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List of abbreviations

AIFA Agenzia Italiana del Farmaco (Italian Medicines Agency)
AOW Algemene Ouderdomswet
BAU Business-As-Usual
CAR Contractual Accrual Rate
CDC Collective defined contribution
CPI Consumer Price Index
CQC Care Quality Commission (England)
CRD Chronic Respiratory Disease
CVD Cardiovascular Disease
DB Defined benefit
DC Defined contribution
DWP Department for Work and Pensions
GDP Gross Domestic Product
GP General Practitioner
HTA Health Technology Assessment
ICS Integrated Care System (England)
IP Intellectual Property
NDC Notional defined contribution
NHS National Health Service (UK)
NICE National Institute for Health and Care Excellence (UK)
NZa Nederlandse Zorgautoriteit (Dutch Health Care Authority)
OBR Office for Budget Responsibility
OECD Organisation for Economic Co-operation and Development
ONS Office for National Statistics
OOP Out of pocket
PAYG Pay-As-You-Go
PE Private equity

PPP	Post-growth + Pension Policy
PPPH	Post-growth + Pension Policy + Healthcare
QUALY	Quality-Adjusted Life Year
R&D	Research and Development
R&D	Research and Development
SFC	Stock-flow consistent
SSN	Servizio Sanitario Nazionale (Italian National Health Service)
SSR	Servizio Sanitario Regionale (Regional Health Service — Italy)
UK	United Kingdom
US	United States (of America)
WSC	Wellbeing Service County (Finland)
Zvw	Zorgverzekeringswet (Dutch Health Insurance Act, 2006)

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Executive Summary

This deliverable examines a critical question for post-growth policy: how resilient are different European healthcare and pension systems to a post-growth transition? Drawing on comparative case studies of four countries — the UK, Italy, Finland and the Netherlands — and a calibrated macroeconomic model of the UK economy (UK-PADME), the report offers both qualitative and quantitative insights into the vulnerabilities and areas of resilience of these two pillars of the European welfare state.

Chapter 1 identifies four mechanisms through which healthcare systems become dependent on economic growth: growth in population needs; labour cost growth; technology-driven cost growth; and rent-seeking. It offers a comparative case study analysis, finding that no system is likely to be more/ less resilient across the board to a post-growth transition. Each country exhibits a different configuration of vulnerabilities shaped by its socio-demographic profile, welfare financing model, governance structures, and cost-containment institutions. A consistent finding across all four cases is that growth dependencies are already impacting the healthcare system, even in growing economies; their impacts are simply being displaced onto healthcare workers (through pay freezes and understaffing) and patients (through unmet need and catastrophic out-of-pocket spending). And we expect these dynamics to become even more pronounced as growth rates decline. We draw learning from the paradox of Italy; a country with some of the worst socioeconomic indicators in our sample and yet the highest life expectancy. We reflect on the potential benefits of a tax-funded healthcare system. And we highlight the need for robust pharmaceutical and technology cost-containment, as well as effective regulation around rent-extraction by private entities. The chapter ends with some tentative principles for a post-growth healthcare system that might steer future research agendas.

Chapter 2 examines how pay-as-you-go (PAYG) and funded pension systems each interact with post-growth conditions. The core challenge is distributional: how to allocate income between workers and pensioners when aggregate resources are stagnant or declining. PAYG systems generally depend on the wage bill; funded systems depend on asset returns. Neither is fully growth independent, but their vulnerabilities to lack of economic growth differ. Assessed against five post-growth criteria — financial viability, needs satisfaction, distributional equity, democratic governance and environmental sustainability — Finland and the Netherlands appear to be the most resilient. Italy's system, by contrast, is generous but financially fragile, structurally inequitable and politically resistant to reform. The UK also shows vulnerabilities, with high pension inequality and weak participatory governance. Several policies are suggested to make the systems growth resilient. In particular, pension income ceilings are suggested as a potential tool to reduce pension inequality while preserving financial viability.

Chapter 3 simulates five post-growth transition scenarios for the UK, using a stock-flow consistent model, UK-PADME. The simulations emphasise that, without accompanying policies, a post-growth transition is likely to produce a sharp rise in pension and healthcare spending as a share of a shrinking GDP, with public debt climbing to unsustainable levels even if the tax take increases substantially. A combined package of pension and healthcare reforms can reduce this welfare spending and maintain a relatively low debt-to-GDP ratio, while still increasing real healthcare provision relative to 2025. These reforms are detailed in the chapter. Overall, the modelling confirms that UK pension and healthcare systems can be made post-growth resilient, but only through deliberate institutional reform and a willingness to move towards a more

sufficiency-oriented welfare system. For instance, by reducing overmedicalisation and offering less generous indexation policies for pension benefits.

Taken together, the three parts of this deliverable point to the overarching conclusion that growth dependencies are already active in all four healthcare and pension systems. Their impacts are currently being managed by displacing costs onto workers, patients, and future generations — not by resolving the underlying structural tensions. At the same time, distributional equity emerges as a key dimension for policy reform. Across both healthcare and pensions, greater inequality makes growth more 'necessary' as a political tool for avoiding redistribution. Targeting inequality directly is both a post-growth priority in its own right and a means of reducing these growth dependencies.

The findings in this deliverable support the overall aims of MAPS by broadening the range of policies and models available for healthcare and pension systems that are compatible with a climate neutral economy. In particular, we tackle the question of how to make healthcare and pensions growth independent so that we can better reconcile human wellbeing with environmental sustainability.

Within the project, this deliverable connects most clearly to work package five. Work package five aims to assess the sustainability and equity of various alternative policy packages to achieve climate neutrality by means of scenario simulations. The different policy options proposed in this deliverable for growth resilient health and pensions systems will feed directly into the modelling work of work package five. They will be translated into the language of the MAPS model and clustered to define a set of transition strategies or approaches to a climate-neutral transition.

Chapter 1: Post-growth Healthcare Futures: A Case Study Analysis

1.1 Introduction

Many authors in the post-growth literature have critiqued the current models of healthcare provision in wealthy economies (Hensher 2025, 2023; Corlet Walker et al. 2021; Borowy and Aillon 2017). Challenges have been posed around the impacts of privatisation on healthcare (e.g., in primary care clinics, mental health services, social care, medical imaging, and pharmaceuticals); the iatrogenic impacts of increasing medical interventions and medical consumption beyond the point of 'uneconomic growth' (Hensher et al. 2020); the hyper-focus of the healthcare system on cure rather than prevention; and the broader political and economic context that both underplays the role of the socioeconomic determinants of health, and often actively contributes towards generating ill health (Aillon and Dal Santo 2014). Further, many authors have pointed to the decline in certain types of illness and disease during periods of recession. One well-known example is that, in Cuba, deaths resulting from diabetes, heart disease and stroke declined during the economic crisis in the 1990s (Borowy 2013). As a result of all of this, authors such as Aillon and Dal Santo (2014, p1) argue that it may be "necessary to question and overturn the current economic system", and hence to rethink our healthcare systems also.

