

Rethinking the economic importance of older adults' employment: A conceptual framework for sustainable labour market transformation in ageing societies

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Abstract

Population ageing is reshaping labour markets, pension systems, and the fiscal sustainability of contemporary welfare states. Contemporary research increasingly recognises old age as a socially constructed and functionally differentiated category rather than a self-evident life stage defined solely by chronological age. This shift in perspective calls for a more systemic rethinking of how ageing is conceptualised and addressed in economic and policy analysis. While existing research has examined ageing, retirement, and later-life employment from multiple disciplinary perspectives, it remains fragmented and lacks an integrated analytical structure. This paper addresses this gap by developing a conceptual framework that links demographic ageing, institutional settings, individual capacities, and labour market participation patterns with multidimensional sustainability outcomes. The framework conceptualises later-life employment as a heterogeneous and dynamic process shaped by structural drivers, reframing mechanisms, and enabling or constraining conditions. By doing so, it advances the literature by explaining how older adults' labour market participation contributes not only to labour supply and economic growth, but also to productivity, knowledge retention, social inclusion, and the long-term sustainability of welfare systems. The paper further outlines a research agenda for empirically testing the proposed relationships using advanced econometric approaches capable of capturing heterogeneity, non-linearity, and causal dynamics.

Keywords: population ageing, older workers, labour market participation, functional ageing, pension systems, sustainability

1. Introduction

Old age has been increasingly recognised as a social construct rather than a self-evident biological condition defined solely by chronological age (Fields et al., 2018). Therefore, old age cannot be defined in universal terms and should be understood contextually, considering the many layers of identity. At the same time, population ageing is generally understood as a continuous process in which the proportion of older people increases over time, while the proportion of adults and young people declines (United Nations, 2019). In general, the current ageing process is driven by

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lower fertility and longer life expectancy (Emerson et al., 2024). This demographic shift is the central context, because it fundamentally alters labour markets, pension systems, and fiscal policies across the European Union and globally.

Significant demographic transformations have driven these conceptual changes. Improvements in sanitation and medical care, family planning and education, and the broader transformation of social roles have contributed to longer life expectancy worldwide (United Nations, 2023). For example, average life expectancy in the European Union (EU) increased from around 69 years in 1960 to 81 years in 2023 (World Bank, 2026). Yet longer life does not automatically mean a proportionally longer period of health or work capacity. In 2023, healthy life expectancy in the EU stood at 63.1 years, leaving a substantial gap between overall longevity and years lived in good health (Eurostat, 2025). Taken together, these trends make population ageing a major socioeconomic challenge, as social protection systems come under increasing strain and the role of older adults in the labour market becomes progressively more important.

Demographic ageing places growing pressure on labour markets and social protection systems by shrinking the relative size of the working-age population, increasing old-age dependency ratios, and raising age-related public expenditure, particularly on pensions, healthcare, and long-term care (Emerson et al., 2024). As the balance between contributors and beneficiaries becomes less favourable, concerns about labour shortages, slower economic growth, and the fiscal sustainability of welfare systems become more pronounced (OECD, 2025a). In this context, the participation of older adults in the labour market is increasingly important, not only to alleviate labour supply constraints but also to sustain productivity, broaden the contribution base, and reduce the economic pressures associated with demographic change (OECD, 2025b; 2026). At the same time, the modern life-course model – in which employment is followed by retirement – should not be taken as a normative benchmark, since it is a historically recent social construction rather than a timeless arrangement, and one that may be reshaped as socioeconomic conditions evolve (Anton, 2016; Fields et al., 2018).

Although the economic relevance of older adults' employment has received growing scholarly attention, the literature remains fragmented across several partly disconnected fields, including gerontology, labour economics, social policy, and active ageing research (Allen, 2023; Menassa et al., 2023, van Soest & Zaidi, 2015). As a result, existing studies often examine only selected dimensions of later-life employment, such as retirement timing, employability, health, productivity, or pension incentives (Cau-Bareille et al., 2022; Frangos et al., 2023), without integrating them into a broader explanatory structure. This fragmentation limits a more systematic understanding of how demographic change translates into labour market transformation (OECD, 2025b) and, in turn, into broader economic, social, and fiscal sustainability outcomes. What remains insufficiently developed is an integrated conceptual framework that links population ageing, the reconfiguration of work and retirement, enabling and constraining institutional conditions, and the diverse forms through which older adults participate in the labour market.

Against this background, this conceptual paper develops an integrated framework for understanding the economic importance of older adults' employment in ageing societies. The study contributes to the literature by connecting demographic change, labour market transformations, and sustainability change within a single analytical structure that explains how older adults' labour market participation may support economic resilience, social inclusion, and the long-term sustainability of welfare systems. In doing so, the paper moves beyond narrowly defined retirement or employability perspectives and proposes a broader lens for interpreting later-life work as part of ongoing societal and institutional transformations. The remainder of the paper is structured as follows: the next section reviews the literature on old age, employment, retirement, and the labour market role of older workers; the following section develops the proposed conceptual framework and its core propositions; the final section discusses the theoretical and practical implications of the framework and outlines directions for future research.

2. Literature review

2.1. From chronological old age to functional ageing

Age thresholds and classifications are not clearly established and remain subject to ongoing debate in the academic and policy literature. The traditional 65-year threshold is often treated as a historical convention, closely linked to nineteenth-century pension arrangements rather than to actual functional capacity (Orimo et al., 2006). Researchers increasingly emphasise that chronological age is a poor proxy for health, work ability, or social needs (Frangos et al., 2023). Today's older adults are often functionally more capable than previous generations, which is why contemporary research is shifting toward functional and person-centred definitions of ageing, especially in the context of labour market participation (Schoeni et al., 2008; United Nations, 2019).

In response to earlier views on ageing as a stage of inevitable physical and mental decline, social withdrawal, and growing dependency, as well as to later concerns about its fiscal implications, a more differentiated and analytically nuanced perspective on ageing gradually emerged. The term "third age" gradually replaced "old age" in administrative and policy discourse, stressing active lifestyles and self-realisation after retirement, while "fourth age" came to describe later old age associated with disability and dependency (Bourdelaïs, 1999; Landolfi, 2023). This shift also strengthened interest in biological age, functional age, healthy ageing, and successful ageing, reflecting a broader move away from purely chronological understandings of later life (Frangos et al., 2023; Rowe and Kahn, 1997; World Health Organization, 2015). In this perspective, ageing came to be increasingly assessed in terms of physical and cognitive functioning, disease burden, autonomy, and continued social participation, thereby reinforcing the view that older people do not constitute a homogeneous category but rather a highly diverse group whose capacities, needs, and labour-market potential vary substantially.

Building on the influential conceptualisation of successful ageing proposed by Rowe and Kahn (1997), which challenged deficit-oriented conceptions of later life by highlighting the importance of preserving physical and cognitive functions alongside active engagement, the World Health Organization's (WHO) World Report on Ageing and Health (2015) consolidated a decisive shift towards a functional perspective on ageing. By placing *functional ability* at the core of healthy ageing, the report marked a conceptual and policy turning point that has since shaped contemporary research, policy discourse, and institutional approaches to ageing. Subsequent WHO work (World Health Organisation, 2021) further operationalised this perspective through the concept of *intrinsic capacity* (IC), detailing it across key domains such as locomotor, cognitive, sensory, psychological, and vitality capacities, thereby providing a more structured basis for assessing ageing beyond chronological age alone.

The concept of functional ageing refers to an approach that assesses ageing not in terms of chronological age alone, but through an individual's physical, cognitive, and social capacities that enable independent and meaningful functioning in everyday life, thereby contributing to quality of life and longevity (Frangos et al., 2023; Kok et al., 2025). While this perspective builds on critiques of age-based classifications (Kotschy et al., 2025), it emphasises functionality as a central analytical category, recognising that chronological age alone provides limited insight into actual work ability, adaptability, and autonomy. In this context, following the WHO's conceptualisation of intrinsic capacity, recent research in geriatrics, public health, and related fields has increasingly focused on operationalising its key domains and examining their ability to predict ageing outcomes. These studies show that higher levels of intrinsic capacity are associated with lower risks of functional decline, frailty, and dependency (Sánchez-Sánchez et al., 2024; Zhu et al., 2025; Simões et al., 2025), thereby reinforcing the importance of multidimensional and capacity-based approaches to understanding ageing trajectories.

