial transitions, such as leaving education, parenthood, health-related work interruptions, or retirement, and is often related to outcomes such as unemployment, precarity, marginal attachment, and inactivity.

Being at-risk of labour market vulnerability is not exclusively based on individual characteristics such as gender, age or migrant background, but often relates to acquired characteristics and contextual factors such as health issues, lower levels of education, lack of employment-related skills, and caregiving responsibilities. Consequently, the intersection of individual characteristics and their interplay with contextual factors can create significant barriers to labour market attachment for certain groups throughout their life course. The specific combination of intersecting characteristics and how they shape labour market outcomes may vary across different contexts and national labour markets (Fernandez et al, 2016; Sundaram et al, 2014).

Within this framework, labour market vulnerability is increasingly understood as the result of complex interactions between individual and broader contextual factors. These dynamics are influenced by welfare regimes, labour market regulations, and social norms (e.g., Esping-Andersen, 1990; Lewis, 1992; Pfau-Effinger, 2004). Moreover, adopting an intersectional perspective (e.g., Crenshaw, 1989; McCall, 2005; Anthias, 2013) reveals that multiple axes of inequality, such as gender, migration background, health, social class, and care obligations, interact in non-additive ways. This means that certain groups (e.g., migrant mothers or older workers with disabilities) may face compounded and distinctive forms of disadvantage that cannot be fully explained by looking at single variables in isolation (e.g., Verloo, 2006).

In addition to the individual and contextual factors previously mentioned, economic cycles and, in particular, economic downturns constitute a key contextual element that can significantly affect individuals' attachment to the labour market. Economic downturns followed by increased unemployment often disproportionately affect at-risk groups' labour market attachment. The

COVID-19 pandemic can be characterised by such economic challenges with a high risk of job loss and a sharp increase in the unemployment rate, in addition to impacting people's daily lives, including social distancing, school closures, and the implementation of remote working. The pandemic affected individuals in general, but particularly workers with health issues and older workers, due to the nature of the virus. Furthermore, young workers entering the labour market for the first time and older workers who have been displaced may be particularly disadvantaged in this competitive environment (OECD, 2021). The selective hiring process may exacerbate pre-existing inequalities, as individuals with health conditions might be perceived as higher-risk employees due to potential absenteeism or decreased productivity (Bennedsen et al., 2022). Although the recovery was swifter compared to other economic downturns, the post-pandemic labour market may present unique challenges for workers belonging to at-risk groups, thereby increasing their labour market vulnerability. Many workers lost their jobs or were furloughed during the crisis, and evidence suggests that individuals with pre-existing or emerging health risks may encounter greater barriers to re-entering the workforce compared to their healthier counterparts. This issue is particularly relevant given the broader transformations in employment structures and hiring practices following the pandemic.

This working paper aims to examine whether the characteristics of at-risk groups in terms of labour market vulnerability have changed from the pre-pandemic period (2019) to the post-pandemic period (2022), and to assess whether contextual factors are associated with the labour market attachment of at-risk groups during these periods. Particular attention is paid to how health-related limitations intersect with other sociodemographic variables—such as age, gender, education, or household composition—to shape patterns of labour market attachment or exclusion. In this way, this paper analyses labour market attachment through an intersectional lens, recognising that vulnerability is dynamic – accumulating or decreasing over time depending on individual situations and the context, for example, economic downturns or the supportiveness of social policies.

This working paper is structured as follows. Sections 2 and 3 briefly review relevant literature on how the COVID-19 pandemic impacted labour market outcomes among persons with health-related limitations, interacting with other sources of vulnerability, such as gender, age, education and care responsibilities, and contextual factors. The review forms the basis for the theoretical and empirical background for the analysis. Section 4 describes the data sources and methodological approach employed in the study. Section 5 presents the main findings, groups most at risk of labour market exclusion, with a particular focus on those facing health-related limitations. Finally, section 6 concludes by summarizing the results and discussing their implications for future research and policy.

2. Unequal social impact of the COVID-19 pandemic

Crises have repeatedly occurred in modern economies, with more recent examples including the Great Recession and the COVID-19 pandemic. The labour force implications of the Great

Recession of 2007-2009 were more severe and long-lasting compared to the economic downturn caused by the COVID-19 pandemic. However, recent research has found that the COVID-19 pandemic exhibited a strong socioeconomic gradient in its social outcomes, disproportionately affecting individuals with various vulnerabilities, such as gender, age, ethnicity, and health limitations (Adams-Prassl et. al., 2020; Alstadsæter et al., 2020).

The COVID-19 pandemic impacted men and women more equally than previous economic recessions, which often have stronger male-biased effects due to their impact on traditionally male-dominated sectors such as manufacturing and construction (Alon et al., 2020). Some authors, such as Teigen and Østbakken (2024) even emphasise a greater impact on women as the COVID-19 pandemic disproportionately affected women's employment, a deviation from previous recessions. This disparity is partly due to women's overrepresentation in sectors severely impacted by the pandemic such as retail or hospitality. Furthermore, as economies reopened, gender disparities in labour market reintegration emerged. Many of the female-dominated sectors experienced slower recovery rates compared to male-dominated industries that rebounded more quickly (Adams-Prassl et al., 2020), leading to long-term employment instability for women (Dang & Nguyen, 2021).

The impact of the pandemic on persons with care responsibilities further highlights gendered labour market dynamics. The closure of schools and childcare facilities during the crisis forced many parents, particularly mothers, to assume increased caregiving responsibilities while also managing their professional obligations. Some studies indicate that mothers, to a larger extent than fathers, had a higher risk of job loss due to employment interruptions or an increased burden of combining domestic responsibilities and demand from paid work (Andrew et al., 2020, Alon et al., 2020; Blundell et al., 2020; Hupkau & Petrongolog, 2020).

Remote work arrangements provided some flexibility, but in many cases, they led to reduced working hours, unpaid leave, or even labour market exit (Beckel & Fisher, 2022; Collins et al., 2021). A clear distinction exists between voluntary and non-voluntary remote working. During the COVID-19 crisis, extensive use of remote work, primarily from home, was mandated by the governments (Ker et al., 2021). A study by Kazekami (2020) shows that voluntarily remote work has several positive benefits. During the COVID-19 pandemic, non-voluntary remote work was widespread, which among other factors, negatively impacted many workers satisfaction and performance (Camacho & Barrios, 2022). Moreover, remote work outcomes are gendered as mothers are more likely to combine multiple roles, thus experiencing greater role conflict and stress. Consequently, adverse effects of remote work for mothers' physical and psychosocial health compared to fathers were found (Graham et. al., 2021; Lundberg & Lindfors, 2002; Mann & Holdsworth, 2003).

Age also played a crucial role in shaping post-pandemic employment trajectories. During the pandemic-year 2020, the unemployment rate for the EU-27 Member States was 17% for young people under the age of 25, compared to 7% for adults (ILO, 2020), which can largely be attributed to the significant decline in economic activity (Stefanik et. al, 2020). In general, long-term unemployment among young people can lead to scarring effects, such as poor employment perspectives and well-being (Arulampalam et al., 2001; Gavin et. al., 2022; Tomlinson & Tholen,

2023; Schmillen & Umkehrer, 2017) and diminish their chances of re-entering the labour market (Sacchi & Samuel, 2024; Shi et al., 2018). Young people entering the labour market during the pandemic faced increased uncertainty, as employers were less likely to offer stable, long-term contracts in an unstable economic environment (Rotar et al., 2022). Moreover, young people with periods of unemployment experienced delays in securing their first jobs, which has been linked to long-term earnings penalties and career instability (Bell & Blanchflower, 2021). Meanwhile, older workers who were furloughed or displaced during the pandemic faced difficulties in securing new employment opportunities. Some opted for early retirement, either due to health concerns or a lack of viable job options, leading to an overall decline in labour force participation among older age groups (OECD, 2021).