One increasingly well-researched alternative to our current economic system is a post-growth economy. Throughout this report, we use the term post-growth economy in its broadest sense, as defined by Kallis et al. (2025, pe62), as an economy that "do[es] not pursue GDP growth as an objective, and which [is] able to meet human needs in an equitable way without growth while staying within [its] fair share of planetary boundaries". Using such a broad definition means that we are also including under the umbrella term 'post-growth' other terminologies such as degrowth, the well-being economy, and doughnut economics, among others. In addition to the reasons listed above for actively considering and planning for a transition to a post-growth healthcare system, there are other, more precautionary reasons too. For example, there is evidence that many economies across Europe and elsewhere are in a period of secular stagnation, with economic growth becoming more and more elusive (Jackson 2019). This means that it may be necessary to prepare for the transition to a post-growth economy, regardless of whether it is considered politically feasible or desirable.

A transition to a post-growth economy will impact the healthcare system in many ways, and there is a small but growing literature looking at how different sectors of the economy (and the economy at large) depend on economic growth to function (Janischewski et al. 2026; Keyßer et al. 2025; Wiman 2024; Corlet Walker et al. 2024; Richters & Siemoneit 2019; Jackson 2016; Douthwaite 1992). Such "growth dependencies" can be understood as "those conditions that require the continuation of growth in order to avoid significant physical, psychological, social, and/or economic harms." (Corlet Walker et al. 2024, p2). Several frameworks have now been created, attempting to clarify the different socio-economic structures that generate and maintain growth dependencies in different parts of the economy. However, to date, there have been few detailed analyses applying these ideas at the national level to sectors of the welfare state – Corlet Walker et al. (2024) and Wiman (2024) are notable exceptions.

In this chapter, we have chosen to adapt Corlet Walker et al.'s (2024) framework (developed in the context of the UK's adult social care sector), in order to analyse growth dependencies in the healthcare sector. This framework was chosen because it offers the most detailed, comprehensive and practical approach to analysing growth dependencies at a sector level so far. Additionally, we opted to layer in a comparative case study methodology in order to broaden our analysis beyond one national case; something that has not yet been attempted in the literature, to our knowledge. This means developing health system profiles for our chosen case study countries and then comparing and analysing them against the growth dependency mechanisms outlined in the Corlet Walker et al. (2024) paper. There are more details on the analytical framework used, and our approach, in sections 1.2 and 1.3 below.

The rest of this chapter is now structured as follows. Section 1.2 details Corlet Walker et al.'s (2024) framework and adapts its core concepts to the healthcare sector, including the addition of a novel mechanism – growing technology costs – not included in the original paper. Section 1.3 outlines our comparative case study methodology, including case selection, data collection and analysis method. Section 1.4 presents the four case studies (the UK, Italy, Finland and the Netherlands), including both descriptive health system profiles as well as detailed comparative secondary data. These profiles seek to summarise the delivery and governance structures of each healthcare system, indicators of broader economic and social context, health outcomes, accessibility, technology costs, and the degree of privatisation and private equity involvement, among other factors. Section 1.5 reflects on the relative performance of each of the four health care systems, in relation to one another. Section 1.6 then analyses the case studies against the growth dependency mechanisms detailed in section 1.2, highlighting particular areas of vulnerability and resilience. Section 1.7 looks towards potential policies and avenues for further research.

1.2 Analytical framework

In this section we present the growth dependency framework used in this chapter, and detail the core mechanisms driving growth dependency in the healthcare sector. Before turning to that task, we borrow Janischewski et al.'s (2026, p1311) necessary elements for facilitating "conceptual clarity" when operationalising growth dependency analyses. This enables us to draw some boundaries around our analysis before proceeding. In brief, we are focusing our analysis on the formal healthcare sector and, in determining its state of growth dependency, are particularly concerned with its capacity to meet the health needs of its population and to maintain healthy working conditions. Table 1 below shows the details of our choices concerning each element for operationalising growth dependency analyses.

Table 1 Elements for operationalising growth dependency analyses from Janischewski et al. 2026

Element	Our analytical choice
The system under investigation	We are looking at growth dependencies within the formal healthcare system only (including primary, secondary and tertiary), not the wider informal or allied health systems. However, we will be considering, where relevant, broader systems and how they might feed into, affect, exacerbate or alleviate any growth dependencies identified within the healthcare system.
The unit of growth measurement	We are considering growth dependencies at various scales, including dependency on GDP growth, dependency on sector inputs such as labour and materials across the system, and dependency on revenue growth for private providers (Corlet Walker et al. 2024). All of this will be considered with an eye to how it impacts the national picture of healthcare delivery in our selected case study countries.
The meaning of "growth"	We are allowing our analysis to capture both potential impacts during a transition towards low or no growth, as well as a more prolonged state of structurally low growth.
The functions or properties of the system relevant for human well-being	When considering the consequences of growth dependency, the system properties we are particularly interested in are: the capacity of the healthcare system to meet the healthcare needs of the population (including quality of care, affordability and accessibility); the working conditions within the sector (including understaffing/ overworking and the adequacy of pay); and the financial stability of healthcare providers.

Turning towards the analytical framework applied in this chapter, Corlet Walker et al. (2024) have created a framework for understanding growth dependencies within the welfare state, taking adult social care in the UK as their focus sector. Adult social care has many relevant similarities to healthcare. They are both basic welfare services that are impacted by demographic trends such as aging and migration. They have both been marketised in many European countries (often developing as a quasi-market). They both face significant workforce challenges in terms of retention and pay, and financial actors play a substantial role in shaping the economic landscape of the system. Due to these similarities, and the fact that this framework offers the most comprehensive, sector-level approach to analysing growth dependencies to date, we utilise it as a starting point for our analysis.

The framework involves several stages. First, the authors recommend developing a detailed descriptive profile for the sector of interest, including "information about the structure of the sector, its workforce, service users, ownership patterns, as well as relevant details about the financial and market characteristics, and the policy and regulatory environment" (Corlet Walket et al. 2024, p7). This is followed by a process of analysing which growth dependency mechanisms (Table 2) might be present in the chosen sector, detailing the social, economic and political structures that underpin and maintain these growth dependencies, and lastly identifying potential levers for mitigation and transformation. We present the descriptive health system profiles for each of our case study countries in section 1.4 and have woven together the remaining parts of the analysis into a comparative discussion, presented in section 1.6.

At the heart of their paper, Corlet Walker et al. (2024) propose three core mechanisms of growth dependency in the UK's adult social care sector: 1) growth in population needs; 2) growth in labour productivity; and 3) the pursuit of economic rents (see Table 2 for details). These form the basis of their conceptual framework, and we use the remainder of this section to reflect on how each might apply to the healthcare sector.

Table 2 Growth dependency mechanisms, as described in Corlet Walker et al. 2024

Mechanism	Description
Growth in manifest needs	When "manifest needs grow at a faster rate than growth in the labour productivity, material efficiency or energy efficiency of needs satisfier production", growth in labour, material, and energy inputs are needed to meet the needs of the population (Corlet Walker et al. 2024, p3).
Labour productivity growth	This growth dependency emerges under two conditions. One, "when rentiers have the socio-political power to capture the gains of that productivity growth" it creates a dependency on growth in order to maintain full employment in the economy (Corlet Walker et al. 2024, p4). Two, when Baumol's cost disease [1] leads to labour becoming relatively more expensive over time in sectors with lower rates of labour productivity growth, growth in sector revenue is needed to keep up with rising wages (Corlet Walker et a. 2024, p5).
Rent-seeking	The pursuit of economic rents can also result in a growth dependency when "rentiers use costly and risky rent-seeking strategies, and when they have the socio-political power to resist the redistribution of their resulting wealth, this creates a firm-level dependency on growing revenues" (Corlet Walker et a. 2024, p5).