Overall, the shift from a merely chronological to a functional understanding of ageing challenges conventional assumptions about older adults' work capacity and social roles. In doing so, it also calls into question the traditional model of retirement as a clear, irreversible exit from employment, thereby providing a basis for a broader discussion of extended and flexible work lives.

2.2. From retirement as exit to extended and flexible work lives

Before the Industrial Revolution, work was an integral part of life from childhood until death, and the end of working capacity usually coincided with exhaustion, disability, or illness (Humphries, 2012; Midwinter, 2009; Papathanassiou, 2007). The clear separation between working life and retirement was therefore not a natural fact, but a later institutional creation. During industrialisation, work became strongly tied to sectors that required physical endurance, and declining earnings in later life increased the need to define the boundary between productive labour and dependency (Haines, 2019).

In this context, Germany introduced the first modern old-age and disability social insurance system in 1889, as part of Chancellor Otto von Bismarck's broader welfare reforms (Coile et al., 2025). Although initially combining elements of disability and old-age protection and setting a relatively high pensionable age, the system gradually evolved into a comprehensive public pension scheme and established a model that later spread internationally. These developments laid the institutional foundations of contemporary Western retirement systems, in which public pensions became the principal source of income in old age. This model continues to shape retirement-income arrangements across advanced economies (Börsch-Supan, 2000). During the 20th century, developed countries gradually expanded old-age pension systems through broader coverage, more generous benefits, earlier access to retirement, and the inclusion of disability and survivors' benefits. Today, across the 38 OECD countries, full-career average wage earners now receive pensions with an average net replacement rate of 63% (OECD, 2025a).

Traditionally, retirement was conceptualised as a one-time and irreversible exit from the labour market, marking a clear transition from economic activity to dependency. However, as population ageing has intensified, this model has come under growing financial and demographic pressure, prompting renewed debate over its long-term sustainability and the need for changes. Since the 1990s, and more intensively from the early 2000s, many OECD and EU countries have implemented pension reforms aimed at extending working lives, including raising statutory retirement ages, restricting early retirement pathways, and strengthening incentives to remain in employment (Whitehouse, 2009; Carone et al., 2016; OECD, 2019). A central component of these reforms has been the gradual increase in the normal retirement age (NRA), which is projected to rise in 23 of the 38 OECD countries. In some cases, this process has been institutionalised through explicit links between the retirement age and life expectancy, an approach currently used in around one-quarter of OECD countries. If fully implemented, these arrangements could raise the NRA to 70 years or above in Denmark, Estonia, Italy, the Netherlands, and Sweden (OECD, 2023).

The effects of these reforms are already visible in labour market participation patterns. Across OECD countries, older individuals have become increasingly active in the labour market, and in the EU, the activity rate of older adults (aged 55–64) reached 67% in 2023, an increase of almost 20 percentage points compared to 2009 (European Commission, 2024). These developments show that retirement is no longer a fixed institutional endpoint but part of a broader transformation of the life course, shaped by sustainability pressures, pension design, and labour market needs. Yet age-based policy adjustments, especially those linking retirement age to life expectancy, risk oversimplifying the complex and heterogeneous realities of ageing and later-life labour market participation, thereby necessitating a more nuanced understanding of who older workers are and how they engage in the labour market.

2.3. Rethinking older workers: health and later-life employment patterns

Although old age is often associated with age 65, the labour market concept of an “older worker” is broader and more pragmatic. Different studies define older workers from age 45, 50, 55, 60, or 65, depending on the research question, occupational context, and policy focus (Maestas et al., 2016; Steenstra et al., 2017; Yen et al., 2025). Historically, the upper age boundary of the working age was closely tied to the institutionalisation of retirement and the emergence of pension systems, which helped establish age 65 as a conventional threshold in both policy and public discourse. Over time, however, this understanding has evolved (Bourdelaïs, 1999; Orimo et al., 2006). As labour markets became more differentiated and life expectancy increased, researchers increasingly treated “older workers” as a relative labour market category rather than a group defined solely by the statutory retirement age (Baars, 2016; Eurofound, 2025). In many contexts, workers aged 45 or 50 and above are already considered older workers because they may face age-related disadvantages in hiring, career progression, retraining opportunities, and/or job retention long before reaching retirement age (Kalwij & Vermeulen, 2007; Steenstra et al., 2017; van Soest & Zaidi, 2015). This ambiguity suggests that the category of an older worker is relative and linked more closely to labour force retention and career termination than to a single pension-based threshold.

At the same time, the classification of workers as “older” from as early as age 45 or 50 is not solely a matter of perception or labour market bias. It also reflects age-related challenges that affect individuals’ health, functional capacity, and overall ability to meet evolving labour market demands. Demographic evidence cited above shows that increases in life expectancy are not necessarily accompanied by equivalent gains in healthy life expectancy. This gap has increased over time, rising from 8.62 to 9.72 years and is projected to widen further (Cao, 2020), suggesting that a growing share of later life is spent in less favourable health conditions. As a result, individuals reach older ages with heterogeneous levels of physical and cognitive capacity that may constrain sustained labour market participation and re-entry. This is consistent with empirical evidence indicating that long-term health conditions and functional limitations remain important determinants of work ability at older ages, particularly in physically demanding jobs (Seeberg et al., 2022). Evidence further indicates that cognitive functioning also plays a significant role, as lower cognitive performance may limit the ability to meet job demands, adapt to changing work environments, and sustain productivity (Fattori et al., 2024).

Despite these health-related constraints, the labour market participation of older individuals has increased in recent decades, reflecting both demographic pressures and policy efforts to extend working lives (Allen, 2023). This growing presence of older individuals in employment has, in turn, heightened the need to better understand the patterns and characteristics of their labour market participation.

Recent research indicates that older workers are not evenly distributed across the labour market but tend to be concentrated in specific sectors and types of employment. In OECD countries, older workers are overrepresented in sectors such as healthcare and education, where employment rates for women aged 55-59 rose by

18.5 percentage points between 2000 and 2024, reflecting demographic shifts, policy reforms, and improvements in health and education (OECD, 2025b). Likewise, in the EU, workers aged 55 and over are disproportionately employed in healthcare and social work, public administration, education, defence, professional, scientific and technical activities, wholesale and retail trade, and agriculture (Allen, 2023; European Commission, 2024; Eurofound, 2025), reflecting both sectoral labour demand and institutional employment arrangements. This concentration appears to be driven in part by higher retention among older workers in more stable and empowered jobs, which account for around one-third of older workers, although about one-fifth remain in high-strain positions associated with poorer well-being outcomes (Eurofound, 2025). Moreover, some older workers are channelled into low-wage and low-skill jobs in economically declining sectors (Grundy, 1991).

In addition to sectoral concentration, later-life employment is increasingly characterised by more flexible and diverse work arrangements. Rather than a uniform extension of full-time employment, later-life work is often characterised by a wide range of employment forms. Empirical evidence shows that older adults engage in part-time arrangements, phased retirement, self-employment, informal work, precarious employment, unpaid family work, bridge employment, and “unretirement” (Chen & Gardiner, 2019; Dufour et al., 2021; Lee & Kim, 2017). Also, they are more likely to be found in less physically demanding roles, particularly in sectors where flexible work arrangements are more available (Albinowski, 2024). Re-entry into work after retirement often involves lower-paid service jobs, yet full-time re-employment has also been associated with better physical health for some groups (Nakajima et al., 2022; Yen et al., 2025). Gender differences are also pronounced, as women in later life are more likely than men to work part-time, particularly in Western and Northern Europe (Kalwij & Vermeulen, 2007; OECD, 2025b).

Yet another important dimension of later-life employment concerns the role of highly qualified workers in advanced economies. Evidence suggests that extended working lives are particularly prevalent among managers, professionals, and other high-skilled employees, who are more likely to remain economically active at older ages and are disproportionately represented in high-skill occupations in advanced economies, reflecting the continued relevance of accumulated experience and cognitive skills for productivity in knowledge-based work (Beier & Fisher, 2025). This is partly because knowledge-intensive and service-oriented occupations – such as information technology, research, and other desk-based activities – are less physically demanding and more adaptable to age-related changes in capacity (Garcia et al., 2025). In addition, higher-skilled individuals are more likely to engage in self-employment or continue in professional and managerial roles, benefiting from greater autonomy and more favourable working conditions (Hoogendoorn et al., 2024).