Further, older workers faced a higher risk of severe illness and mortality from COVID-19 (Bauer et al, 2021; Centres for Disease Control and Prevention, 2021; Jordan et al., 2020), in addition to reduced healthcare utilisation for non-COVID-19 related conditions (Masroor, 2020; Oyebode et al., 2021; Raifman et. al., 2020) which may have compromised their overall health status (Jiskrova et al., 2021). Recent studies from the U.S. show that workers aged 55-64 were not disproportionately affected in labour market attachment compared to younger age groups (Munnell & Chen, 2021), while the opposite was observed among workers aged 65 and above (Bui et al., 2020; Jacobson et al., 2020; Coile & Zhang, 2022). These findings may reflect that the oldest workers are impacted by both adverse labour market conditions and increased vulnerability to virus infection, making it more difficult for them to retain employment post-pandemic.

People with health limitations face labour market disadvantages, are overrepresented among those economically inactive (Kaspersen et al., 2016), and have a greater risk of job insecurity in economic crises (see e.g. Bartley & Owen, 1996, Urbanos-Garrido & Lopez-Valcarcel, 2015). Moreover, they tend to experience longer unemployment spells (Butterworth et al., 2012) and are at a higher risk of accumulating disadvantages over time (see e.g. DiPrete & Eirich, 2006; Leopold, 2016).

The COVID-19 pandemic introduced an additional health risk that disproportionately affected individuals with pre-existing health limitations or disabilities, potentially leading to greater challenges in maintaining employment participation. To the best of our knowledge, few published articles explicitly examine the impact of health limitations on labour market attachment. In the Norwegian context, a study by Bjørnshagen (2021) shows that job applicants with mental health issues face discrimination in the recruitment process; however, the discrimination rate was not affected by the COVID-19 pandemic. Furthermore, individuals with health issues were more exposed to uncertain labour market conditions (Bakkeli, 2021). Nevertheless, those receiving health-related benefits were less likely to experience unemployment compared to their counterpart pre-crisis year 2019 (Heggebø & Elstad, 2024). Studies from the UK show that poorer female labour market attachment during the COVID-19 crisis was accompanied by a higher incidence of mental health issues (Oreffice & Quintana-Domeque, 2020). Additionally, women with health issues may have faced compounded challenges due to a combination of employer selectivity and sector-specific recovery patterns

(Hupkau & Petrongolo, 2020). Therefore, mothers with health issues may have encountered even greater difficulties in maintaining stable employment, as employers weighed potential health-related absences against productivity expectations (OECD, 2022a).

People with disabilities were disproportionately affected by the pandemic in various ways. Depending on the type of disability, many faced a higher risk for severe COVID-19 outcomes and mortality (Landes et al., 2020; Turk et al., 2020). Moreover, people with disabilities faced heightened challenges due to infection control measures, such as loss of access to health care, and reduced opportunities for physical activity (Lebrasseur et al., 2020), as well as financial insecurity and reduced employment (Emerson et al., 2021; Paul et al., 2020). However, the disability employment gap is significant and has existed for decades across OECD countries (OECD, 2022b).

A potential concern has been that the recovery in the labour market during economic downturns may take longer for persons with disabilities compared to persons without disabilities. Recent studies from the U.S show a dramatic increase in unemployment, mainly caused by temporary layoffs, among people with and without disabilities. During the first half of 2020, the employment losses of workers with disabilities were greater compered to workers without disabilities (Schur et al., 2020). On the other hand, a study by Houtenville and Chang (2021) indicates a positive trend in employment already in fall 2020, and a significant change in the percentage of persons without disabilities not in the labour force, the same pattern was not found among persons with disabilities. Schur and colleagues (2020) argued that the observed pattern can partly be explained by the fact that remote working was the norm during the pandemic, which was beneficial to persons with disabilities. Workers with disabilities are more likely to work remotely, reflecting the types of jobs they hold, and thus less affected by the economic downturn and infection control measures. The flexibility offered by remote work could be beneficial for workers with a long commuting time, e.g., workers with mobility impairments, for workers with mental health issues who might find it challenging to work in traditional workplace settings, and among those workers with health issues that require frequent breaks from work (Schur et al., 2020). Recent research supports this assumption, indicating an increase in disability employment in telework-prone occupations (Ameri et al., 2023; Ne'eman and Maestas, 2023; Ozimek, 2022). Connected to this, a study by Bloom, Dahl and Rooth (2025) utilised the significant increase in remote work caused by the pandemic (Barrero et al., 2023) to investigate whether the exogenous rise in the ability to work remotely provided new employment opportunities for persons with disabilities. Their main findings indicate an increase in disability employment in occupations with high potential for remote work, mostly driven by an increase in full-time employment.

The current literature illustrates how the COVID-19 pandemic intensified pre-existing employment inequalities across gender, age, health, and disability status. Women, particularly mothers, experienced prolonged employment instability due to sector-specific impacts and increased caregiving responsibilities exacerbated by mandatory remote work. Younger workers faced substantial barriers to labour market entry and heightened risks of long-term economic disadvantage, while older workers confronted unique challenges in labour market re-entry,

health concerns, and earlier exits from employment. Workers with health conditions or disabilities were particularly vulnerable due to employer hesitance, compounded health risks, and changing workplace norms. However, increased opportunities for remote work potentially provided new employment avenues for persons with disabilities. Overall, these findings indicate that post-pandemic recovery patterns remain uneven, and that the pandemic has reshaped employment dynamics in ways that may continue to affect labour market inequalities for years to come, making it essential to analyse the specific difficulties faced by at-risk groups in re-entering and maintaining employment post-pandemic.

3. Contextual factors

The extent to which individuals with health conditions remain attached to the labour market is influenced by the structure of unemployment and disability benefits, as well as broader labour market institutions. Variations in welfare regimes and employment protection policies across European countries shape the employment prospects of this group, potentially mitigating or exacerbating labour market disadvantages.

Existing research has examined cross-country differences in labour market exclusion among individuals with health conditions. Heggebø and Buffel (2019) compared labour market outcomes in Denmark, the Netherlands, Norway, and Belgium, finding that individuals with health problems face comparable risks of unemployment across these countries. Their findings suggest that the flexicurity model, often regarded as beneficial for labour market integration, does not necessarily provide stronger protections against exclusion for individuals with health conditions.

The impact of employment protection policies during economic downturns has also been investigated. Reeves et al. (2014) found that in countries heavily affected by the Great Recession, strong employment protection measures did not protect individuals with health conditions from job loss. However, in countries where the economic impact was less severe, such policies were associated with a lower risk of job loss among vulnerable workers, thereby reducing health-related employment inequalities. These findings highlight the conditional effects of labour market policies, which may vary depending on broader economic conditions.

The relationship between economic crises, prolonged unemployment, and disability benefit claims has also been documented. The OECD (2010) reported that economic downturns increase the likelihood of long-term unemployment, particularly among low-skilled workers, which in turn raises the incidence of disability benefit claims. Extended periods of labour market inactivity can contribute to deteriorating health, further reducing the likelihood of re-employment and reinforcing labour market exclusion.

Despite these insights, existing research has paid limited attention to the intersectionality of vulnerabilities, particularly how they shape employment outcomes for individuals with health conditions. Furthermore, there is a lack of encompassing cross-country analysis on the topic. Addressing these gaps is essential to develop evidence-based policies that enhance labour market attachment among individuals with health conditions and mitigate the risk of long-term exclusion.

4. Data and methods

4.1. Data

This study uses data from the European Union Statistics on Income and Living Conditions (EU-SILC), a survey coordinated by Eurostat that includes both cross-sectional and longitudinal components. The survey targets all private households and their members residing in the country during the data collection period. EU-SILC gathers detailed information from EU countries on income levels, poverty, social exclusion, living standards, and labour market involvement. Sampling techniques differ between countries, but stratified multistage sampling is most commonly used. Geographic identifiers for respondents are available at various levels, NUTS0, NUTS1, or NUTS2, depending on the country.

We base our analysis on the cross-sectional data and treat it as a pooled dataset, since the longitudinal portion of EU-SILC does not contain a sufficient number of cases, and hence lacks the statistical power to explore the intersectional and contextual effects we are interested in. This results in a final sample that includes 28 countries (the 27 EU member states and Norway) and spans 103 NUTS regions in 2019 and 98 in 20221. As we are interested in understanding how individual and contextual characteristics affect the risk of exclusion from the labour market before and after the pandemic, we restrict our sample to the 2019 and 2022 samples.