1.2.1 Growth in needs

The first dynamic proposed by Corlet Walker et al. (2024) that can result in the emergence of a growth dependency in the welfare state is growth in population needs. In the healthcare sector, this might result from growth in population size or growth in the number of people with complex health needs (this could be due to worsening population health or an aging population), or both. We know that this growth in needs is already happening and is presenting a significant burden on healthcare systems across Europe that is only forecast to grow in the coming decades (European Commission 2024; Kingston et al. 2018). Factors that impact this growth dependency are varied, including: the material, labour and energy efficiency of healthcare services (i.e., how many people can be treated per unit resource input); the geopolitical forces shaping migration patterns; and fertility rates in the population. A broad range of other socioeconomic determinants of health – such as access to nutritious food sources, quality housing, affordable transport, sufficient income, and environmental quality – also affect the extent of healthcare needs within the population (Marmot 2013). Access to healthcare also impacts how these health needs ultimately translate into measurable demand on the healthcare system. Hence, we can see that the equation for growth dependency resulting from growing needs for healthcare is not straightforward and can be impacted by policy-choices in other health-influencing sectors, equity and accessibility.

Further, growth itself is a significant driver of growing demands on the healthcare system via several pathways. For example, growth in tobacco, alcohol and ultra-processed food consumption, sedentary lifestyles, high levels of work stress, pollution, and iatrogenic harms from healthcare treatment itself all create a greater need for healthcare services (Gilmore et al. 2023). As has been pointed to in the literature, one would expect a planned transition to a post-

[1] Baumol's cost disease is the hypothesis that labour productivity grows more slowly in some sectors (e.g., public services) than in others (e.g., manufacturing), resulting in labour in the slower sectors becoming relatively more expensive over time (Corlet Walker et al. 2024; Baumol 2012)

growth economy to alleviate these commercially-driven pressures on the healthcare system (Campbell et al. 2026; Hensher and Aillon 2025). Indeed, there are many examples of improving health for conditions affected by these factors (e.g., cardiovascular disease) during times of economic downturn and recession (Borowy 2013; Tapia Granados & Roux 2009; Ruhm 2015, 2016). The word 'planned' does a lot of heavy lifting here, and these potentially positive impacts of low growth on health cannot be taken for granted. It is well-established also that austerity politics in times of economic contraction tend to lead to very poor health outcomes for the affected populations (Karanikolos et al. 2013; Stuckler and Basu 2013).

1.2.2 Labour productivity growth

The second mechanism that is hypothesised to create growth dependency in the welfare state is labour productivity growth. The healthcare sector typically falls within the group of sectors that author Ben Gallant terms the 'slow' sectors (Gallant 2023); also known as the stagnant sectors. These are the sectors where labour productivity grows relatively slowly, compared to the economy as a whole, theoretically making labour in these sectors relatively more expensive over time (Baumol 2012). This is often cited as a key contributing factor to the increasing cost of healthcare per unit output over time (and to the increase in healthcare expenditure as a proportion of GDP) (Bates and Santerre 2013; Colombier 2017; Medeiros and Schwierz 2013). This is in part because wages tend to make up the largest single cost in the health sector (King's Fund 2025).

However, the picture is more complex in healthcare than it is for adult social care, where care and time with the patient are arguably the primary service being delivered. In fact, a reduction in labour productivity in adult social care can even mean an improvement in the quality of care being delivered (Corlet Walker et al. 2022). Healthcare, by contrast, is more capital intensive and there is therefore more scope for labour saving technologies to improve total factor productivity in the system than there is in adult social care – to a point. Hence, there is evidence to suggest that Baumol's cost disease does impact expenditure in healthcare sectors across Europe, but the effects tend to be more moderate than in adult social care (Celebi et al. 2025).

1.2.3 Technology-driven cost growth

Here, we depart slightly from Corlet Walker et al.'s (2024) original framework by proposing a novel mechanism that drives cost-growth in the healthcare sector, and therefore creates a dependency on growing sector revenues. Pharmaceutical and technological advancements within the healthcare system can sometimes result in net cost increases, rather than savings (Sorenson et al. 2013; Smith et al. 2009; Bodenheimer 2005). This is because, although some technologies might be labour-saving, they can also expand the scope of conditions that are treatable within the medical system, thereby growing demand. This means that despite modest productivity gains (particularly in terms of increases in the quality of care), healthcare still struggles with the potential for a growing cost-base. We therefore propose technology-driven cost growth as a fourth mechanism to build into the growth dependency framework from Corlet Walker et al. (2024). It has particular relevance for the healthcare sector, but may also be worth considering in other parts of the welfare state too.

An important nuance to the arguments in this section is that expenditure within public healthcare systems is largely politically determined, with public-sector pay freezes being commonplace (Reps and Zaidi 2026; Pedaci et al. 2020). This means that the growth dependencies created by Baumol's cost disease and rising technology costs can be hidden behind overworked employees, poor and stagnating wages – e.g., real wages in the National Health Service (NHS) have fallen over

the last decade (Dayan and Palmer 2022) – and long waiting times for appointments. I.e. it appears as though the healthcare system is continuing to function, but the cost of that functioning is being borne by workers (and patients) in the form of poor pay and working conditions and low-quality care. This is the kind of cost-shifting that both characterises and masks growth dependent systems under strain, and hints at the central importance of power in determining who bears the brunt of the structural growth dependencies within the system in a non-growing economy.

1.2.4 Rent-seeking

The final growth dependency mechanism that is present in the healthcare sector is rent-seeking. Much healthcare across Europe is delivered by private providers, both through the private healthcare market, and through privatised parts of the public healthcare system. Privatisation affects "virtually all segments of healthcare", from pharmaceuticals and health insurance to mental health clinics, dentistry, radiology, laboratories and primary care (Batifoulier et al. 2025, p8; Suzuki 2025). This opens the door to the use of predatory financial strategies by private actors within the system. From a growth dependency perspective, we are particularly concerned with the use of "costly and risky" rent-seeking tactics such as debt leveraging, asset stripping, and the offshoring of profits (Corlet Walker et al. 2024; 2022), as well as IP/ patent rents, price gouging, and the prioritisation of share buybacks over R&D (Lazonick et al. 2017). These are typically employed by larger healthcare providers, often owned by investment firms, who "seek returns on investment rather than prioritizing patient care" (Batifoulier et al. 2025, p8). These strategies have the effect of diverting money out of the healthcare system and into the pockets of investors, often requiring significant revenue growth in order to meet the desired return on investment.

Investigative reports 'following the money' are most advanced in the adult and children's social care sectors (Corlet Walker et al. 2021; Kotecha et al. 2019; Burns et al. 2016), and many countries still lack "a cohesive picture of the extent to which financial firms have scaled-up investments into their health systems" (Suzuki 2025, p4). However, there are growing reports and papers beginning to document these trends (Singh 2026). This growing presence of financial entities and the predatory financial tactics they employ, creates a dependency on revenue growth in order to meet the significant management fees, interest payments, property rents and expected returns on investment they demand. This reduces the financial flexibility of these healthcare companies and increases the financial fragility of the sector as a whole, rendering healthcare providers at greater risk of collapse (De Maeseniere and Brinkhuis 2012; Ayash and Rastad 2021). This state of play has significant potential negative consequences for both patients and healthcare workers in the sector, with research beginning to uncover the detrimental impacts on quality of care and working conditions of such predatory financial practices (Marchandot and Morel 2025; Cordilha 2021; Hunter and Murray 2019; Bayliss 2016).