These patterns vary across institutional and individual contexts: in some cases, older workers voluntarily transition into self-employment or informal activities after retirement, while in others they express a preference for partial retirement but face constrained choices between full-time employment and complete labour market exit (Kantarıcı et al., 2025; van Soest & Zaidi, 2015). Taken together, this variation reflects

a growing recognition that older individuals differ substantially in their capacities, preferences, and work ability, and that labour market participation in later life should be aligned with this heterogeneity. Consequently, the role of older adults is gradually being redefined – from passive recipients of pensions to active contributors to labour supply and economic performance – highlighting their increasing importance in ageing societies.

2.4. Motivations, individual benefits, and constraints of older adults' employment

Older adults remain in the workforce for a combination of financial and non-monetary reasons. Financial security is a major driver, especially where social security systems are weaker or where pension reforms discourage early retirement (Lee and Kim, 2017). Many older workers continue working to supplement pensions or retirement savings, particularly when limited assets must be stretched over longer life expectancy or when faced with rising living costs, particularly healthcare expenses. This, in turn, allows them to avoid drawing down personal savings or relying on family support, while maintaining access to employer-sponsored health insurance and other employment-related benefits (Rahayuwati et al., 2024). At the same time, the need to work longer is unevenly distributed. Individuals with lower levels of assets, education, or health are more likely to remain in employment out of necessity, while those with greater resources have more flexibility in retirement decisions. Limited financial literacy further exacerbates these disparities by constraining effective retirement planning (Toder et al., 2008, National Academies of Sciences, Engineering, and Medicine, 2022). Overall, extended working lives are often driven not only by choice but also by financial necessity, highlighting the importance of policies that protect those unable to continue working due to poor health or insufficient resources.

At the same time, work at older ages can support subjective well-being, healthy ageing, social participation, and the prevention of isolation by providing structure to daily life, maintaining social networks, and fostering a sense of purpose and identity (Duffield et al., 2014; Nakajima et al., 2022; van Soest & Zaidi, 2015). Continued engagement in work may also contribute to better mental health outcomes, fewer depressive symptoms, and higher levels of happiness, particularly when working conditions are supportive and aligned with individual capacities. Meanwhile, retirement has in some cases been associated with declines in health, self-esteem, and social contact (Kantarci et al., 2025; Lee & Kim, 2017; Nakajima et al., 2022). Overall, these findings indicate that later-life employment is not only economically important for labour markets and the sustainability of social protection systems, but also beneficial for older individuals themselves, as continued engagement in work – when supported by appropriate conditions – can contribute to both their physical and mental well-being.

However, the contemporary period is also marked by a tension between improved health and longevity (Quinby & Wettstein, 2024), on the one hand, and persistent ageism, stereotypes, and institutionally rigid age boundaries, on the other. Ageism often involves viewing older people as weak, helpless, and unable to contribute to

societal well-being, which justifies their marginalisation in employment, healthcare, and public life (Ayalon et al., 2020). Unlike racism or sexism, ageism is frequently overlooked or socially condoned, with age-based prejudice considered more acceptable and less serious than other forms of discrimination (Iversen et al., 2009). In the labour market, ageism manifests as persistent stereotypes that older workers perform less effectively, are unable to adapt to change, have difficulty learning new skills, and are more expensive to employ due to higher wages or more comprehensive benefits packages (Posthuma & Campion, 2009). Although there is a shift toward the concept of functional ageing, which emphasises a person's skills and health rather than chronological age, existing stereotypes remain serious barriers to employment and professional growth (Iversen et al., 2009; Kunze & De Meulenaere, 2024). This mismatch has important implications for labour market dynamics and long-term sustainability, as it may lead to the underutilisation of older workers' potential.

Ageism is not only a matter of social prejudice or employer bias – it is also reinforced by institutional structures such as mandatory retirement rules, which allow employers to fire older employees with significantly fewer legal complications than in ordinary situations (Rabaté, 2019). These regulations result in individuals' complete reliance on the employer's goodwill for their participation in the labour market, and legal protection is significantly weakened once a certain age is reached (Tunney and Oude Mulders, 2021). Institutional barriers are also evident in the laws that regulate the final years of a person's career. While these laws are designed to protect current employees, they often impede individuals who have lost their jobs from finding new employment (Bennett & Möhring, 2014). Taken together, these institutional and regulatory constraints need to be reoriented towards policies that support longer and more secure labour market participation, with frameworks that support the retention, re-employment, and fair treatment of older workers.

2.5. Economic importance of retaining older workers in the labour market

Retaining older workers in the labour market is increasingly regarded as an economic necessity, particularly in ageing societies such as the European Union and many OECD countries. Higher labour force participation among older people helps mitigate the adverse effects of population ageing on output and tax revenues (Guillemette & Château, 2023; Koutsogeorgopoulou & Morgavi, 2025). Fiscal model analyses further indicate that policies aimed at delaying labour market exit can reduce long-term pressures on public budgets by expanding the labour force and strengthening tax revenues (OECD, 2025b). As long as older workers remain employed, they continue to earn wages and salaries, thereby contributing directly to GDP through their labour input and indirectly through their consumption. Their continued earnings tend to support household expenditure on goods and services (Crawford et al., 2022), thereby sustaining aggregate demand and partly offsetting the slower growth of younger population cohorts.

Employment at an older age is associated with better self-reported physical and mental health because employment provides structure, social contacts, and a sense

of purpose (Sonntag et al., 2023). In addition, employment can support social integration and reinforce identity and self-worth, which are critical components of healthy ageing (Khalid & Syed, 2024). Evidence suggests that healthier older people are more likely to remain employed, and that continued employment can, in turn, help maintain functional capacity and reduce disability, thereby delaying the need for intensive care (Lee & Kwak, 2025). This bidirectional relationship between health and employment suggests that better outcomes among working older adults may reflect both the fact that healthier individuals are more likely to remain employed and the possibility that continued employment itself contributes to maintaining health. At the macroeconomic level, this means that a healthier and more active older workforce may mitigate some of the adverse effects of population ageing by reducing pressure on healthcare and long-term care systems (Cylus, 2024).

Beyond health-related benefits, an important aspect of older adults' employment lies in their role as carriers of accumulated knowledge and experience, particularly in senior and leadership positions. Older workers often contribute to complex decision-making through their developed judgment, professional networks, and long-term sectoral expertise, which matter for productivity growth (Allen, 2023; Garcia et al., 2025), and are difficult to substitute in the short term. Their experience can enhance risk assessment, improve crisis management, and support the mentoring and development of younger employees, thereby strengthening organisational resilience and capacity for innovation. In addition, research on leadership and age diversity suggests that older leaders may foster higher engagement and well-being among older employees, particularly when leadership approaches are relational and values-oriented (Zellman et al., 2025). Measures such as flexible schedules, mixed-age teams, age-specific equipment, and broader job redesign can help convert the experience of older workers into productive and sustainable labour market participation (Allen, 2023; Göbel & Zwick, 2013; Kim et al., 2025).

Retaining experienced workers in high-level positions also helps organisations preserve institutional memory and avoid productivity losses associated with abrupt retirements (Saraki & Ade, 2025). This continuity of knowledge is especially important in high-skill sectors and public institutions, where replacing senior staff is both costly and time-consuming, further reinforcing the economic importance of sustained employment at older ages. Highly educated older individuals in non-routine jobs may have particularly strong potential for extended working lives, especially through partial retirement arrangements (Kantarci et al., 2025). Yet significant obstacles remain: lower hiring probabilities, age discrimination, gendered disadvantage, and limited access to age-friendly workplaces (Allen, 2023; Chen and Gardiner, 2019; Kim et al., 2025). Measures such as flexible schedules, mixed-age teams, age-specific equipment, and broader job redesign can help convert the experience of older workers into productive and sustainable labour market participation (Allen, 2023; Göbel and Zwick, 2013; Kim et al., 2025).

Beyond income, health, and leadership, the continued labour market participation of older individuals generates broader systemic benefits. Evidence suggests that intergenerational teams combining younger and older workers may

enhance innovation by integrating new perspectives with accumulated experience (Thönnissen & Kuonen, 2025). At the organisational level, retaining experienced employees can reduce turnover and recruitment costs, while also improving reliability and preserving job-specific skills (Westover, 2024). At the societal level, prolonged employment may strengthen social cohesion by supporting the integration of older adults into working communities and reducing the risk of social isolation, particularly when work is motivated by non-financial considerations (Murayama et al., 2025). Moreover, extended participation in the labour market increases contributions to pension and social insurance systems (Chrostek et al., 2024), thereby alleviating pressure on younger generations and supporting the long-term sustainability of public finances.