Since our focus is on individuals' attachment to the labour market, our main outcome variable is a binary indicator. This variable takes the value of 1 if the respondent demonstrates a relatively stable connection to the labour market, defined as having been employed (either part-time or full-time) or engaged in studies for at least six months during the survey year. Conversely, the indicator is set to 0 for all other respondents. Specifically, our outcome variable is set to 0 both for those who spent more than six months in unemployment, and that therefore are technically still participating in the labour market, and for those who spent six months or more in inactivity during the survey year[2]. In other words, our outcome variable is 0 for all those who are at greater risk of labour market detachment.

The total sample size is 262,169 in 2019 and 281,323 in 2022.

Given our interest in applying an intersectional lens, we identified the following key individual-level variables as central to the analysis:
(a) *age*, as a continuous variable;

[1] It was decided to include 28 EU countries because of the focus on the group of people with health-related limitations and their interaction with other individual and regional level characteristics. Therefore, we needed to ensure a sufficiently large sample.

[2] Our definition of labor market attachment, being employed for at least 6 out of 12 months, sets a relatively low threshold. While this choice allows for inclusivity in diverse employment contexts, it likely underestimates levels of employment instability at the individual level and overstates labor market attachment.

(b) *gender*, as a binary variable indicating the respondent's biological sex;
(c) *education*, as a categorical variable with three levels: lower-secondary or less, secondary, and tertiary education;
(d) *household composition*, as a categorical variable classified into three groups: households with dependents (children or individuals aged 65+), households without dependents, and single-parent households;
(e) *disability*, proxied by a binary variable indicating whether the respondent reports a long-standing health-related limitation in usual activities;

To account for potential confounding effects, we also included the following individual-level control variables:
(f) *socio-economic status*, proxied by quintiles of taxes paid on wealth in order to have a proxy for SES that does not suffer from reverse causality, as instead does income;
(g) living area, as a three-category variable indicating whether the respondent lives in an urban, peri-urban, or rural area.

In addition, we include three context-level variables, namely:
(h) *health expenditure* (% of GDP), a continuous variable measuring national public health expenditure as a share of national GDP;
(i) *social protection expenditure* (% of GDP), representing national public spending on social protection as a share of GDP; and
(j) *regional unemployment rate*, capturing local labour market conditions (expressed at NUTS2 level).

4.2. Methods

Intersectionality theory encourages us to move beyond single-axis analyses of labour market attachment determinants, such as gender or disability, and instead consider how multiple, interlocking dimensions of identity and context shape outcomes. Within this framework, the risk of exclusion from the labour market is seen as the result of several individual and contextual factors, which might interact in complex ways.

To explore intersectionality in labour market attachment, we adopt two complementary analytical strategies: the first one, which is more descriptive, is a Classification and Regression Tree (CART) model, a machine learning technique that allows to uncover complex interactions between variables, and that is used in intersectional studies (see for instance Cairney et al., 2014). CART works by recursively splitting the dataset based on rules that best differentiate groups, without relying on assumptions about the distribution or form of relationships among variables. In our study, we use CART to further examine the individual-level determinants of labour market attachment and to identify potential interaction effects that may not emerge from the parametric models.

Then, as main methodological approach, we adopted a two-level multilevel model in which we introduce three-way interactions between individual-level and contextual-level characteristics: (1) gender, household composition and health-related limitation; (2) gender, age, education and health-related limitation; (3) gender, education and health-related limitation; (4) education,

health-related limitation and health expenditure; and (5) household composition, health-related limitation and health expenditure. This approach allows us to adopt an intersectional perspective, acknowledging that the effects of gender, education, health-related limitations, and household composition are not simply additive, but may combine in complex and context-dependent ways.

To facilitate the interpretation of the results, marginal effects (averaged over all values) from multilevel estimates have been calculated, and interaction effects have been plotted and presented in Section 5.2. Moreover, to assess changes between the pre- and post-Covid periods, we conducted z-tests (a statistical test used to compare two groups with respect to their mean values) comparing the coefficients across the 2019 and 2022 waves.

In our framework, individuals (i) are nested within European regions (j), defined at either the NUTS2 or NUTS1 level depending on data availability. Multilevel modelling is particularly well-suited to address the hierarchical structure of the EU-SILC dataset, as it allows us to disentangle the influence of individual attributes from that of broader contextual conditions, while properly accounting for the nested nature of the data. In our random slope specification, the first level corresponds to individuals, while the second level represents regions (NUTS1 or NUTS2). The resulting model including individual and regional variables is:

$$Y_{ij}=\beta_0 +\beta_1\ Age_{ij} +\beta_2\ Educ_{ij} +\beta_3\ Limit_{ij} +\beta_4\ Female_{ij} +\beta_5\ HHtype_{ij} +\beta_6\ Rural_{ij} +\beta 7\ WealthTax_{ij} +\gamma_1\ Unemp_j +\gamma_2\ Health_j +\gamma_3\ SocialP_j +u_j +\varepsilon_{ij}$$

Where:

- Y_{ij} is the outcome variable for individual $_i$ in region $_j$
- Age_{ij} is the age (continuous)
- $Educ_{ij}$ is the level of education (lower-secondary or less, secondary, and tertiary education)
- $Limit_{ij}$ is the health-related limitation (limited, not limited)
- $Female_{ij}$ is the gender (female, male)
- $HHtype_{ij}$ is the household type (with dependents, without dependents, single-parent)
- $Rural_{ij}$ is the living area (urban, peri-urban, or rural area)
- $WealthTax_{ij}$ is the quintiles of taxes paid on wealth (Lowest 20%, Second 20%, Middle 20%, Fourth 20%, Highest 20%)
- $Unemp_j$ is the regional unemployment rate
- $Health_j$ is the national % of GDP spent on health
- $SocialP_j$ is the national % of GDP spent on social protection
- u_j is the random intercept for region j
- ε_{ij} is the individual-level residual

5. Results

5.1. Descriptive Statistics

This section provides descriptive statistics for the working-age population in 2019 (pre-pandemic) and 2022 (post-pandemic) with a focus on labour market attachment across various sociodemographic groups, using EU-SILC data. Overall, the percentage of active individuals rose moderately from 61.00% to 64.97%, indicating a general rebound in labour market attachment following the pandemic. Labour market activity increased across all age groups, most notably among older adults aged 55–67 (from 38.93% to 45.51%), suggesting a delayed exit or re-entry into employment post-pandemic. Younger and prime-aged adults (18–34 and 35–54) also experienced slight increases. Men consistently exhibited higher activity rates than women, but both groups saw modest increases between 2019 and 2022 (men: 63.99% to 67.64%; women: 58.21% to 62.47%). Higher educational attainment was associated with greater labour market attachment in both years. All educational groups experienced gains in activity, with the largest increase among those with high education (ISCED 5–8), from 71.93% to 75.52%.