1.3 Methodology

1.3.1 Research design and rationale

For this paper we have undertaken a comparative case study analysis. Drawing on the replication logic of Yin (2009, p54), we hope to utilise this study to deepen our understanding of what structures and conditions impact the vulnerability and resiliency of healthcare systems to periods of low or no growth. Our chosen case study countries are the UK, Italy, Finland and the Netherlands. We selected these cases following a purposive, diverse-case selection design (see section 1.3.2). We then developed detailed health system profiles for each country (section 1.4), utilising descriptive secondary data, as well as reports and analyses from the white and grey literature. These profiles then formed the basis of a comparative analysis, considering how each country's health system fairs against the four growth dependency mechanisms described in section 1.2.

1.3.2 Case selection

We opted for four case study countries: the UK; Italy; Finland; and The Netherlands. We selected these countries based on the broad principle of purposive diverse-case selection (Seawright & Gerring 2008), opting for four countries that offered variation in welfare state regime (see Table 3). By welfare state regime we refer to the various typologies that have been developed to classify welfare regimes on the basis of factors such as the degree of de-commodification it embeds (i.e., "the degree to which a person can maintain a livelihood without reliance on the market"), and the types of social stratification promoted by its policies (Arts & Gelissen 2002, p141). This variation offers us the opportunity to investigate how growth dependencies vary within difference institutional healthcare structures. Notably, all of our chosen case studies sit within the broad grouping of being high-income economies; hence, the scope of our analysis and findings are limited to such contexts.

Table 3 Case study variation (Arts & Gelissen, 2002; Böhm et al. 2013; Ferrera 1996; Esping-Anderson 1990)

	UK (NHS)	Italy (SSN)	Finland	Netherlands
Welfare state regime	Liberal: low level of decommodification, means-tested benefits, primacy of the market, and a high degree of individualism, mostly tax-funded	Mediterranean: highly fragmented social protections with little state intervention, no net minimum guaranteed, healthcare as an institutionalised right, tax-funded	Social-democratic: high degree of decommodification and generous universal benefits not dependent on individual contribution, tax-funded	Conservative-corporatist: modest decommodification, sphere of solidarity is "narrow and corporatist" (p142), reliance on family structures of support, health-insurance-funded

1.3.3 Data sources

We used a number of secondary data sources to develop these case study profiles [2]. The data were taken primarily from the OECD Health at a Glance 2025 report, the OECD Data Explorer, World Bank Data, the European Commission Ageing Reports and PitchBook (investment data was reproduced from Singh, 2026). All data sources are cited in the relevant table legends. We used the latest year of data available for each country. In some cases, the latest year of data available was different for each country; where this was the case, we are explicit about the year used. The secondary data analysis was then complemented by a narrative review of white and grey literature describing the history and structure of the healthcare systems in the four selected case study countries. All references are included in-text for these sources.

1.3.4 Analysis

Several secondary data points of interest were identified a-priori to reflect factors of relevance to the four dimensions of the growth dependency framework outlined in section 1.2; others emerged as the case study analysis progressed. Ultimately, we ended up with secondary data spanning eight categories: socio-economic background, social and commercial determinants of health, current and projected healthcare needs, population health outcomes, health system capacity, health system accessibility, technology diffusion and expenditure, and degree of financialisation of healthcare. See tables 4-11 in section 1.4.2 for a full list of indicators and accompanying data. The data are not intended as definitive markers of growth dependency, but rather potential indicators of stress or vulnerability in a post-growth transition. We then combined this secondary data with our narrative review of each health system to compare the potential structural vulnerabilities and areas of resilience of each country to our four growth dependencies (section 1.6). This is not a forecasting or predictive exercise, but rather a theoretically-informed, exploratory analysis, focusing on identifying the potential vulnerabilities and areas of resilience of our four case study healthcare systems to a low or no growth future.

1.4 Case studies

In this section, we present concise summaries of the profiles we have developed for our four case study countries: the UK, Italy, Finland and the Netherlands. These health profiles provide a concise summary, focusing on health system structure and governance, access and inequalities. This will be followed by section 1.4.2, where we compare key indicators spanning socioeconomic factors, health outcomes, and more.

[2] We also conducted 18 semi-structured interviews with healthcare experts and practitioners (with approval from the University of Surrey Ethics Committee). These interviews have not yet been formally analysed, but have been a crucial support in the development of the concepts, analysis and interpretation undertaken in this paper.

1.4.1 Health system profiles

THE UK

The NHS was established in 1948, and designed to be universal, comprehensive, free at the point of delivery, publicly provided, funded and accountable (Roderick and Pollock 2022). Much of this promise has continued to be delivered to this day; however, over the course of the last 30 years, it has gradually shifted towards a "marketized, two-tier, mixed-funding system", with a growing presence of large US healthcare companies (Roderick and Pollock 2022, p470). It is estimated that around 8.3% of all elective inpatient activity in England was privately funded in 2022/23 (Keith et al. 2024). Meanwhile, more inclusive estimates that account for NHS spending on primary and social care also, bring this figure up to 26% (Rowland 2019).

These figures are the result of an ongoing strategy of outsourcing healthcare services, particularly in areas such as primary care practices, mental health services, medical imaging and voluntary procedures such as cataracts surgeries (Goodair 2023). This move towards a privatised health service comes at a cost, with research indicating that "an annual increase of one percentage point of outsourcing to the private for-profit sector corresponded with an annual increase in treatable mortality of 0.38%" (Goodair and Reeves 2022, pe638). There has been significant concern about the lack of transparency and accountability in this regard also, with the movement of NHS decision-makers into private-sector roles and the apparent decision-making power of private companies within integrated care boards raising alarm bells for many (Roderick and Pollock 2022).

Overall, the NHS accounts for 81.3% of healthcare spending in the UK – a figure that is on the rise (ONS 2024; Keith et al. 2024). The remainder is made up of out-of-pocket spending (14.6%), voluntary health insurance schemes (2.6%), and non-profit institutions supporting households (1.4%) (ONS 2024). Management of the NHS is devolved across the four nations, with each of the four nations having their own multi-level delivery and governance structures, comprised of some combination of regional health boards, national specialist boards, and local services (Powell and Harker 2023). All health care services are then monitored by a national regulatory body (e.g., CQC in England).

ITALY

The Italian healthcare landscape is predominantly shaped by the public national health service (SSN). The SSN was established in 1978, inspired by the UK's NHS (Giorgi, 2023), and is based on the same universalistic principles (Giulio De Belvis et al., 2022). In the 1990s and early 2000s, several healthcare reforms led to a devolution of power and responsibility from the central government to regional governments (Ricciardi and Tarricone, 2021; Vicarelli, 2023), generating the conditions for highly diversified regional healthcare services. Indeed, while the central government retains substantial power over overall healthcare spending and national standards, regional governments have been free to adopt the pro-market reforms introduced in the 1990s to differing degrees, and experiment with different models of governance and service delivery (Betti et al., 2023; Bifulco and Neri, 2022; Bobini et al., 2020; Borsoi et al., 2024; d'Angela et al., 2023; Mapelli et al., 2007; Nuti et al., 2016).