Although public discourse sometimes assumes that older workers crowd out younger workers, empirical research has repeatedly rejected this so-called “lump of labour fallacy” (OECD, 2025b). Rather than displacing younger workers, older workers’ participation reflects broader labour market dynamics, including intergenerational complementarities and overall economic expansion. Evidence further suggests that the employment of older individuals does not reduce overall productivity and may even positively contribute to total factor productivity and broader economic performance (Huang et al., 2019). In this sense, the economic importance of older adults’ employment cannot be reduced to labour supply alone; it is also linked to knowledge retention, productivity, social inclusion, and the long-term sustainability of welfare systems (Allen, 2023; OECD, 2025b; United Nations, 2023). Taken together, these insights suggest that assessing the economic importance of older adults’ employment requires a holistic perspective that goes beyond narrow fiscal or growth-oriented metrics to encompass its broader contributions to productivity, knowledge transfer, social cohesion, and the long-term sustainability of economic and social systems.

3. Conceptual framework for sustainable labour market transformation

The literature reviewed above suggests that the economic importance of older adults’ employment should be understood through an integrated framework rather than through isolated variables (Frangos et al., 2023; Menassa et al., 2023; Eurofound, 2025). The proposed conceptual framework, therefore, builds directly on the preceding analysis by integrating fragmented strands of literature into a coherent explanatory structure. While existing research tends to examine *ageing*, *retirement*, *health*, and *labour market participation* separately, this framework conceptualises them as interdependent components of a broader transformation process. In doing so, it moves beyond descriptive accounts and offers a theoretically grounded model that explains how demographic ageing translates into labour market outcomes and, ultimately, its sustainability implications. The framework is therefore not merely a synthesis of prior findings, but a structured analytical lens that identifies causal pathways, mediating mechanisms, and moderating factors shaping later-life

employment. Based on the literature review, the following conceptual framework is proposed to systematically capture these interrelated dynamics.

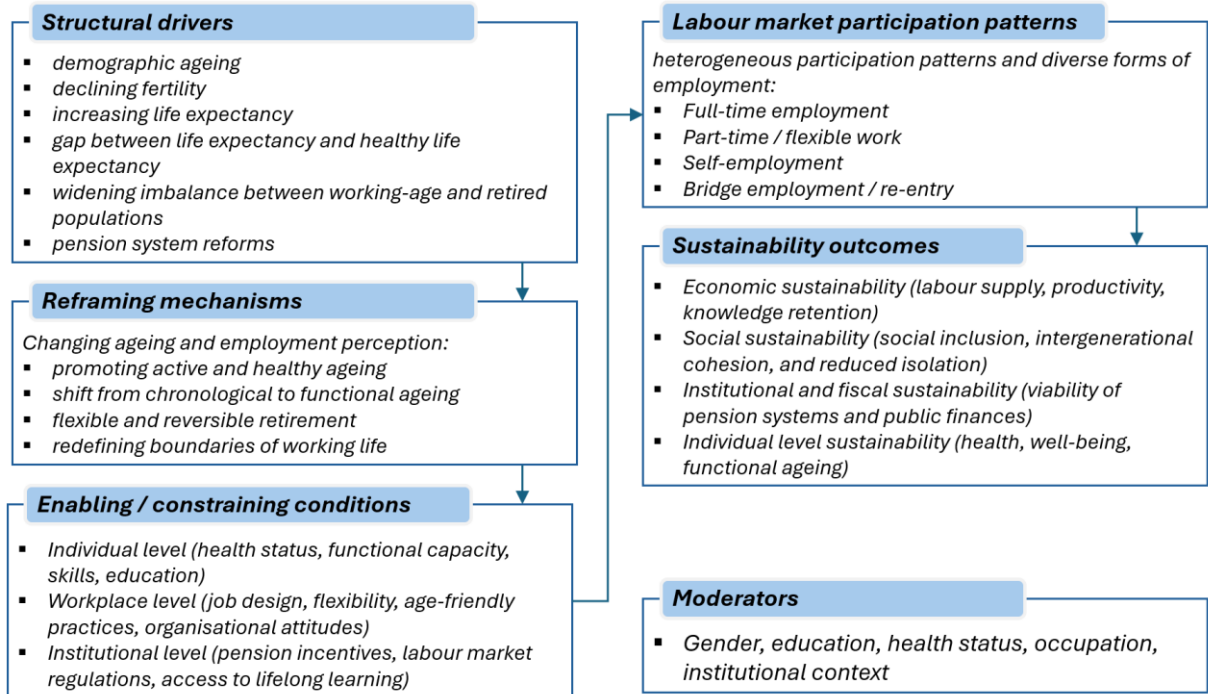


Fig. 1. Conceptual framework.
Source: designed by the authors.

The central idea of the framework is that later-life employment is not determined by a single factor but emerges from the interaction between structural demographic forces, evolving conceptualisations of ageing, and multi-level enabling conditions. These interactions shape diverse labour market participation patterns, which in turn generate multidimensional sustainability outcomes at the economic, social, institutional, and individual levels.

Structural drivers. At the macro level, the framework is anchored in structural drivers that create the conditions for labour market transformation. These include demographic ageing, declining fertility, increasing life expectancy, and the widening imbalance between working-age and retired populations (Allen, 2023; Emerson et al., 2024; Ivic et al., 2021). Importantly, these trends are compounded by a persistent gap between life expectancy and healthy life expectancy, which implies that longer lives are not necessarily accompanied by prolonged work capacity. These developments increase pressure on pension systems, labour supply, and fiscal sustainability (Chen and Gardiner, 2019; Fenge and Peglow, 2018; Lai and Yip, 2021). Thus, labour and skill shortages in many advanced economies increase the demand for retaining older workers, while pension system reforms – particularly those raising retirement ages and linking them to life expectancy – reshape incentives for prolonged employment. Together, these forces generate both pressure and

opportunity, making extended working lives not only a policy response but a structural necessity.

Reframing mechanisms. A second layer of the framework consists of reframing mechanisms that translate structural pressures into changes in how ageing and work are understood. The shift from chronological to functional ageing redefines employability by focusing on capacity rather than age thresholds, while evolving narratives around active and healthy ageing challenge traditional associations between old age and dependency (Frangos et al., 2023; Dufour et al., 2021). At the same time, retirement is increasingly conceptualised not as a fixed endpoint but as a flexible and reversible process. These conceptual shifts act as a bridge between demographic change and labour market transformation by redefining the boundaries of working life in terms of who is considered employable, productive, or in need of support in later life (Allen, 2023; van Soest and Zaidi, 2015), and by legitimising extended participation. In this sense, reframing mechanisms play a critical role in aligning institutional logic with the heterogeneous realities of ageing.

Enabling and constraining conditions. The translation of these shifts into actual labour market outcomes depends on a set of enabling and constraining conditions operating at multiple levels. At the *individual level*, health status, functional capacity, skills, and education shape the ability to remain economically active. At the *workplace level*, job design, flexibility, age-friendly practices, and organisational attitudes – including ageism – determine whether older workers can effectively participate. At the *institutional level*, pension incentives, labour market regulations, access to lifelong learning, and healthcare systems either support or hinder extended working lives (Eurofound, 2025; Garcia et al., 2025; OECD, 2025b). The interaction of these conditions explains why similar demographic contexts can produce markedly different employment outcomes across countries and groups.

Labour market participation patterns. Within this framework, later-life employment is conceptualised as a spectrum of heterogeneous participation patterns rather than a binary choice between work and retirement (Dufour et al., 2021; Kalwij and Vermeulen, 2007; Kantarcı et al., 2025). Older individuals engage in diverse forms of employment, including full-time work, part-time arrangements, self-employment, bridge employment, and post-retirement re-entry (OECD, 2025b; United Nations, 2019). These patterns reflect both individual heterogeneity and institutional constraints. Importantly, this diversity is not merely descriptive but analytically central, as different forms of employment generate different economic, social, and health outcomes. Recognising this heterogeneity is essential for empirical analysis, as it enables the identification of differentiated effects and avoids aggregation bias in assessing the role of older workers in the economy.

Sustainability outcomes. The final component of the framework concerns sustainability outcomes, which are conceptualised as multidimensional. *Economic sustainability* includes labour supply, productivity, and knowledge retention, while *social sustainability* encompasses social inclusion, intergenerational cohesion, and reduced isolation (Rollnik-Sadowska, 2023). *Institutional and fiscal sustainability* relate to the viability of pension systems and public finances. At the *individual level*,

outcomes include health, well-being, and functional ageing (Gianfredi et al., 2025). These dimensions are interconnected: for example, healthier older workers are more productive and less reliant on public support, thereby linking individual and macro-level outcomes. The framework thus highlights that the benefits of later-life employment extend beyond narrow economic indicators and must be understood within a broader sustainability context. This multidimensional perspective is crucial for developing policies that effectively harness the “longevity dividend” by addressing roadblocks to productive ageing and fostering an environment where older workers can thrive (Scott, 2021; OECD, 2025b).