Table 1. Descriptive statistics

	Pre-pandemic (2019)		Post-pandemic (2022)	
	% (n)	Active (%)	% (n)	Active (%)
Age (mean age 46)				
18-34	25.05 (65,668)	77.70	23.55 (66,259)	80.70
35-54	41.84 (109,687)	68.47	42.46 (119,457)	71.82
55-67	33.11 (86,814)	38.93	33.98 (95,607)	45.51
Gender				
Female	51.70 (135,535)	58.21	51.68 (145,383)	62.47
Male	48.30 (126,634)	63.99	48.32 (135,940)	67.64
Education				
Low education (ISCED0-2)	25.35 (66,459)	47.23	21.54 (60,600)	49.53
Medium education (ISCED3-4)	46.16 (121,007)	61.82	47.21 (132,802)	65.04
High education (ISCED5-8)	28.49 (74,703)	71.93	31.25 (87,921)	75.52
Household composition				
Household with children or 65+	49.44 (129,609)	62.83	48.96 (137,742)	65.78
No dependents	47.07 (123,404)	57.95	47.07 (132,426)	63.21
Single parent household	3.49 (9,156)	76.20	3.97 (11,155)	75.86
Health-related limitation				
Health-related limitation	19.87 (52,084)	41.20	20.87 (58,718)	45.60
No health-related limitation	80.13 (210,085)	65.91	79.13 (222,605)	70.08
Taxes paid on wealth				
Lowest 20%	54.22 (142,153)	62.28	39.00 (109,717)	63.98
Second 20%	8.16 (21,386)	53.78	10.21 (28,731)	62.43
Middle 20%	10.86 (28,482)	60.55	14.74 (41,462)	65.93
Fourth 20%	12.77 (33,474)	61.96	17.97 (50,557)	66.77
Highest 20%	13.99 (36,674)	59.72	18.08 (50,856)	65.98
Living area				
Cities	34.92 (91,540)	65.82	40.62 (114,285)	69.68
Rural areas	35.61 (93,368)	55.46	30.27 (85,145)	59.47
Towns or suburbs	29.47 (77,261)	61.98	29.11 (81,893)	64.12
Total (n)	**262,169**	**61.00**	**281,323**	**64.97**

Source: Authors' elaboration based on EU-SILC data

Individuals in households with dependents (children or elderly) had higher activity rates than those without, and both categories saw a slight improvement. Interestingly, single-parent households maintained high activity levels across both waves (around 76%), highlighting their

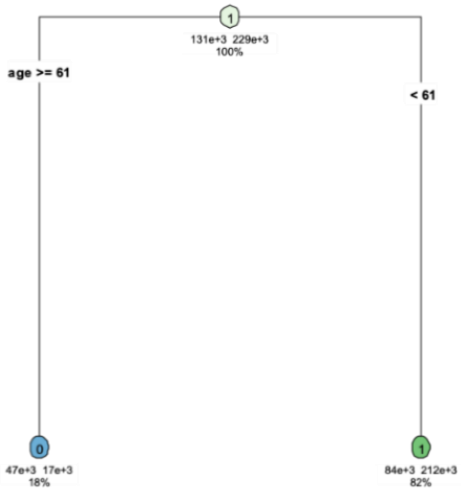
strong labour market attachment despite potential caregiving constraints. Respondents reporting a health-related limitation were substantially less active, though activity among this group rose from 41.20% to 45.60%. The gap between limited and non-limited groups persisted. There is a clear positive gradient in activity rates by tax on wealth, with the lowest 20% displaying the least notable post-pandemic gains (from 62.25% to 63.98%). The proportion of respondents in the lowest quintile decreased substantially (from 54.22% to 39.00%), suggesting a compositional change in the economic structure of the sample. Individuals living in cities were the most active in both years, with activity increasing from 65.82% to 69.68%. Rural residents showed the lowest participation rates, although they also saw a notable post-pandemic improvement (from 55.46% to 59.47%).

5.2. Determinants of labour market attachment using classification and regression trees (CART)

To explore the determinants of being active in the labour market, we estimated classification tree models using the *rpart* package in R, using EU-SILC data from 2019 and 2022. We focus on individual-level predictor variables and included age, gender, educational attainment, rurality, household type, taxes paid on wealth, and presence of health-related limitations.

In 2019, the model identified age as the most important predictor of being active (Figure 1). The first and only split in the tree occurred at age 61, indicating a clear threshold effect. Individuals younger than 61 were more likely to be classified into the reference category (being active in the labour market), with a predicted probability of 73%, while those older than 61 were more likely to be classified into the alternative category (being out of the labour market), with a predicted probability of 71%. According to the variable importance measure, age accounted for the entirety of the model's explanatory power, while other predictors such as health-related limitation, education, and rurality contributed only marginally and were not included in the final tree. This result suggests a highly age-stratified pattern, likely reflecting structural changes in individuals' economic or employment status after the age of 60.

Figure 1. CART 2019

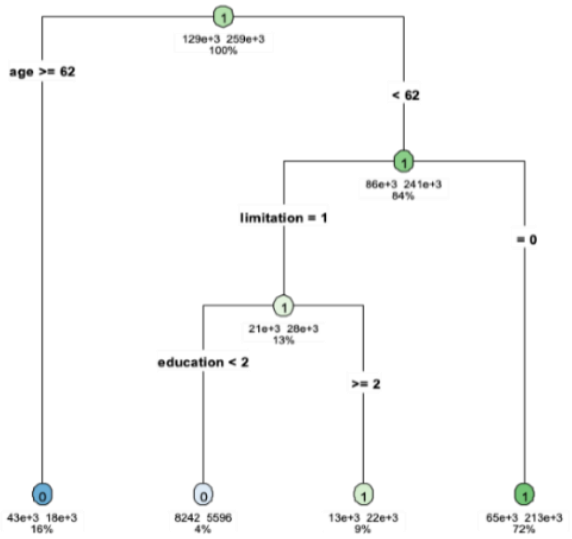


Source: Authors' elaboration based on EU-SILC data

In 2022, age remained the dominant predictor, with a similar threshold identified at 62 years (Figure 2). Individuals below this age were more likely to fall into the active group, with a predicted probability of 70%, while those above this threshold were more likely to be classified into the group out of the labour market, with a predicted probability of 74%. However, in contrast to the 2019 model, the 2022 tree included additional splits, indicating more complexity in the classification process. Among individuals above 62, the model introduced further divisions based on the presence of health-related limitations and educational attainment. Within this subgroup, those reporting no health-related limitations and high educational attainment had a higher probability of being active, whereas individuals with health-related limitations or lower levels of education were more likely to be out of the labour market.

The expansion of the tree in 2022, along with the increased relevance of health and education, suggests that the population above 60 has become more heterogeneous over time with respect to the outcome. While age remained the most important driver of classification in both years, the 2022 model points to a growing influence of social and health-related inequalities, particularly among older individuals. This may reflect the broader impact of the COVID-19 pandemic and related policy shifts, which may have accentuated pre-existing disparities in labour market attachment, income, or social protection based on education and health.

Figure 2. CART 2022



Source: Authors' elaboration based on EU-SILC data

5.3. Determinants of labour market attachment using multilevel models

Starting from a model where we include only individual-level determinants (Model 1), we observe that in both 2019 and 2022 waves, younger individuals are less likely to be out of the labour market compared to older adults. As expected, having a health-related limitation has a strong and negative effect on labour force attachment, as does being female. Both secondary and tertiary education are positively associated with labour market attachment, while living in an urban area appears to offer some advantages compared to rural areas.

An interesting finding concerns the effect of different household compositions. Compared to the reference group—households with dependents (i.e., children or individuals aged 65 and over)—both living in a household without dependents and being a single parent are associated with a higher probability of participating in the labour market. These effects may be driven by contrasting mechanisms: households without dependents may face fewer constraints on labour market attachment, whereas single parents may be more likely to seek employment out of economic necessity. Lastly, we observe how belonging to higher social classes, proxied here by quintiles of taxes paid on wealth, facilitates labour market participation. Interestingly, being in the highest 20% of wealth taxpayers was not statistically significant in 2019 but became highly significant in 2022. This suggests that, before the pandemic, individuals at both the lower and upper ends of the socio-economic spectrum had similar probabilities of being out of the labour market, though likely for very different reasons (e.g., unemployment versus voluntary non-participation). However, after the pandemic, the situation changed: those among the wealthiest

who wished to (re)enter the labour market were generally able to do so, whereas the usual barriers to employment remained firmly in place for individuals in the lower wealth quintiles.

To assess changes between the pre- and post-Covid periods, we conducted z-tests comparing the coefficients across the two waves. Some interesting results emerge: above all, with the pandemic secondary and tertiary education (Z-test respectively –4,95 and –4,44) became more important in explaining the attachment to the labour market, maybe also because after COVID-19 remote work, digital communication, and tech-based platforms became essential and jobs that could transition online were disproportionately occupied by higher-educated individuals.

When we move to the model incorporating contextual-level determinants (Model 2), we find that, controlling for individual characteristics, residing in areas with high unemployment significantly reduces the likelihood of labour market attachment. Public health expenditure, on the other hand, consistently facilitates participation in both the pre- and post-pandemic periods and these effects remain constant throughout all specifications. Social protection measures, however, are not significant in either year.