Overall, in 2023, 73.1% of national healthcare spending was devoted to the SSN; the remaining 26.9% comprised voluntary insurance (3.3%) and out-of-pocket payments (23.6%) (OECD 2025a). Despite having among the lowest wait times for elective surgery in Europe, the share of people in

Italy who have paid entirely out of pocket for medical care at least once in their lifetime has risen steeply in the last decade or so, with wait times for specialist care and diagnostics listed as the main reason (Maietti et al. 2023).

In terms of healthcare provision, Italy operates on a quasi-market basis, with a mix of public and private providers delivering services. In recent decades, there has also been a significant growth in outsourcing of healthcare services to private, mainly for-profit, accredited providers (Ciarini and Neri, 2021). It is difficult to find accurate, up to date figures, but in 2016 Toth estimated that around one third of public expenditure goes towards private providers, and that in total – including out of pocket (OOP) spending [3] – private providers accounts for almost half of all healthcare provision (Toth 2016). Although private equity is active in the sector - with recent and looming takeovers reported in the media for both diagnostics (Reuters 2026) and hospital groups (Bruno 2025) - there is relatively limited private equity investment in the Italian healthcare system overall (Del Miglio and Niedermann 2025).

FINLAND

Finland operates a largely public healthcare system that aims to deliver universal services to its residents. Its centralised, specialist university hospital system, combined with the core role of municipalities in delivering healthcare, has a long history unique to Finland, related to its sparsely populated (and historically under-serviced) rural areas, among other factors (Saarivirta et al. 2012). Of healthcare expenditure, 80% is publicly funded, while 17% comes from out-of-pocket (OOP) payments for items like pharmaceuticals, outpatient care, long-term care and dental care (OECD 2025a).

The healthcare system was re-structured in 2023 into 21 self-governing Wellbeing Service Counties (WSCs) (Tynkkynen et al. 2024). These reforms shifted funding from "municipality-levied taxes" to centralised funding, decided at the national level [4] (Tynkkynen et al. 2024, p4). WSCs have decision-making power over funding allocation within their region, and are responsible for organising primary healthcare, social care and a host of allied health services like dental and mental health care (Ministry of Social Affairs and Health 2026). Above this layer of organisation are five university hospitals, to which each of the 21 WSCs belongs, focused on the delivery of specialist care services.

Since their creation in 2023, WSCs have been running deficits "ranging from €50 million to over €100 million… due to a number of factors, such as rapid cost inflation, [and] renegotiations of health workforce wages" (Tynkkynen et al. 2024, p4). As Tynkkynen et al. (2024) point out, a focus on balancing budgets could seriously compromise the capacity of WSCs to provide adequate services and meet the needs of their residents. However, further cuts to welfare spending have been proposed by the Finnish government, to take effect in 2027. If passed, the proposals would result in a reduction in the percentage of the ongoing growth in service-need that will be covered

[3] According to the World Bank, out of pocket spending is "any direct outlay by households, including gratuities and in-kind payments, to health practitioners and suppliers of pharmaceuticals, therapeutic appliances, and other goods and services whose primary intent is to contribute to the restoration or enhancement of the health status of individuals or population groups" (World Bank, 2026a)

[4] Other funding streams include co-payments and sales, the mandatory national health insurance scheme, occupational care scheme, voluntary health insurance and direct out-of-pocket payments.

by the state, as well as an overall reduction in regional funding, weighted more punitively towards more populated areas (Helsinki Times 2026; Ministry of Finance 2023a).

Beyond the publicly managed healthcare services, approximately 22% of services are delivered by private practitioners and providers, organisations and associations (Ministry of Social Affairs and Health 2025). The large gap in unmet care needs appears to have been one of the stated motivations for the growth in the presence of private providers in the market – to supplement public services (Ministry of Social Affairs and Health 2025). However, due to the fact that private providers tend to disproportionately serve the employed and high-income groups (Tynkkynen et al. 2024; Blomgren and Virta 2020), shifts towards privatisation are likely to have a disproportionately negative impact on lower income residents.

THE NETHERLANDS

The Dutch healthcare system is the only Bismarkian welfare system among our case studies, operating on a mandatory insurance model. Citizens are required to purchase healthcare insurance from one of a range of approved providers. Those on low-incomes or who are out of work, as well as children, are entitled to healthcare benefits, which contribute to the cost of their insurance (Loef et al., 2021). While the system was set up to encourage competition in line with the 2006 Heath Insurance Act's stated aims, 80% of the market is currently covered by only 4 major providers (Kroneman et al., 2024). The payments for healthcare insurance are generally taken directly from workers' payslips or pensioners' incomes in the same way as income tax or national insurance in other countries. It is estimated that this system results in 99.9% healthcare coverage among the population (Kroneman et al., 2024).

The mandatory insurance that is required to be purchased by Dutch citizens covers 'essential healthcare' (Khvatova et al., 2024), and additional voluntary insurance can then be purchased to cover additional therapies such as physiotherapy and adult dental care (Kroneman et al., 2024). Overall, spending on healthcare breaks down to 85% mandatory insurance and government contributions, 6% optional additional insurance, and 9% out-of-pocket payments (Kroneman et al., 2024). Health insurance companies in the Netherlands are typically not-for-profit cooperatives (Ministry of Health, Welfare and Sport, 2016). Hospitals are also operated on a private, not-for-profit basis, with for-profit hospitals and nursing homes currently forbidden by law (Jeurissen and Maarse, 2021). Private equity involvement varies and, according to industry reports, appears to account for roughly 4% of specialist medical care, 2% of mental health care, 20-25% of maternal care and 19-26% of dental care activities that have been funded via the Healthcare Insurance Act (EY Consulting 2024).

1.4.2 Secondary data

We collected data from a range of sources about the socio-economic context (Table 4), social and commercial determinants of health (Table 5); health outcomes (Table 6); current and projected health needs (Table 7); health system capacity (Table 8); accessibility (Table 9) technology costs (Table 10); and degree of privatisation (Table 11) for each of our four case study countries. This data is included in tables 4-11 below, after which we discuss the most relevant findings.

*Table 4 Socio-economic indicators. Data sources: *(OECD 2025a) **(OECD 2025b)*

Indicator	UK	Italy	Finland	Netherlands
GDP per capita, 2024 (constant 2021 international $ PPP) **	52,518	53,115	55,629	70,902
Income inequality, 2023 (Gini) **	0.37	0.32 (2022)	0.27	0.29
Unemployment, 2024 **	4.3%	6.5%	8.3%	3.6%
Population with tertiary education (25-64 years), 2024 **	53.8%	22.3%	42.7%	45.1%
Healthcare expenditure per capita, USD PPP, 2024 *	6747	5164	6655	8 436
Percentage of expenditure on governance and health system and financing administration, 2023 **	1.4	1.9	0.8	3
Health spending as proportion of GDP, 2024 **	11.1%	8.4%	10.6%	10.0%
Annual growth in health expenditure per capita (real terms), 2019-2024 *	2.1%	0.9%	2.4%	0%

*Table 5 Social and commercial determinants of health. Data sources: *(OECD 2025a) **(Ortiz-Ospina et al. 2024) ***(OECD 2025c)*