The discussed points lead to the following *conceptual propositions*:

- P1. A functional, rather than chronological, understanding of ageing enhances the economic potential of older adults’ employment by better aligning labour market participation with actual work capacity.
- P2. Age-friendly workplace arrangements mediate the relationship between demographic ageing and sustainable labour market outcomes.
- P3. Pension system design moderates the relationship between population ageing and later-life labour force participation.
- P4. Ageism weakens the transformation of older workers’ human capital into productivity and sustainability outcomes.
- P5. The sustainability benefits of older adults’ employment are stronger in contexts characterised by better health, higher skills, and supportive institutional environments.

Taken together, the proposed framework conceptualises later-life employment as the outcome of interacting structural forces, reframing mechanisms, and enabling or constraining conditions, which jointly shape heterogeneous labour market participation patterns and their sustainability implications. By explicitly linking these components, the framework moves beyond fragmented approaches and provides a coherent basis for analysing how demographic ageing translates into economic, social, and institutional outcomes. Importantly, the conceptual propositions derived from this framework are formulated in a way that allows for empirical testing, thereby bridging the gap between theoretical reasoning and quantitative analysis. The following section, therefore, outlines how the proposed relationships can be operationalised and examined using appropriate empirical strategies.

4. Directions for empirical operationalisation of the framework

The empirical evaluation of factors affecting economic growth requires a move from broad conceptual language to precise quantitative measurement (Bloom et al., 2000). In economic research, the central challenge is not only to identify statistical associations but to demonstrate causality (Wooldridge, 2013). This is especially important when analysing the economic importance of older adults’ employment, because the relevant relationships are multidimensional and potentially shaped by endogeneity, omitted variables, and reverse causality (Kalwij & Vermeulen, 2007; Lai & Yip, 2021; Teixeira et al., 2016). These methodological challenges underscore the

need for rigorous empirical strategies capable of identifying causal relationships and accounting for the complex dynamics inherent in ageing and economic performance.

In multi-country research, panel data approaches are especially useful because they combine cross-sectional and time-series variation (Verbeek, 2004). At the same time, the choice between fixed-effects and random-effects frameworks requires careful consideration of unobserved heterogeneity (Gujarati, 2003). Static panel models are helpful as benchmarks, yet they are often criticised for their limited ability to address endogeneity and persistence in macroeconomic processes (Teixeira et al., 2016). For this reason, research on ageing and economic performance increasingly uses instrumental-variable strategies and dynamic panel estimators such as Difference GMM and System GMM (Temsunrit, 2023). These approaches are valuable because they help isolate causal effects, control for unobserved country heterogeneity, and account for the persistence of economic outcomes over time (Windmeijer, 2005). Strong post-estimation diagnostics remain essential, including tests of serial correlation and instrument validity (Teixeira et al., 2016).

A further methodological complication is cross-sectional dependence. Countries in the European Union or OECD cannot realistically be treated as independent units because they are connected through common shocks, shared policy environments, and spatial interdependencies (Papapetrou & Tsalaporta, 2020; Yaqoob et al., 2025). This is why newer approaches, including cross-sectionally augmented ARDL and distributed lag models, have gained importance in recent macroeconomic research (Chudik & Pesaran, 2013; Chudik et al., 2015). Taken together, these approaches highlight the need for flexible and advanced methodological frameworks capable of capturing non-linear, mediated, and heterogeneous relationships in the analysis of ageing and economic outcomes.

In contemporary growth research, non-linear relationships are also often recognised in the impact of demographic variables (González et al., 2005). Threshold effects, regime shifts, and heterogeneous responses can be studied through frameworks such as Panel Smooth Transition Regression (Pan & Chang, 2019). Beyond that, mediation analysis is useful when the objective is not only to test whether older adults' employment matters, but also through which channels it matters (Huang et al., 2019). Recent computational approaches, including double machine learning and heterogeneous treatment effect estimation, further expand the possibilities for analysing complex and high-dimensional macro-social relationships (Chernozhukov et al., 2016; Syrgkanis et al., 2019).

Overall, the methodological discussion highlights that the empirical operationalisation of the proposed framework requires approaches capable of addressing endogeneity, cross-sectional dependence, and non-linear and heterogeneous dynamics inherent in ageing-related processes. In this context, future research should prioritise integrative and flexible empirical strategies that combine causal inference, advanced econometric techniques, and data-driven methods to adequately capture the multidimensional relationships linking demographic change, labour market participation, and sustainability outcomes.

5. Concluding remarks

The paper rethinks the economic importance of older adults' employment by proposing an integrated conceptual framework that connects demographic change, labour market dynamics, and sustainability outcomes. The analysis demonstrates that later-life employment cannot be understood through isolated variables such as retirement age or labour supply alone, but must be examined as part of a broader transformation of the life course shaped by demographic pressures, institutional arrangements, and individual capacities.

The findings underscore that work capacity, retirement age, and the category of the "older worker" are socially and historically constructed rather than biologically fixed. As societies move away from a standardised retirement model towards more fluid and extended working lives, later-life employment emerges as a multidimensional phenomenon shaped by heterogeneous health trajectories, skills, motivations, and institutional constraints. In this context, age-based policy approaches that rely on fixed thresholds risk oversimplifying the complex realities of ageing, particularly given the persistent gap between life expectancy and healthy life expectancy and the resulting diversity in work capacity.

A key contribution of the paper is to highlight the importance of shifting from a chronological to a functional understanding of ageing. By focusing on individuals' actual capacities rather than age alone, this perspective challenges conventional assumptions about productivity and employability, while emphasising the need to align labour market institutions and workplace practices with the heterogeneous realities of ageing populations. Despite this shift, many existing systems continue to rely on rigid age boundaries, limiting the effective utilisation of older workers' potential and reinforcing structural inefficiencies in labour markets.

The analysis further shows that later-life employment is characterised not only by sectoral concentration but also by occupational stratification and increasing diversity in employment forms. Extended working lives are more prevalent among higher-skilled workers and in knowledge-intensive occupations, where accumulated experience and cognitive skills remain highly valuable and where job demands are more adaptable to age-related changes in capacity. At the same time, a wide range of flexible employment arrangements – including part-time work, self-employment, and phased retirement – reflects both individual heterogeneity and institutional constraints, highlighting the need for more adaptable and inclusive employment structures.

Importantly, the economic relevance of older adults' employment extends beyond fiscal considerations and labour supply effects. Continued participation in the labour market contributes to productivity, knowledge retention, organisational resilience, and social cohesion, while also supporting individual well-being and healthy ageing. At the macro level, extended working lives can help sustain aggregate demand, alleviate pressure on public finances and healthcare systems, and improve the utilisation of accumulated human capital, particularly in senior and knowledge-intensive roles. However, these benefits are not automatic and depend critically on

job quality, working conditions, and the alignment between job demands and individual capacities.

From a policy perspective, these findings suggest that sustainable labour market transformation requires a holistic systemic approach. Rather than relying solely on parametric reforms such as increasing the retirement age, policymakers should focus on creating age-inclusive labour market institutions that support flexible employment trajectories, lifelong learning, and age-friendly work environments. Such an approach should also address structural barriers, including age discrimination and institutional rigidities, while recognising the diversity of ageing trajectories and the unequal distribution of opportunities to extend working lives.

Finally, the proposed framework provides a foundation for future empirical research by identifying key mechanisms, mediating factors, and moderating conditions that shape later-life employment and its outcomes. By explicitly linking structural drivers, reframing mechanisms, and labour market participation patterns to multidimensional sustainability outcomes, the framework opens new avenues for testing the causal pathways through which older adults' employment contributes to economic, social, institutional, and individual sustainability. Future research should prioritise cross-country analyses and advanced econometric approaches capable of capturing heterogeneity, non-linearity, and dynamic interactions. In this way, the framework contributes to both theoretical integration and evidence-based policymaking in ageing societies.