Table 2. Models 1 and 2

	Model 1		Model 2	
	2019	**2022**	**2019**	**2022**
Individual variables				
Age	-0.010***	-0.009***	-0.010***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Education (ref. lower education)				
Medium education	0.112***	0.126***	0.112***	0.126***
	(0.002)	(0.002)	(0.002)	(0.002)
Higher education	0.187***	0.203***	0.187***	0.203***
	(0.003)	(0.002)	(0.003)	(0.002)
Health-related limitation (ref. no health-related limitation)				
Health-related limitation	-0.155***	-0.156***	-0.155***	-0.156***
	(0.002)	(0.002)	(0.002)	(0.002)
Gender (ref. male)				
Female	-0.053***	-0.047***	-0.053***	-0.047***
	(0.002)	(0.002)	(0.002)	(0.002)
Household composition (ref. household with children or 65+)				
Household without dependents	0.017***	0.031***	0.017***	0.031***
	(0.002)	(0.002)	(0.002)	(0.002)
Single parent household	0.072***	0.057***	0.071***	0.057***
	(0.005)	(0.004)	(0.005)	(0.004)
Living area (ref. cities)				

Urban areas	-0.056***	-0.053***	-0.056***	-0.054***
	(0.002)	(0.002)	(0.002)	(0.002)
Towns or suburbs	-0.011***	-0.015***	-0.011***	-0.015***
	(0.002)	(0.002)	(0.002)	(0.002)
Taxes paid on wealth (ref. first 20%)				
Second 20%	0.017***	0.034***	0.017***	0.034***
	(0.004)	(0.003)	(0.004)	(0.003)
Middle 20%	0.042***	0.041***	0.041***	0.041***
	(0.003)	(0.003)	(0.003)	(0.003)
Fourth 20%	0.038***	0.042***	0.037***	0.042***
	(0.003)	(0.002)	(0.003)	(0.002)
Highest 20%	0.001	0.020***	0.001	0.020***
	(0.003)	(0.002)	(0.003)	(0.002)
Regional variables				
Unemployment			-0.006***	-0.007***
			(0.001)	(0.001)
% of GDP spent on Health			0.028***	0.022***
			(0.008)	(0.005)
% of GDP spent on Social Policies			-0.002	-0.003
			(0.002)	(0.002)
Constant	1.033***	1.006***	0.931***	0.984***
	(0.009)	(0.008)	(0.039)	(0.040)
Observations	262,169	281,323	262,169	281,323
Number of groups	103	98	103	98

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' elaboration based on EU-SILC data and EUROSTAT data

Interactions

In Models 3, 4 and 5 we interact respectively: (1) gender, household composition and health-related limitation (see appendix, Figure 1a and Table 1a); (2) gender, age, education and health-related limitation (see appendix, Figure 2a and Table 1a); (3) gender, education and health-related limitation (see appendix, Figure 3a and Table 1a).

In Model 3, the most striking result is that having a health-related limitation consistently represents the strongest disadvantage in the labour market, regardless of how it intersects with gender or household composition. Moreover, differences in household structure also emerge: for women in particular, beyond the effect of the health-related limitation itself, living in a household with dependents further compounds their disadvantage in labour market attachment, while in households without dependents there are no particular differences between men and women, regardless of the presence of health-related limitations. This evidence seems to confirm the stylized fact for which in presence of dependents, care responsibilities tend to fall disproportionately on women (Figure 1a).

In Model 4 (marginal effects reported in Figure 2a), we first observe that the effect of age on labour market participation follows a reversed U-shape: attachment has a positive correlation with age up to around 40, after which it starts to be negative. This pattern holds across all groups, besides those with the lowest level of education for which attachment in the labour market constantly decreases with age.

Another noteworthy finding is that secondary—and especially tertiary—education appears to mitigate the disadvantage associated with having a health-related limitation. Across nearly all age groups, the probability gap in labour market attachment between individuals with and without health-related limitations narrows as educational attainment increases. This suggests that higher levels of education can partially compensate for the labour market barriers faced by individuals with health-related limitations.

A similar effect of education emerges in Model 5 (Figure 3a), where the probability gap between individuals with and without health-related limitations narrows with increasing levels of education. This pattern is observed for both women and men, but it is particularly pronounced among men.

Model 5 also confirms that having a health-related limitation remains the strongest factor reducing labour market attachment. However, gender differences persist, even after accounting for health-related limitations. Interestingly, the gap in labour market attachment between men and women, both with and without health-related limitations, is inversely correlated with the educational level. This suggests that education not only mitigates the disadvantage associated with health-related limitations but also contributes to narrowing gender disparities in access to the labour market. For these three models, we detect no particular differences between the pre- and post-pandemic period.

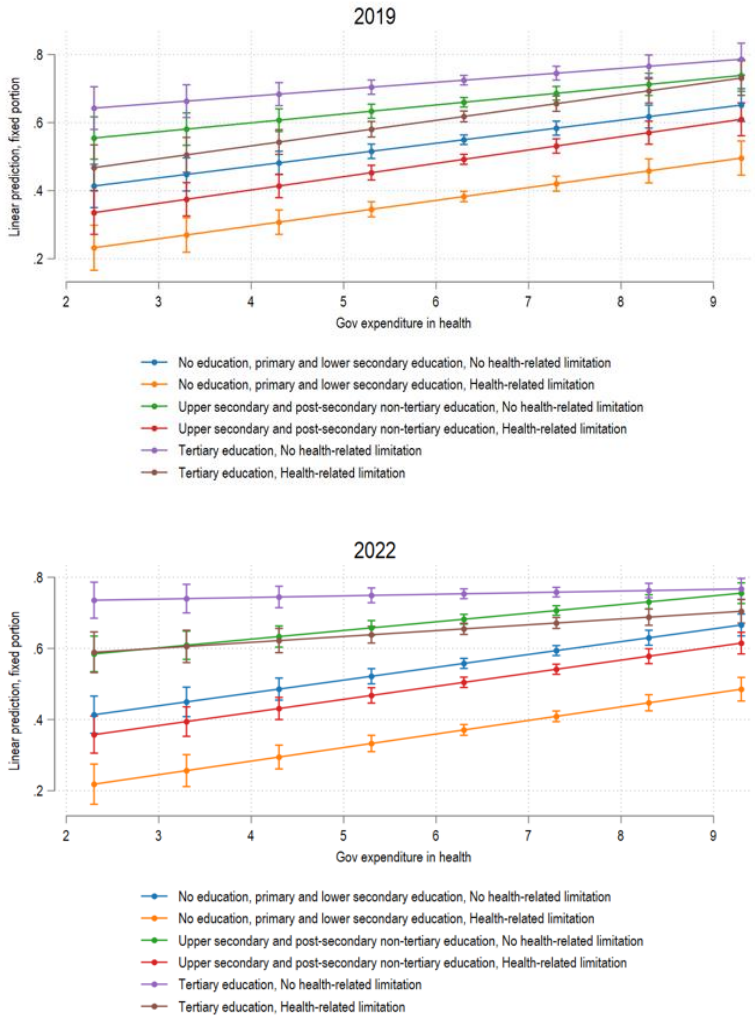
Finally, in Models 6 and 7, we investigate how the impact of certain individual characteristics may change when contexts also change. Specifically, through a cross-level three-way interaction, we investigate how individual characteristics interact with the share of national public expenditure allocated to the health sector (as % of GDP). This is explored in model 6 (education, health-related limitation and health expenditure) and model 7 (household composition, health-related limitation and health expenditure).

Results from Model 6 show that overall, as health expenditure increases, the likelihood of participating in the labour market increases for all groups. Moreover, as health expenditure

increases, the gap in labour market attachment between individuals with and without health-related limitations tends to narrow for those with higher levels of education.

Furthermore, when comparing 2019 and 2022, the role of education re-emerges as a key factor, reinforcing the findings from the previous model. Specifically in contexts characterized by low health expenditure, tertiary education becomes increasingly important in the post-pandemic period. For individuals with health-related limitations, having a tertiary degree substantially increases the likelihood of labour market attachment, suggesting that education plays a crucial buffering role when institutional support is weaker, and that education became even more important after the pandemic.