Indicator	UK	Italy	Finland	Netherlands
Overall alcohol consumption among people aged 15 and over, 2023 (or nearest year), litres per year *	9.3	8	7.4	7.8
Daily smokers among people aged 15 and over, 2023 (or nearest year) *	10.5%	19.5%	11.3%	13.2%
Self-reported overweight and obesity rates among people aged 15 and over, 2023 (or nearest year) *	29%	12%	24%	15%
Daily vegetable consumption among people aged 15 and over, 2023 (or nearest year) *	No data	57%	44%	57%
Insufficient physical activity among adults, 2022 *	22%	45%	12%	11%
Share of people agreeing with the statement "most people can be trusted", 2022 **	43%	27%	68%	57%
Share of respondents who interacted (either in person or remotely) with friends or family who live nearby over the past 7 days ***	69%	79%	68%	58%
Share of respondents who report having zero close friends ***	No data	6%	9%	10%
Share of respondents who felt lonely most or all of the time over the past 4 weeks ***	No data	5%	7%	6%

*Table 6 Health outcomes. Data sources: *(OECD 2025b) **(WHO 2024) ***(World Bank 2024, 2023, 2021) ^(Our World in Data, 2024)*

	UK	Italy	Finland	Netherlands
Life expectancy, 2023 *	81.0	83.5	81.6	81.9
Healthy life expectancy at birth (years), 2021 **	68.6	70.6	69.9	70.0
Change in healthy life expectancy (years), 2000 – 2021 **	+1.36	+2.18	+3.07	+1.87
Difference in life expectancy between the region with the highest life expectancy and the region with the lowest, years *	2.8 (2021)	3 (2024)	1.0 (2023)	1.4 (2022)
Under-5 mortality rate: deaths per 1000 live births, 2024 ***	5	3	2	4
Maternal mortality ratio (modelled estimate); deaths per 100,000 (2023) ***	8	6	8	4
Mortality from CVD, cancer, diabetes or CRD (%) (2021) ***	11%	9.1%	9.6%	9.9%
Air pollution, deaths per 100,000, 2023 ^	14.5	26.3	2.8	12.5
Difference in perceived health status between top and bottom income quintiles, 2024 *	20.4 pp (2019)	11.7 pp	25.4 pp	29.1 pp

Table 7 Indicators of current and projected healthcare needs. Data sources: (OECD 2025a)

Indicator	UK	Italy	Finland	Netherlands
Share of the population aged 65 and over	18.7% (2023); 25.1% (2020)	24% (2023); 33.7% (2025)	23.2% (2023); 27.5% (2050)	20.1% (2023); 24.6% (2050)
People reporting a long-standing illness or health problem, 2024	~41.7%	~17.0%	~56.0%	~36.3%

*Table 8 Health system capacity. Data sources: *(OECD 2025) **(European Commission 2024) ^(ONS 2019)*

Indicator	UK	Italy	Finland	Netherlands
Doctors per 1 000 population, 2023 (or nearest year) *	3.4	5.4	2.9	3.9
Nurses per 1 000 population, 2023 (or nearest year) *	9.1	6.9	12.7	11.1
Hospital beds per 1000 population, 2023 (or nearest year) *	2.4	3.0	2.6	2.3
Old age-dependency ratio (pop 65+ / pop 20-64)	28.9 (2022); 36.1 (2050) ^	40.8 (2022); 66 (2050) **	41.2 (2022); 50.3 (2050) **	34.3 (2022); 46.4 (2050) **
Remuneration of hospital nurses, 2023 (or nearest year), ratio to average national wage *	0.9	0.9	0.9	1.2
Remuneration of specialists, 2023 (or nearest year), ratio to average national wage *	3.3	2.8	2.5	3.3

Table 9 Access to health system. Data sources: OECD 2025

Indicator	UK	Italy	Finland	Netherlands
Population coverage for a core set of services, 2024 (or nearest year)	100%	100%	100%	100%
Population reporting unmet needs for medical care, by main reason, 2024	4.5%	1.8%	8.6%	0.6%
Patients waiting more than 3 months of hip replacement surgery	64% (England)	30%	66%	No data
Out-of-pocket spending as a share of final household consumption, 2023	2.6%	3.5%	3.0%	2.7%
Share of households with catastrophic health spending [5]	1.5% (2019)	8.6% (2022)	3.8% (2016)	0.5% (2015)
Population satisfied with availability of quality healthcare in area where they live, 2024	61%	44%	61%	83%

Table 10 Health technology diffusion, capital and pharmaceutical expenditure. Data sources: OECD 2025a

Indicator	UK	Italy	Finland	Netherlands
Expenditure on retail pharmaceuticals per capita, 2023	557 USD PPP	846 USD PPP	655 USD PPP	485 USD PPP
Share of generics in the pharmaceutical market by volume, 2023	80%	28%	49%	79%
Change in spending on pharmaceuticals as a percentage of health spending, 2013-2023	-2.3%	+0.4%	-1.2%	-1.3%
CT scanners, MRI units and PET scanners per million population, 2023 (or nearest year)	19	79	55	37
CT, MRI and PET exams per 1000 population, 2023 (or nearest year)	196	200	124	205
Access to electronic health records, 2024	No data	84%	85%	65%
Annual capital expenditure in health and social work as a share of GDP, average 2021-2024 (or nearest year)	0.4%	0.5%	0.7%	0.7%

[5] The OECD defines catastrophic health expenditure as out of pockets payemtns that exceed 40% of available household resources to pay for healthcare (OECD 2025).

Table 11 Extent of financialisaton of healthcare (reproduction of numbers from Singh 2026, data from PitchBook)

Indicator	UK	Italy	Finland	Netherlands
Number of private equity investments deals in healthcare	573	133	102	145
Reported value of private equity investment deals in healthcare, nominal USD, billions	25.3	2.3	3.7	4.4
Total value of private equity investment deals in healthcare (reported plus imputed), nominal USD, billions	~57.3	~19.6	~29.4	~59.9
Share of private equity deal value disclosed	44%	12%	12%	7%
Proportion of reported private equity deals in clinics/ outpatient services, 2013-2023	36%	47%	56%	59%
Proportion of reported private equity deals in elder care, 2013-2023	29%	5%	25%	5%
Proportion of reported private equity deals in hospitals/ inpatient services, 2013-2023	4%	5%	<3%	3%
Proportion of reported private equity deals in laboratory services, 2013-2023	6%	29%	<3%	6%

1.5 Country comparisons

As is clear from the health system profiles detailed in section 1.4 above that our four case study countries each have very different health systems in terms of welfare regime type, governance structures and financing institutions. The health systems also operate within different, country-specific, economic, social and commercial contexts. With this in mind, we now share some reflections on how the four health systems compare to one another, before turning to the task of placing all this within the context of the four growth dependencies outlined in section 1.2.

1.5.1 Reflections on the UK

As a proportion of GDP, the UK's healthcare spending was the highest in our sample, with an average annual per capita increase of 2.1% in real terms between 2019 and 2024 – the second highest in our sample. However, when considered against the long-run trend in spending, and in the context of an ongoing underinvestment in capital and substantial and growing levels of unmet need in the population (Dunn et al. 2023), it is clear there is still a significant shortfall in provision. As a result of this shortfall, waiting times in the NHS, both for emergency care as well as for longer-term treatments, have been increasing over the last decade (Harker at al. 2026). In fact, the NHS is widely referred to as being in crisis, with a 2024 independent investigation of the NHS by Lord Darzi finding it to be in "serious trouble". The data demonstrates low levels of public trust, poor morale among workers, long wait times (Darzi 2024; Harker 2023), and poor health outcomes across the board, relative to the other countries in our sample (OECD 2025).