References

- Albinowski, M. (2023). Part-Time Employment Opportunities and Labour Supply of Older Workers. <https://doi.org/10.2139/ssrn.4646492>
- Allen, S. G. (2023). Demand for older workers: What do we know? What do we need to learn? *The Journal of the Economics of Ageing*, 24, 100414. <https://doi.org/10.1016/j.jeoa.2022.100414>
- Anton, A. L. (2016). How long should people work? The debate over the retiring age. *The Palgrave Handbook of the Philosophy of Aging*, 495–516. https://doi.org/10.1057/978-1-137-39356-2_27
- Ayalon, L., Chasteen, A., Diehl, M., Levy, B. R., Neupert, S. D., Rothermund, K., Tesch-Römer, C., & Wahl, H.-W. (2020). Aging in times of the COVID-19 pandemic: Avoiding ageism and fostering intergenerational solidarity. *The Journals of Gerontology: Series B*, 76(2). <https://doi.org/10.1093/geronb/gbaa051>
- Baars, J. (2016). Concepts of time in age and aging. *The Palgrave Handbook of the Philosophy of Aging*, 69–86. https://doi.org/10.1057/978-1-137-39356-2_5
- Beier, M. E., & Fisher, G. G. (2025). Aging, work, and retirement: Twenty-first-century issues in an interdisciplinary context. *Annual Review of Organizational Psychology and Organizational Behavior*, 13, 221–249. <https://doi.org/10.1146/annurev-orgpsych-020924-071358>
- Bennett, J., & Möhring, K. (2014). Cumulative (dis)advantage? The impact of labour market policies on late career employment from a life course perspective. *Journal of Social Policy*, 44(2), 213–233. <https://doi.org/10.1017/s0047279414000816>

- Bloom, D. E., Canning, D., & Malaney, P. N. (2000). Population dynamics and economic growth in Asia. *Population and Development Review*, 26, 257–290.
<http://www.jstor.org/stable/3115219>
- Börsch-Supan, A. (2000). A model under siege: A case study of the German retirement insurance system. *The Economic Journal*, 110(461), F24–F45.
<http://www.jstor.org/stable/2565940>
- Bourdelaïs, P. (1999). Demographic aging: A notion to revisit. *The History of the Family*, 4(1), 31–50. [https://doi.org/10.1016/s1081-602x\(99\)80264-4](https://doi.org/10.1016/s1081-602x(99)80264-4)
- Cao, X., Hou, Y., Zhang, X., Xu, C., Jia, P., Sun, X., ... & Wang, Y. (2020). A comparative, correlate analysis and projection of global and regional life expectancy, healthy life expectancy, and their gap: 1995-2025. *Journal of Global Health*, 10(2), 020407.
<https://doi.org/10.7189/jogh.10.020407>
- Carone, G., Eckefeldt, P., Giamboni, L., Laine, V., & Pamies-Sumner, S. (2016). Pension reforms in the EU since the early 2000's: Achievements and challenges ahead (Discussion Paper No. 42). European Commission. https://economy-finance.ec.europa.eu/document/download/4a2718d0-5599-4e60-84aa-39f9535fba85_en?filename=dp042_en.pdf
- Cau-Bareille, D., Jolivet, A., Thébault, J., & Delgoulet, C. (2022). Training: A way of reducing the risks of weakening for older workers at work and in employment? The case of a call centre. *Safety Science*, 148, 105581. <https://doi.org/10.1016/j.ssci.2021.105581>
- Chen, M. K.-L., & Gardiner, E. (2019). Supporting older workers to work: A systematic review. *Personnel Review*, 48(5), 1318–1335. <https://doi.org/10.1108/pr-11-2018-0455>
- Chernozhukov, V., Chetverikov, D., Demirer, M., Duflo, E., Hansen, C., & Newey, W. K. (2016). Double machine learning for treatment and causal parameters. <https://doi.org/10.1920/wp.cem.2016.4916>
- Chrostek, P., Karbownik, K., & Myck, M. (2024). Labor market externalities of pre-retirement employment protection (No. w32371). National Bureau of Economic Research. <https://doi.org/10.3386/w32371>
- Chudik, A., & Pesaran, M. H. (2013). Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2316329>
- Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2015, January). Long-run effects in large heterogeneous panel data models with cross-sectionally correlated errors. Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute. <https://www.dallasfed.org/research/international/-/media/documents/research/international/wpapers/2015/0223.pdf>
- Coile, C., Wise, D., Börsch-Supan, A., Gruber, J., Milligan, K., Woodbury, R., ... & Yashiro, N. (2025). Social security and retirement around the world: Lessons from a long-term collaboration. *Journal of Pension Economics & Finance*, 24(1), 8-30.
<https://doi.org/10.1017/S1474747223000215>
- Crawford, R., Karjalainen, H., & Sturrock, D. (2022). How does spending change through retirement? (No. R209). IFS Report. <https://ifs.org.uk/sites/default/files/2022-09/IFS-Report-R209-How-does-spending-change-through-retirement.pdf>
- Cylus, J. (2024). Health, an ageing labour force, and the economy: Does health moderate the relationship between population age-structure and economic growth? *European Journal of Public Health*, 34(Supplement 3), ckae144-445.
<https://doi.org/10.1093/eurpub/ckae144.445>

- Duffield, C., Graham, E., Donoghue, J., Griffiths, R., Bichel-Findlay, J., & Dimitrelis, S. (2014). Why older nurses leave the workforce and the implications of them staying. *Journal of Clinical Nursing*, 24(5–6), 824–831. <https://doi.org/10.1111/jocn.12747>
- Dufour, M.-E., Saba, T., & Ballesteros Leiva, F. (2021). Planned retirement age: Do attachment to work and expectations relating to workplace adjustments matter? *Equality, Diversity and Inclusion: An International Journal*, 40(7), 892–906. <https://doi.org/10.1108/edi-09-2020-0281>
- Emerson, P., Knabb, S., & Sirbu, A.-I. (2024). Does the old-age dependency ratio place a drag on secular growth? *Economic Analysis and Policy*, 82, 1056–1070. <https://doi.org/10.1016/j.eap.2024.04.026>
- Eurofound. (2025, March 31). Keeping older workers in the labour force. Publications Office of the European Union. <https://www.eurofound.europa.eu/en/publications/all/keeping-older-workers-labour-force>
- European Commission. (2024). Labour market and wage developments: Annual review 2024. <https://doi.org/10.2767/967925>
- Eurostat. (2025). Healthy life years statistics. [https://ec.europa.eu/eurostat/databrowser/view/hlth_hlye\\$defaultview/default/table](https://ec.europa.eu/eurostat/databrowser/view/hlth_hlye$defaultview/default/table)
- Fattori, A., Comotti, A., Barnini, T., Di Tecco, C., Laurino, M., Bufano, P., ... & Bonzini, M. (2024). Exploring workability in an older working population: associations with cognitive functioning, sleep quality, and technostress. *Frontiers in Public Health*, 12, 1303907. <https://doi.org/10.3389/fpubh.2024.1303907>
- Fenge, R., & Peglow, F. (2018). Decomposition of demographic effects on the German pension system. *The Journal of the Economics of Ageing*, 12, 61–76. <https://doi.org/10.1016/j.jeoa.2018.01.001>
- Fields, N. L., Adorno, G., Felderhoff, B., Parekh, R., Miller, V., Magruder, K., & Rogers, K. (2018). The social construction of “Emerging elders”: Implications for age-friendly community assessments. *Gerontology and Geriatric Medicine*, 4. <https://doi.org/10.1177/2333721418784844>
- Frangos, E., Graf, C., & Samaras, N. (2023). Functional aging: Integrating functionality to a multidimensional assessment of healthy aging. *Current Gerontology and Geriatrics Research*, 2023, 1–6. <https://doi.org/10.1155/2023/9409918>
- Garcia, I. L., Maestas, N., & Mullen, K. J. (2025). Aging and work capacity. *The Journal of the Economics of Ageing*, 31, 100576. <https://doi.org/10.1016/j.jeoa.2025.100576>
- Gianfredi, V., Nucci, D., Pennisi, F., Maggi, S., Veronese, N., & Soysal, P. (2025). Aging, longevity, and healthy aging: The public health approach. *Aging Clinical and Experimental Research*, 37(1), 125. <https://doi.org/10.1007/s40520-025-03021-8>
- Göbel, C., & Zwick, T. (2013). Are personnel measures effective in increasing productivity of old workers? *Labour Economics*, 22, 80–93. <https://doi.org/10.1016/j.labeco.2012.11.005>
- González, A., Teräsvirta, T., & van Dijk, D. (2005, August). Panel smooth transition regression models. EconStor. <https://www.econstor.eu/handle/10419/56363>
- Grundy, E. (1991). Ageing: Age-related change in later life. *Population Studies*, 45(1), 133–156. <https://doi.org/10.1080/0032472031000145936>
- Guillemette, Y., & Château, J. (2023). Long-term scenarios: Incorporating the energy transition. OECD Economic Policy Papers. <https://doi.org/10.1787/153ab87c-en>