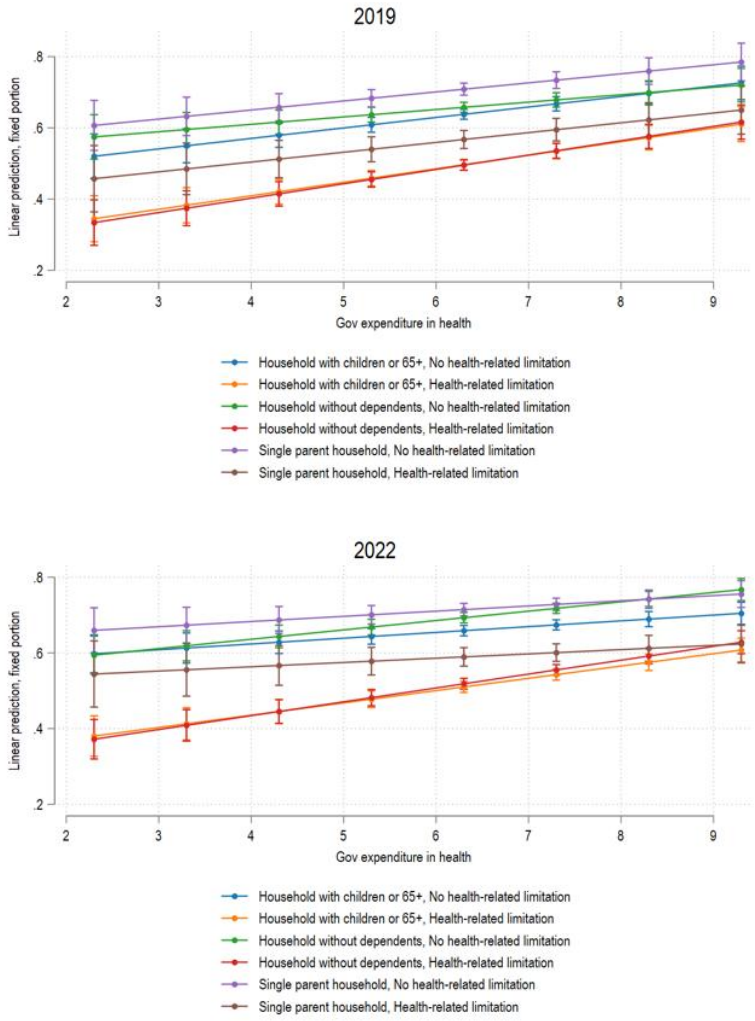
Figure 3. Model 6: education x health-related limitation x % of GDP spent in health, 2019 and 2022



Note: Plotted marginal effects are averaged across all values
Source: Authors' elaboration based on EU-SILC data and EUROSTAT data

Model 7 shows that for all groups, an increase in public health expenditure is associated with a higher probability of labour market attachment. Holding household composition constant, individuals with health-related limitations consistently show lower attachment probabilities compared to those without health-related limitations. However, this gap slightly narrows as health spending increases. For example, the difference in labour market attachment between individuals from households without dependents—with and without health-related limitations—tends to decrease as public health expenditure rises.

Figure 4. Model 7: household type x health-related limitation x % of GDP spent in health, 2019 and 2022



Note: Plotted marginal effects are averaged across all values
Source: Authors' elaboration based on EU-SILC data and EUROSTAT data

Overall, our findings highlight the complex and multifaceted nature of labour market attachment, shaped by the intersection of individual and contextual factors. Across all models, having a health-related limitation in activities because of health problems (that we adopted as

proxy for disability) consistently emerges as the strongest barrier to labour market attachment, followed by gender disparities, which persist despite controlling for other variables. However, education, particularly tertiary education, plays a key mitigating role, reducing both the gap between individuals with and without health-related limitations, and the gender gap, especially in post-pandemic contexts.

Contextual factors such as public health expenditure further shape these dynamics. Higher health spending is associated with increased attachment across all groups and, importantly, helps to narrow labour market attachment gaps for individuals with health-related limitations, especially when coupled with higher education levels. This reinforces the idea that both individual resources and institutional support are needed to foster inclusive labour market access, particularly in the wake of the pandemic.

6. Discussion

This working paper examines labour market attachment in Europe using EU-SILC data from 2019 and 2022, before and after the COVID-19 pandemic, with a focus on the intersection of health-related limitations, age, gender, education, and household composition. It also analyses how these individual characteristics intersect with contextual factors to shape labour market attachment.

While *age* is a strong and consistent predictor across both time points, the post-pandemic period revealed greater complexity in the mechanisms underlying labour market attachment. The CART analysis shows that in 2019, labour market activity followed a relatively clear age-based threshold, with older individuals more likely to be out of the labour market. By 2022, this pattern had become more nuanced: among older adults, differences in attachment were increasingly influenced by health-related limitations and education. This suggests that older populations have become more internally differentiated, reflecting widening inequalities in the capacity to remain active in later life. This is consistent with evidence showing that older workers faced compounded challenges in the post-pandemic period due to health risks and labour market selectivity (Bui et al., 2020; Coile & Zhang, 2022; Jacobson et al., 2020).

Among the barriers identified, our analyses show that *health-related limitations* stand out as the most persistent and significant constraint, followed closely by gender inequalities, which remain substantial even after accounting for other factors. Health-related limitations proved to be the most powerful barrier to labour market attachment across groups and periods, and their negative impact was compounded by other individual characteristics. Our results show that these disadvantages are not experienced in isolation. Rather, they operate in intersectional ways, with the effects of *gender, education, age, and household composition* combining in context-dependent patterns. For example, women with health-related limitations living in households with dependents faced particularly high barriers to labour market attachment, while highly educated individuals, regardless of gender, were better able to overcome the disadvantages associated with poor health. This is in line with previous research showing that women with health issues, especially those with caregiving responsibilities, faced heightened

vulnerability to job loss and exclusion during the pandemic due to employer selectivity and slower recovery in female-dominated sectors (Hupkau & Petrongolo, 2020; OECD, 2022a).

A particularly robust finding, emerging consistently from both the multilevel models and the CART analysis, is the increasingly central role of *education*, especially in the post-pandemic period. Tertiary education appears to buffer the negative effects of both health-related limitations and gender on labour market access. One plausible explanation lies in the structural transformations triggered by the pandemic: the widespread adoption of remote work and digital tools disproportionately affected low-skilled workers, who faced greater difficulties in adapting to the new demands of the labour market. In contrast, highly educated individuals were more likely to retain or regain employment in a context that rewarded digital fluency, autonomy, and adaptability. This aligns with recent findings that remote work opportunities became increasingly concentrated in high-skilled and telework-prone occupations, offering more security for the highly educated (Ameri et al., 2023; Bloom, Dahl & Rooth, 2025; Ozimek, 2022).

Gender disparities in labour market attachment persisted across the two periods, with women, particularly those in households with dependents, less likely to be active in the labour market. These differences reflect the continuing influence of gendered caregiving responsibilities. In this way, recent research highlights the disproportionate impact of the pandemic on women's employment due to their overrepresentation in hard-hit sectors and greater caregiving burdens (Teigen & Østbakken, 2022; Adams-Prassl et al., 2020). Additionally, the widespread use of non-voluntary remote work further exacerbated stress and role conflict among mothers (Beckel & Fisher, 2022; Graham et al., 2021). However, the interaction between gender and education shows that higher education was associated with a narrowing of gender gaps.

Household composition also plays a role in explaining labour market attachment. Those living in households without dependents, and, in some cases, single-parent households, are more likely to participate in the labour force, suggesting the combined influence of reduced caregiving burdens and economic necessity. Previous literature similarly points to the disproportionate labour market exit of mothers during school closures and lockdowns, often driven by an inability to reconcile care demands and professional responsibilities (Collins et al., 2021; Kazekami, 2020).