The UK also faces inequalities through a number of lenses, from significant differences in life expectancy and rates of infectious disease admissions between the most and least deprived areas, to stark differences in health outcomes between ethnic groups, with infant mortality among black infants in England being more than double the rate among white infants (ONS 2026). Despite the high levels of health inequality, the share of people experiencing catastrophic health spending in the UK is low because of the public, free-at-point-of-use services (Anandaciva 2023).

1.5.2 Reflections on Italy

Compared to our other three case study countries, Italy presents a paradoxical picture. Its socioeconomic indicators are among the worst of the selected countries, ranking lowest by GDP per capita until 2024, second highest on income-inequality, highest average unemployment rates over the last decade, and lowest levels of tertiary education. It is also the oldest of our four case studies, with the highest proportion of smokers, and the second highest rate of alcohol consumption. In addition, the population has the lowest levels of satisfaction with the healthcare service. However, despite all of this, it has the highest life expectancy and healthy life expectancy of our case studies. Some distinguishing factor appears to be that Italy has by far the lowest share of self-reported obesity in the population of our four countries, and better indicators of social interaction with friends and family.

The SSN appears to preform quite well on some metrics, with recent reviews acknowledging the efficient use of resources within the system (Ardito et al., 2024; Giulio De Belvis et al., 2022; Ricciardi and Tarricone, 2021). Average waiting times for elective surgery are among the lowest in Europe (OECD 2024), and avoidable mortality statistics generally show the Italian health service performing in line with or above the European average (Ardito et al., 2024; Giulio De Belvis et al., 2022; Ministry of Economy and Finance, 2024). However, health spending as a proportion of GDP is the lowest of our case study countries, and annual real-terms growth in health expenditure per capita was the second lowest in our sample between 2019 and 2024. Further, Italy has by far the highest percentage of households experiencing catastrophic health spending, the majority of whom come from the poorest quintile of the income distribution. Given that the Italian real GDP has remained approximately stagnant since 2000, this spending trend means that the SSN has had to manage a rapidly ageing population with a relatively small increase in resources, and perhaps at the cost of catastrophic health spending for those in the population who can least afford it. This continuous underfunding, alongside growing shortages of nurses and doctors (de Belvis et al. 2024), and stark regional disparities creates a clear vulnerability to future social or economic shocks.

Italy also presents a challenging picture on inequality. Although it has by far the lowest gap in self-reported health status between the highest and lowest income groups in our sample, it also has the largest difference in life expectancy between the region with the highest life expectancy (typically in the North) and the region with the lowest life expectancy (typically in the South). And although public healthcare spending per capita is relatively homogenous across regions (Borsoi et al., 2024), Southern regions consistently underperform in national rankings (d'Angela et al., 2023), with health outcomes remaining below the national average (Naghavi et al., 2025). Moreover, families residing in the South represent 48% of families experiencing catastrophic healthcare spending, while they only make up 32% of total families (Del Vecchio et al., 2024).

1.5.3 Reflections on Finland

Finland has the second highest GDP per capita of our case study countries (above the UK and Italy, but well below the Netherlands), the second highest expenditure on healthcare as a proportion of GDP and the highest annual growth in health expenditure per capita. However, OOP spending is higher than the EU average, reflecting limited "mechanisms for financial protection" (Tynkkynen et al. 2024, p3). User charges are "high and apply to most publicly financed services", and payment caps can still leave people with co-payments totalling as much as €1689 per year (Tynkkynen et al. 2024, p6-7). In other words, there are a lack of effective policies in place to prevent onerous health costs for the population.

Further, low-income groups tend to face longer wait times for treatments. This is partly due to the better access to primary care and general practitioners afforded to those in employment by occupational health care schemes (Väisänen et al. 2025). Low-income groups also have worse outcomes than their wealthier counterparts across a range of mortality categories and age-groups, with alcohol-related mortality showing the greatest degree of inequality (Lume 2018, p1). In terms of the geographical distribution of services, much of the Finnish population live in what Väisänen et al. (2025, p2) call medical deserts: "areas with poor accessibility and availability of [primary health care] services", typically related to "long waiting times and travel distances in addition to the low availability of healthcare workforce". This is in part because of Finland's naturally sparse rural population, and in part because Finland has gone for a policy of centralising services, particularly for specialist care (Ilmarinen et al. 2025). This has also included closing down small regional hospitals, reducing access in rural areas (Tynkkynen et al. 2024, p10).

On health outcomes and commercial determinants of health, Finland shows a mixed picture compared to our other case study countries, with the second-lowest life expectancy, and the joint-highest maternal mortality rates, but the lowest under-5 mortality rate. Obesity rates are second highest among our case studies and on the rise; meanwhile, smoking and alcohol consumption are both the lowest in our sample and declining. As a result, deaths resulting from "behavioural risk factors" are below the EU average (European Commission 2023, p7). However, "deaths of 'despair'" (related to suicide and drug and alcohol abuse) remain significantly higher in Finland than the EU average (European Commission 2023, p3).

1.5.4 Reflections on the Netherlands

The economic performance of the Netherlands is very strong relative to our other case study countries, with the highest GDP per capita by far, and the lowest level of unemployment. It also has the lowest level of wealth inequality and the second lowest level of income inequality among our case study countries. It spends by far the most on healthcare per capita of our sample, and performs fairly well on commercial determinants of health such as alcohol consumption, and self-reported obesity. On health outcomes it fairs middlingly, particularly considered in the context that it spends "considerably more per person on health than many other EU countries, including some with similar treatable mortality rates" (Kroneman et al. 2024, p4,16).

The Netherlands performs well in terms of accessibility, with low OOP spending, very low rates of catastrophic health spending, and "among the lowest unmet needs in the EU" (Kroneman et al. 2024, p14), also compared to the rest of our sample. This is due in part to its mandatory health insurance policy and caps on out-of-pocket spending, among other factors. However, these figures do hide substantial health inequalities, with unmet need significantly higher for individuals at risk of poverty (European Commission 2025). Further, it has the largest gap in our sample in self-reported health outcomes between the highest and lowest income groups; a variation that is also much wider than the EU average (European Commission 2025, p3). Additionally, the exposure to health risk factors varies greatly between groups, with individuals who have the lowest education levels being "two times more likely to smoke and be obese than the most highly educated" (European Commission 2025v, p1).

1.6 Comparative growth dependency analysis

We now come to reflect on these case study findings in the context of the growth dependency framework presented in section 1.2, considering how each case study might show unique vulnerabilities and areas of resilience to each growth dependency mechanism.