- Gujarati, D. N. (2003). *Basic econometrics (4th ed.)*. McGraw-Hill.
- Haines, M. R. (2019). Inequality among industrial workers in the late 19th century United States. *Economics & Human Biology*, 34, 125–137.
<https://doi.org/10.1016/j.ehb.2019.02.005>
- Hoogendoorn, B., O'Hagan-Luff, M., Ramezani, S., & van Stel, A. (2024). Does self-employment provide a bridge to retirement? *Cambridge Journal of Economics*, 48(4), 767–784. <https://doi.org/10.1093/cje/beae016>
- Huang, W.-H., Lin, Y.-J., & Lee, H.-F. (2019). Impact of population and workforce aging on economic growth: Case study of Taiwan. *Sustainability*, 11(22), 6301.
<https://doi.org/10.3390/su11226301>
- Humphries, J. (2012). Childhood and child labour in the British Industrial Revolution. *The Economic History Review*, 66(2), 395–418.
<https://doi.org/10.1111/j.1468-0289.2012.00651.x>
- Iversen, T. N., Larsen, L., & Solem, P. E. (2009). A conceptual analysis of ageism. *Nordic Psychology*, 61(3), 4–22. <https://doi.org/10.1027/1901-2276.61.3.4>
- Ivic, S., Nikolic, G., & Igrutinovic, M. (2021). Recognition of older adults as a heterogeneous social group. *Trans/Form/Ação*, 44(4), 357–374.
<https://doi.org/10.1590/0101-3173.2021.v44n4.29.p357>
- Kalwij, A., & Vermeulen, F. (2007). Health and labour force participation of older people in Europe: What do objective health indicators add to the analysis? *Health Economics*, 17(5), 619–638. <https://doi.org/10.1002/hec.1285>
- Kantarci, T., Been, J., van Soest, A., & van Vuuren, D. (2025). Partial retirement opportunities and the labor supply of older individuals. *Labour Economics*, 96, 102739 .
<https://doi.org/10.1016/j.labeco.2025.102739>
- Khalid, A., & Syed, J. (2024). Mental health and well-being at work: A systematic review of literature and directions for future research. *Human Resource Management Review*, 34(1), 100998. <https://doi.org/10.1016/j.hrmr.2023.100998>
- Kim, H., Lee, C., & Eggleston, K. (2025). The evolution of age-friendly jobs in a rapidly ageing economy. *The Journal of the Economics of Ageing*, 31, 100575.
<https://doi.org/10.1016/j.jeoa.2025.100575>
- Kok, A. A., Huisman, M., Giltay, E. J., & Lunansky, G. (2025). Adopting a complex systems approach to functional ageing: Bridging the gap between gerontological theory and empirical research. *The Lancet Healthy Longevity*, 6(3).
<https://doi.org/10.1016/j.lanhl.2024.100673>
- Kotschy, R., Bloom, D. E., & Scott, A. J. (2025). On the limits of chronological age. *Annual Review of Economics*, 17(1), 151–173.
<https://doi.org/10.1146/annurev-economics080824-112429>
- Koutsogeorgopoulou, V., & Morgavi, H. (2025). Ageing populations, their fiscal implications and policy responses. OECD Economics Department Working Papers.
<https://doi.org/10.1787/6aacc03b3-en>
- Kunze, F., & De Meulenaere, K. (2024). Discrimination in organizations on the basis of age. *Current Opinion in Psychology*, 60, 101927.
<https://doi.org/10.1016/j.copsyc.2024.101927>
- Lai, S. L., & Yip, T. M. (2021). The role of older workers in population aging–economic growth nexus: evidence from developing countries. *Economic Change and Restructuring*, 55(3), 1875–1912. <https://doi.org/10.1007/s10644-021-09370-4>

- Landolfi, L. (2023). Beyond ageism. The redefinition of social categories to account for complexity. *Bulletin of the Transilvania University of Braşov. Series VII: Social Sciences Law*, 16, 49–58. <https://doi.org/10.31926/but.ssl.2023.16.65.1.5>
- Lee, J. W., & Kwak, D. W. (2025). Impact of retirement and re-employment on health of older adults. *Review of Economics of the Household*, 1-38. <https://doi.org/10.1007/s11150-025-09795-0>
- Lee, J., & Kim, M.-H. (2017). The effect of employment transitions on physical health among the elderly in South Korea: A longitudinal analysis of the Korean retirement and Income Study. *Social Science & Medicine*, 181, 122–130. <https://doi.org/10.1016/j.socscimed.2017.04.002>
- Maestas, N., Mullen, K. J., & Powell, D. (2016, July 25). The effect of population aging on economic growth, the labor force and productivity. NBER. <http://www.nber.org/papers/w22452>
- Menassa, M., Stronks, K., Khatami, F., Roa Díaz, Z. M., Espinola, O. P., Gamba, M., Itodo, O. A., Buttia, C., Wehrli, F., Minder, B., Velarde, M. R., & Franco, O. H. (2023). Concepts and definitions of healthy ageing: A systematic review and synthesis of theoretical models. *eClinicalMedicine*, 56, 101821. <https://doi.org/10.1016/j.eclinm.2022.101821>
- Midwinter, E. (2009). The social history of older age. *International Health*, 1(2), 111–116. <https://doi.org/10.1016/j.inhe.2009.08.002>
- Murayama, H., Muto, Y., Takase, M., Nakamoto, I., Nonaka, K., & Fujiwara, Y. (2025). Effects of employment status and motivations on the onset of social isolation in old age: A 2.5-year longitudinal study. *JMA Journal*, 8(4), 1098-1107. <https://doi.org/10.31662/jmaj.2025-0006>
- Nakajima, H., Morita, A., Kanamori, S., Aida, J., & Fujiwara, T. (2022). The frequency of job participation and well-being of older people in Japan: Results from Jages Study. *Archives of Gerontology and Geriatrics*, 102, 104720. <https://doi.org/10.1016/j.archger.2022.104720>
- National Academies of Sciences, Engineering, and Medicine. (2022). Understanding the aging workforce: defining a research agenda. The National Academies Press. <https://doi.org/10.17226/26173>
- OECD. (2019). Working better with age. OECD Publishing. <https://doi.org/10.1787/c4d4f66a-en>
- OECD. (2023). Pensions at a glance 2023. <https://doi.org/10.1787/678055dd-en>
- OECD. (2025a). Pensions at a glance 2025: OECD and G20 indicators. OECD Publishing. <https://doi.org/10.1787/e40274c1-en>
- OECD. (2025b). OECD Employment outlook 2025: Can we get through the demographic crunch? OECD Publishing. <https://doi.org/10.1787/194a947b-en>
- OECD. (2026). Building healthy, productive workforces for our 21st century: Accompanying issues note for the joint OECD-GCOA workshop. OECD. https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/ageing-and-long-term-care/Paper_OECD_GCOA_LTC.pdf
- Orimo, H., Ito, H., Suzuki, T., Araki, A., Hosoi, T., & Sawabe, M. (2006). Reviewing the definition of “elderly.” *Geriatrics & Gerontology International*, 6(3), 149–158. <https://doi.org/10.1111/j.1447-0594.2006.00341.x>
- Pan, J.-N., & Chang, M.-L. (2019). Population aging, middle-income trap, and economic growth: An empirical study of Asian economies. *The Singapore Economic Review*, 66(06), 1577–1594. <https://doi.org/10.1142/s0217590818420092>