Living in areas with high *unemployment* was linked to lower labour market attachment, reinforcing the importance of regional labour market dynamics beyond individual characteristics. % of GDP spent on health, on the other hand, has a significant moderating role. It was positively associated with labour market attachment and played an important role in supporting individuals with health-related limitations. Increased investment in the health sector is positively associated with labour market attachment across all population groups and tends to reduce the disadvantage experienced by individuals with health-related limitations. Other research also found that robust public health systems help mitigate attachment gaps, particularly for those with disabilities or chronic health issues, who otherwise face persistent exclusion (Schur et al., 2020; OECD, 2022b).

Overall, the analyses show that labour market attachment is shaped by intersecting inequalities. These inequalities became more pronounced after the pandemic, especially among older

individuals and those with health-related limitations. However, the findings also point to the potential of education and institutional investment in promoting labour market attachment. In particular, tertiary education emerges as a key resource that can partially offset structural disadvantages related to gender and health, especially in contexts where investment in public health is low. Moreover, education has become increasingly important for navigating a post-pandemic labour market shaped by digitalisation and flexible work arrangements, trends that have disproportionately benefited those in higher-skilled occupations (Barrero et al., 2023; Ne'eman & Maestas, 2023).

The findings provide new insights into inequalities in labour market attachment due to the intersection of health-related limitations and other individual characteristics, and thus we have been able to identify some of the groups most at risk in the labour market (for instance, old workers with low education or women with health-related limitations), and how inequalities have been maintained and, in some cases, increased in the post-COVID-19 pandemic. In addition, two different ways of approaching and analysing intersectionality have been explored. Some limitations of the study should also be mentioned: (1) the data used are cross-sectional from 2019 and 2022, so it has not been possible to compare the same individuals and see how the pandemic has affected them; (2) only one labour market outcome has been analysed (having been employed, either part-time or full-time, or engaged in studies for at least six months during the survey year). In future studies it would be useful to include other outcomes (e.g., full or part-time work). Furthermore, it would be important to explore a more restrictive outcome for labour market attachment such as being 12 out of 12 months out of labour market; (3) three regional indicators have been included, but in future studies it would be interesting to explore other regional indicators; (4) due to data availability we could not explore migration background although it is an individual characteristic that is often linked to vulnerability in the labour market.

Overall, policies aimed at increasing labour market attachment need to look at the intersectional nature of disadvantage. One-size-fits-all approaches are likely to fall short in the face of such complexity. Instead, inclusive strategies need to target overlapping vulnerabilities, supporting not only older workers or individuals with health-related limitations, but also recognizing how these characteristics intersect with gender, caregiving responsibilities, and education.

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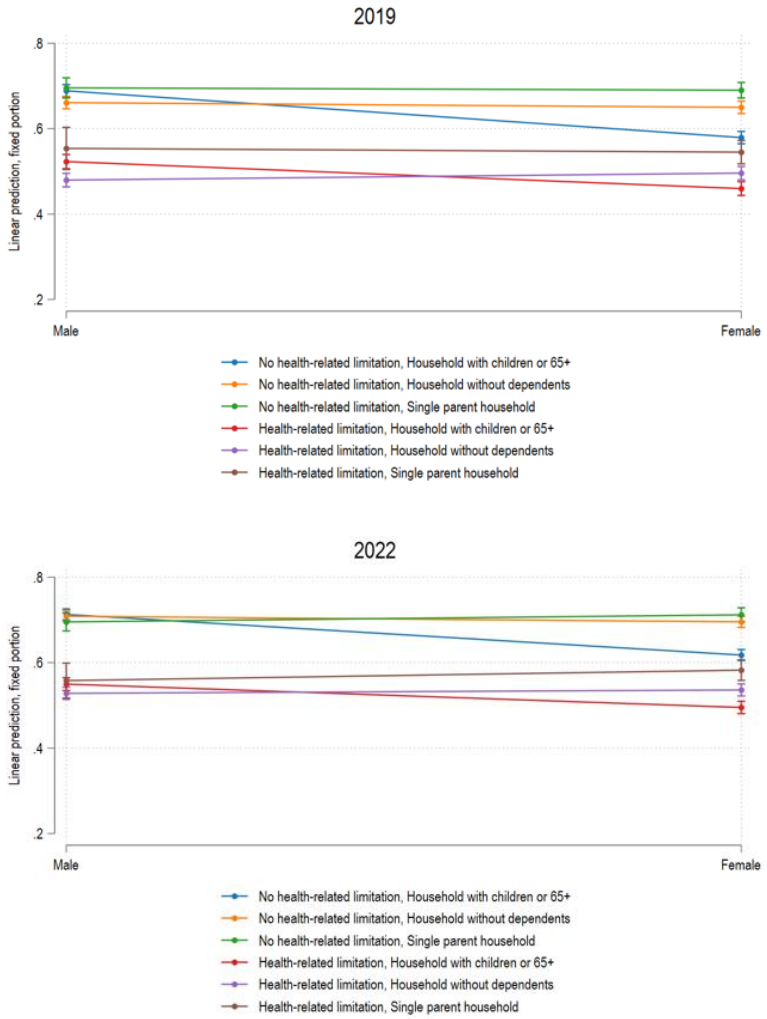
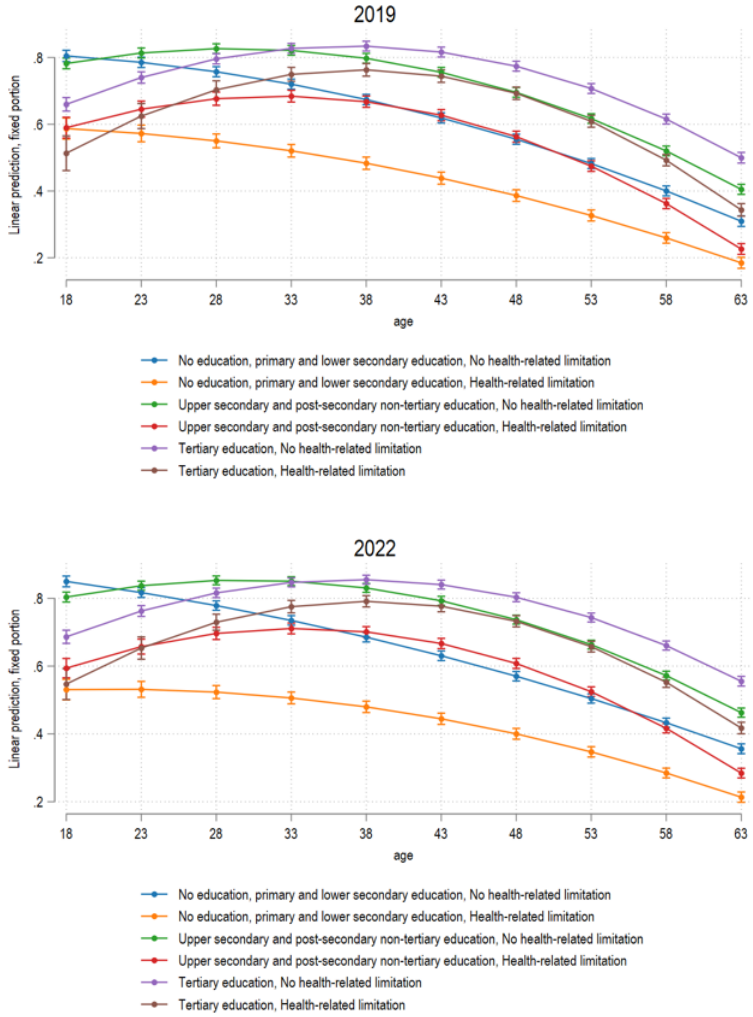
Appendix

Figure 1a. Model 3: female x household type x limitation, 2019 and 2022



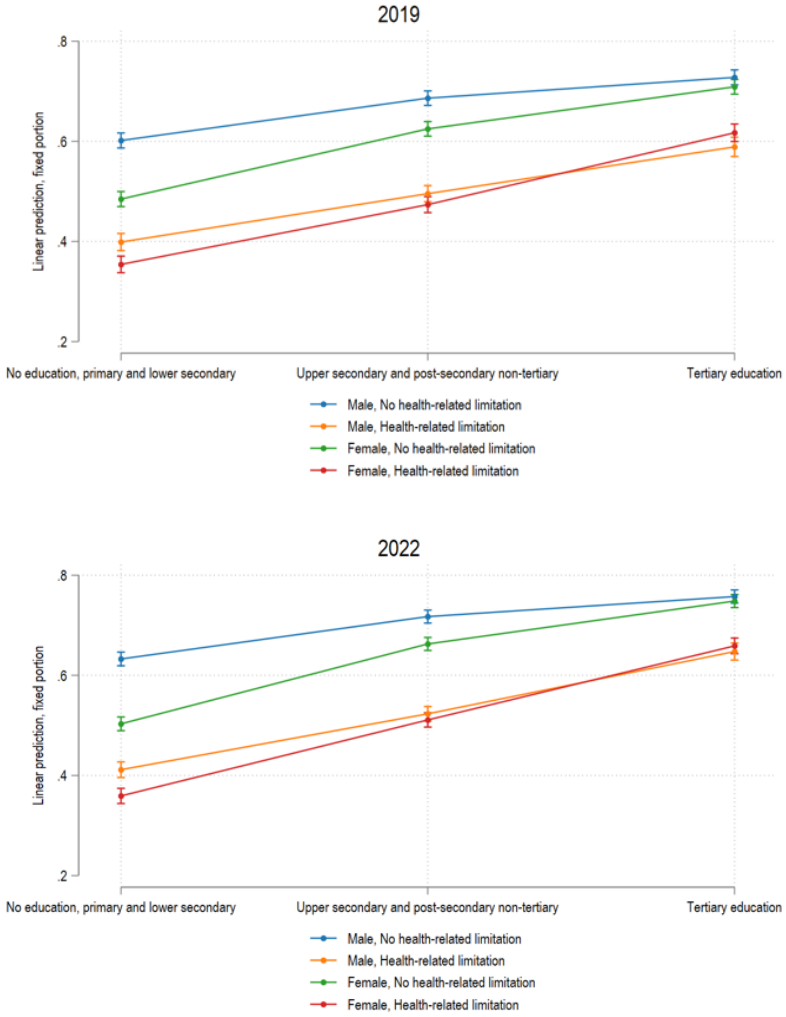
Note: Plotted marginal effects are averaged across all values
Source: Authors' elaboration based on EU-SILC data and EUROSTAT data

Figure 2a. Model 4: age x education x limitation, 2019 and 2022



Note: Plotted marginal effects are averaged across all values
Source: Authors' elaboration based on EU-SILC data and EUROSTAT data

Figure 3a. Model 5: female x education x limitation, 2019 and 2022



Note: Plotted marginal effects are averaged across all values
Source: Authors' elaboration based on EU-SILC data and EUROSTAT data

Table 1a. Multilevel models 3 to 7, three-way interactions

	Model 3 - Female × Household × Health-related limitation		Model 4 - Age × Edu × Health-related limitation		Model 5 - Female × Edu × Health-related limitation		Model 6 - Education × Health-related limitation × HealthGDP		Model 7 - Household × Health-related limitation × HealthGDP	
	2019	2022	2019	2022	2019	2022	2019	2022	2019	2022
Individual variables										
Age	-0.010***	-0.009***	0.003***	-0.002**	-0.010***	-0.009***	-0.010***	-0.009***	-0.010***	-0.009***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education (ref. lower education)										
Medium education	0.112***	0.126***	-0.282***	-0.387***	0.085***	0.085***	0.159***	0.198***	0.112***	0.126***
	(0.002)	(0.002)	(0.020)	(0.020)	(0.003)	(0.004)	(0.014)	(0.015)	(0.002)	(0.002)
Higher education	0.187***	0.203***	-0.633***	-0.698***	0.126***	0.125***	0.260***	0.394***	0.187***	0.203***
	(0.002)	(0.002)	(0.027)	(0.027)	(0.004)	(0.004)	(0.015)	(0.016)	(0.003)	(0.002)
Health-related limitation (ref. no health-related limitation)										
Health-related limitation	-0.166***	-0.163***	-0.222***	-0.469***	-0.203***	-0.221***	-0.190***	-0.200***	-0.195***	-0.257***
	(0.005)	(0.005)	(0.041)	(0.040)	(0.006)	(0.006)	(0.023)	(0.025)	(0.017)	(0.017)
Gender (ref. male)										
Female	-0.110***	-0.095***	-0.051***	-0.044***	-0.117***	-0.130***	-0.053***	-0.047***	-0.053***	-0.047***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)
Household composition (ref. household with children or 65+)										
Household without dependents	-0.028***	-0.004	0.035***	0.046***	0.017***	0.031***	0.017***	0.031***	0.074***	-0.025**
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.010)	(0.010)
Single parent household	0.007	-0.017**	0.062***	0.049***	0.070***	0.055***	0.071***	0.056***	0.096***	0.066**
	(0.010)	(0.009)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.027)	(0.026)
Living area (ref. cities)										
Urban areas	-0.055***	-0.053***	-0.059***	-0.055***	-0.056***	-0.054***	-0.055***	-0.052***	-0.056***	-0.053***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Towns or suburbs	-0.010***	-0.015***	-0.013***	-0.017***	-0.011***	-0.016***	-0.011***	-0.014***	-0.011***	-0.015***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Taxes paid on wealth (ref. first 20%)										
Second 20%	0.17***	0.035***	0.021***	0.036***	0.017***	0.034***	0.017***	0.034***	0.017***	0.035***
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Middle 20%	0.042***	0.042***	0.044***	0.043***	0.041***	0.041***	0.041***	0.041***	0.041***	0.042***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Fourth 20%	0.038***	0.042***	0.039***	0.044***	0.037***	0.041***	0.037***	0.041***	0.037***	0.042***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Highest 20%	0.002	0.020***	0.006**	0.025***	0.001	0.019***	0.000	0.019***	0.001	0.020***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Regional variables										
Unemployment	-0.006***	-0.007***	-0.006***	-0.007***	-0.006***	-0.007***	-0.006***	-0.007***	-0.006***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% of GDP spent on Health	0.029***	0.022***	0.027***	0.022***	0.029***	0.023***	0.034***	0.036***	0.029***	0.015***
	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)	(0.006)	(0.008)	(0.005)

% of GDP spent on Social Policies	-0.002	-0.003	-0.001	-0.003	-0.002	-0.003	-0.002	-0.003	-0.002	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Interactions - individual level variables										
female*household composition(no dependents)*health-related limitation	-0.019**	-0.019***								
	(0.009)	(0.008)								
female*household composition (single parent household)*health-related limitation	-0.050*	-0.033								
	(0.030)	(0.025)								
education (medium education)*health-related limitation*age			0.010***	0.002						
			(0.003)	(0.002)						
education (higher education)*health-related limitation*age			0.013***	0.003						
			(0.004)	(0.003)						
female*education (medium education)*health-related limitation					-0.033***	-0.035***				
					(0.010)	(0.010)				
female*education (higher education)*health-related limitation					-0.025**	-0.057***				
					(0.012)	(0.011)				
Interactions - individual and regional variables										
education (secondary education)*health-related limitation*% of GDP on Health							0.009**	0.010**		
							(0.004)	(0.004)		
education (tertiary education)*health-related limitation*% of GDP on Health							0.013***	0.010**		
							(0.005)	(0.005)		
household composition (no dependents)*health-related limitation*% of GDP on Health									0.011***	-0.005
									(0.004)	(0.003)
Household composition (single parent household)*health-related limitation*% of GDP on Health									-0.006	-0.020**
									(0.009)	(0.009)
Constant	0.960***	0.972***	0.724***	0.870***	0.961***	0.992***	0.900***	0.861***	0.923***	0.993***
	(0.039)	(0.040)	(0.042)	(0.043)	(0.039)	(0.040)	(0.040)	(0.042)	(0.039)	(0.041)
Observations	262,169	281,323	262,169	281,323	262,169	281,323	262,169	281,323	262,169	281,323
Number of groups	103	98	103	98	103	98	103	98	103	98

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' elaboration based on EU-SILC data and EUROSTAT data

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