- Papapetrou, E., & Tsalaporta, P. (2020). The impact of population aging in rich countries: What's the future? *Journal of Policy Modeling*, 42(1), 77–95.
<https://doi.org/10.1016/j.jpolmod.2019.12.002>
- Papathanassiou, M. (2007). Approaches to the history of child labour in Europe. *Jahrbuch Für Wirtschaftsgeschichte/Economic History Yearbook*, 48(2).
<https://doi.org/10.1524/jbwg.2007.48.2.231>
- Posthuma, R. A., & Campion, M. A. (2009). Age stereotypes in the workplace: Common stereotypes, moderators, and future research directions. *Journal of Management*, 35(1), 158–188. <https://doi.org/10.1177/0149206308318617>
- Quinby, L. D., & Wettstein, G. (2024). Are older workers capable of working longer? *Journal of Pension Economics & Finance*, 23(2), 165–182.
<https://doi.org/10.1017/S1474747223000033>
- Rabaté, S. (2019). Can I stay or should I go? Mandatory retirement and the labor-force participation of older workers. *Journal of Public Economics*, 180, 104078.
<https://doi.org/10.1016/j.jpubeco.2019.104078>
- Rahayuwati, L., Arsyad, S. S., Ekawati, R., Dawam, M., Rahmadewi, R., Nurhayati, S., ... & Fauziah, S. R. (2024). Factors that influence the high number of elderly people working in the informal sector. *Journal of Multidisciplinary Healthcare*, 17, 1827–1837.
<https://doi.org/10.2147/JMDH.S450047>
- Rollnik-Sadowska, E. (2023). Labour market in sustainability transitions: a systematic literature review. *Economics and Environment*.
<https://doi.org/10.34659/eis.2023.87.4.681>
- Rowe, J. W., & Kahn, R. L. (1997). Successful aging. *The Gerontologist*, 37(4), 433–440.
<https://doi.org/10.1093/geront/37.4.433>
- Sánchez-Sánchez, J. L., Lu, W.-H., Gallardo-Gómez, D., del Pozo Cruz, B., de Souto Barreto, P., Lucia, A., & Valenzuela, P. L. (2024). Association of intrinsic capacity with functional decline and mortality in older adults: A systematic review and meta-analysis of longitudinal studies. *The Lancet Healthy Longevity*, 5(7).
[https://doi.org/10.1016/s2666-7568\(24\)00092-8](https://doi.org/10.1016/s2666-7568(24)00092-8)
- Saraki, F., & Ade, B. S. (2025). Mandatory retirement of high-performing staff and organizational sustainability. *Asian Journal of Economics, Business and Accounting*, 25(12), 196–219. <https://doi.org/10.9734/ajeba/2025/v25i122086>
- Schoeni, R. F., Freedman, V. A., & Martin, L. G. (2008). Why is late-life disability declining? *The Milbank Quarterly*, 86(1), 47–89.
<https://doi.org/10.1111/j.1468-0009.2007.00513.x>
- Scott, A. J. (2021). Achieving a three-dimensional longevity dividend. *Nature Aging*, 1(6), 500–505. <https://doi.org/10.1038/s43587-021-00074-y>
- Seeberg, K. G. V., Skovlund, S. V., Bláfoss, R., Thomassen, K., Malchow-Møller, L., Sundstrup, E., & Andersen, L. L. (2022). The interplay between multimorbidity, physical work demands and work ability: cross-sectional study among 12,879 senior workers. *International Journal of Environmental Research and Public Health*, 19(9), 5023.
<https://doi.org/10.3390/ijerph19095023>
- Simões, E. J., Perracini, M., Mello, M. A. F., Cohrs, F. M., Neumann, A. P. F. M., Demarzo, M., & Ramos, L. R. (2025). Protocol for an aged cohort study to create a single indicator that expresses the trajectory of intrinsic capacity over the years and its relation to functional abilities. *Frontiers in Aging*, 6, 1459284.
<https://doi.org/10.3389/fragi.2025.1459284>

- Sonnentag, S., Tay, L., & Neshor Shoshan, H. (2023). A review on health and well-being at work: More than stressors and strains. *Personnel Psychology*, 76(2), 473-510.
<https://doi.org/10.1111/peps.12572>
- Steenstra, I., Cullen, K., Irvin, E., Van Eerd, D., Alavinia, M., Beaton, D., Geary, J., Gignac, M., Gross, D., Mahood, Q., Macdonald, S., Puts, M., Scott-Marshall, H., & Yazdani, A. (2017). A systematic review of interventions to promote work participation in older workers. *Journal of Safety Research*, 60, 93-102.
<https://doi.org/10.1016/j.jsr.2016.12.004>
- Syrkkanis, V., Lei, V., Oprescu, M., Hei, M., Battocchi, K., & Lewis, G. (2019, June 6). Machine learning estimation of heterogeneous treatment effects with instruments. arXiv.org.
<https://arxiv.org/abs/1905.10176>
- Teixeira, A. A., Renuga Nagarajan, N., & Silva, S. T. (2016). The impact of ageing and the speed of ageing on the economic growth of least developed, emerging and developed countries, 1990-2013. *Review of Development Economics*, 21(3), 909-934.
<https://doi.org/10.1111/rode.12294>
- Temsumrit, N. (2023). Can aging population affect economic growth through the channel of government spending? *Heliyon*, 9(9). <https://doi.org/10.1016/j.heliyon.2023.e19521>
- Thönnissen Chase, E., & Kuonen, P. (2025). Intergenerational teamwork from the employees' perspective. *ENTRENOVA-ENTERPRISE RESEARCH INNOVATION JOURNAL*, 11(1).
<https://doi.org/10.54820/entrenova-2025-0015>
- Toder, E., Johnson, R. W., Mermin, G. B., & Lei, S. (2008). Capitalizing on the economic value of older adults' work: An Urban Institute roundtable. Urban Institute.
<https://www.urban.org/sites/default/files/publication/31676/411658-Capitalizing-on-the-Economic-Value-of-Older-Adults-Work.PDF>
- Tunney, O. C., & Oude Mulders, J. (2021). When and why do employers (re)hire employees beyond normal retirement age? *Work, Aging and Retirement*, 8(1), 25-37.
<https://doi.org/10.1093/workar/waab020>
- United Nations, Department of Economic and Social Affairs, Population Division. (2019). World population ageing 2019 highlights.
<https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Highlights.pdf>
- United Nations. (2023). World social report 2023: Leaving no one behind in an ageing world. <https://desapublications.un.org/publications/world-social-report-2023-leaving-no-one-behind-ageing-world>
- van Soest, A., & Zaidi, A. (2015). Old age work participation. *International Encyclopedia of the Social & Behavioral Sciences*, 182-189.
<https://doi.org/10.1016/b978-0-08-097086-8.94040-6>
- Verbeek, M. (2004). *A guide to modern econometrics (2nd ed.)*. John Wiley & Sons.
- Westover, J. H. (2024). The untapped potential of mature talent: Making the business case for an aging workforce. *Human Capital Leadership*.
<https://doi.org/10.70175/hclreview.2020.15.1.7>
- Whitehouse, E. (2009). Pension reforms in OECD countries. *CESifo DICE Report*, 7(1), 49-56.
- Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, 126(1), 25-51.
<https://doi.org/10.1016/j.jeconom.2004.02.005>
- Wooldridge, J. M. (2013). *Introductory econometrics: A modern approach (5th ed.)*. South-Western Cengage Learning.

- World Bank. (2026). Life expectancy at birth, total (years). World Bank Open Data. <https://data.worldbank.org/indicator/SP.DYN.LE00.IN>
- World Health Organization. (2015). World report on ageing and health. <https://www.who.int/publications/i/item/9789241565042>
- World Health Organization. (2021). WHO clinical consortium on healthy ageing 2020: Topic focus—intrinsic capacity. <https://iris.who.int/server/api/core/bitstreams/0c4de8a3-e319-45fd-91ba-68ad5296039a/content>
- Yaqoob, M., Bani, Y., Ishak, S., & Rosland, A. (2025). Population ageing, workers ageing and aggregate labour productivity in developing countries. *International Journal of Social Economics*, 1–14. <https://doi.org/10.1108/ijse-08-2023-0653>
- Yen, W.-H., Cheng, W.-J., Chuang, S.-C., Wu, I.-C., Chang, H.-Y., Cheng, C.-W., Tseng, W.-T., Hsu, C.-C., Hsiung, C. A., & Wu, C.-S. (2025). Retirement, reemployment, and bio-psycho-social health among older adults in Taiwan. *Maturitas*, 199, 108649. <https://doi.org/10.1016/j.maturitas.2025.108649>
- Zellman, E., Andrei, D., & Parker, S. (2025). Leadership, follower age, and age-diversity: a systematic review and future directions. *Work, Aging and Retirement*, waaf014. <https://doi.org/10.1093/workar/waaf014>
- Zhu, Y., Zhu, Y., Li, J., Shi, N., Li, W., Tang, Y., ... & Ma, Y. (2025). Research progress on intrinsic capacity in older adults: Concepts, epidemiology, assessments, influencing factors, adverse outcomes, and interventions. *Global Health & Medicine*, 7(5), 358–369. <https://doi.org/10.35772/ghm.2025.01026>