1.6.1 Managing growing health needs

All four of our case studies face rising needs and demands on the health system as a result of population ageing and increasing burdens of multi-morbidity. To better understand what these trends in need might mean for healthcare systems in a post-growth context, we must consider two opposing dynamics. First, in a post-growth context, all else equal, the healthcare system will have to meet the needs of an increasingly old and morbid population, without the assistance of economic growth (i.e., with relatively fewer resources). This places Italy in theoretically the most challenging position among our case study countries, with the oldest current and projected population, and the greatest projected change in the old-age dependency ratio also. Second, in the other direction, we would expect the prevalence of multi-morbidities to be reduced in a post-growth context through the causal mechanism of improvements to the social and commercial determinants of health (Gilmore et al. 2023). As the literature on health trends in recessionary times demonstrates, this may be true whether or not the transition is planned; e.g., through reductions in the consumption of harmful goods like alcohol and tobacco (Borowy 2013; Tapia Granados & Roux 2009; Ruhm 2000). We might also, therefore, expect those countries with good social and commercial determinants of health today to have lower existing rates of multi-morbidity in the population, longer healthy life expectancy, and for their health systems to be partially 'protected' from some of the strains of an ageing population in a post-growth context.

Turning to our case studies, Italy offers an interesting case to examine in terms of the potential impacts and limitations of such protective factors for the functioning of the health system and the overall health of the population. Despite having almost stagnant GDP since 2000, the lowest absolute expenditure on healthcare per capita and lowest expenditure as a proportion of GDP, as well as the oldest population among our case studies, Italy has the longest life expectancy and healthy life expectancy in our sample, as well as the lowest mortality rates from CVD, cancer, diabetes and CRD. This is an apparent paradox. This outlier is often attributed to the 'Mediterranean diet' (Finicelli et al. 2022; Castro-Quezada et al. 2014; Trichopoulou and Vasilopoulou 2000). Indeed, the OECD data shows low obesity rates and high daily vegetable consumption as stand out features of the country. However, Italy also has the highest rates of daily smoking and the second highest alcohol consumption. The other element that is typically cited as supporting population health in Italy is high levels of social capital, particularly in terms of strong familial and community bonds, which contributes to strong elderly support (Alesina and Guiliano 2010). This is also corroborated by our data which, although showing weak trust in strangers, shows Italy with the highest levels of family and friend connections among our case studies. This creates a mixed picture that points towards the need for further research into exactly which social and commercial determinants of health contribute to improved health outcomes and under what conditions.

If we look beyond health outcomes, towards the functioning of the health system, Italy becomes by no means a clear-cut case, with substantial challenges in terms of long waiting times for certain

procedures and severe regional inequalities. In other words, although some measures of health are better, that does not automatically translate into a reduction in *demand* on the health system. This speaks to an important insight for the structuring of a post-growth health system. It is not only about improving population health – that is an important part of the picture – but it must also be about finding ways of translating that reduction in need into a reduction in demand on the formal healthcare system, particularly in the realm of highly specialised, tertiary healthcare. In Italy (and all of our case studies), the healthcare system is still under substantial strain, and there is still a significant amount of unmet need in the population that genuinely needs servicing. Authors such as Zywert (2024), Dengler et al. (2022), Cottom (2018), and others, offer the possibility that many of our health needs might be serviceable in different ways, within and by the community, rather than through the formal healthcare system. This will be a crucial part of the post-growth healthcare landscape too.

1.6.2 Un-masking growing labour costs

The next growth dependency highlighted by Corlet Walker et al. 2024 is growing labour costs resulting from Baumol's cost disease (i.e., from the fact that labour productivity growth in other sectors 'pulls up' wages in the economy at large). Although there is evidence in the literature of the impacts of Baumol's cost-disease on expenditure in the healthcare sector, the precise impact of the cost disease on wages is heavily mediated. This is because wages in the public health sector are typically either arrived at through collective bargaining processes or set by independent pay review bodies, meaning that the impact of the cost disease on the healthcare system can be partially contained or, more accurately, *masked* through cost-shifting. I.e. the growing costs of the healthcare sector are born by workers in the form of poor pay and understaffing. Indeed, the UK, Italy and Finland all pay their nurses around 0.9 times the average wage, with some of the worst pay in the OECD relative to each country's national average wage. This cost-shifting behaviour onto staff is well-documented in the UK, with average earnings for nurses and doctors declining by 5.9% and 7.4% respectively, in real terms between 2010 and 2021 (Dayan and Palmer 2022).

In other words, the impact of this growth-dependency (and others) is likely being borne by workers and patients rather than the public wallet or the pockets of private investors. The recent nurses' disputes in Finland and doctors strikes in the UK have served to partly ameliorated the intensity of these trends in cost-shifting; highlighting the central role of workers' rights and protections in resisting such cost-shifting behaviours. This will become even more crucial in a post-growth context as powerful stakeholders (e.g., pharmaceutical companies, private equity firms, etc) vie more aggressively for their slice of the economic pie (Stratford 2020).

Notably, such cost-shifting behaviours cannot be said to be exclusively a response to Baumol's cost disease. Other cost pressures (e.g., technology cost growth and rent-extraction) also create an environment that is ripe for cost-shifting from public and private actors. Further, costs are not only shifted on workers, but patients too, in the form of poor quality care and high out of pocket payments. For example, Italy is a clear example of cost-shifting onto patients, with by far the largest figure for catastrophic health spending in our sample at 8.6% - the majority of whom are low-income households.

Meanwhile, the Netherlands pays its health workers comparatively well with nurses receiving around 1.2 times of the national average wage and doctors around 3.3 times. It also has the least amount of unmet need and the lowest share of catastrophic household spending in our sample. From this, we might conclude that the impacts of Baumol's cost-disease (and other cost stressors) are not currently being so wholly shifted onto the plates of workers. However, the Dutch

healthcare system has other vulnerabilities in this regard, the capacity of the system to pay its healthcare staff well rest on a very large expenditure per capita on healthcare, something that will likely be challenging to sustain in a post-growth context. Further, the Dutch health system is primarily funded through insurance programmes linked directly to employment. In a post-growth context, we might anticipate that the aggregate wage bill would reduce (e.g., through reduced working hours). This will place a direct strain on the health insurance system and its risk-pooling mechanics, as premiums become less affordable. Within this system, the government also arguably has a more limited (though not entirely absent) capacity to cushion the blow through redistributive measures such as those that might be possible in a tax-funded system.

As we can see from our other three case studies, this is clearly not a straightforward case of tax-funding being the 'better' post-growth option. Ultimately, it comes down to different political dynamics. Tax-funded systems are more vulnerable to austerity politics, as can be seen in our case study comparison, but they also hold the greater potential for equitable and protective redistributive funding to cope with any unavoidable cost-growth in a post-growth environment, without relying on cost-shifting onto the backs of workers and patients.

1.6.3 Containing growing technology costs

Our case study comparison also demonstrates something interesting with regards to the growth dependency resulting from growing pharmaceutical and technology costs. In particular, as we highlight in section 1.2, medical developments and technological advancements can have the effect of expanding the scope of conditions that are treatable within the medical system, thereby growing demand. The diffusion of imaging machines is a prime example of this demand expansion mechanism at work. Such growing costs generate a dependency on growing sector level revenues, and, therefore, the capacity of countries to manage and contain such costs will determine in part their degree of resilience to this growth dependency during a post-growth transition.

Among our case studies there is significant variation in the extent of pharmaceutical and technology costs within the health system. For example, the UK and the Netherlands have the lowest expenditure on retail pharmaceuticals per capita, the highest share of generics in the pharmaceutical market by volume (80% and 79% respectively), and the lowest number of medical scanners per million in the population. This contrasts to Italy, which has by far the highest expenditure per capita on pharmaceuticals, the lowest share of generics in the market (28%) and the highest number of CT, MRI and PET scanners (but roughly the same number of scans conducted per 1000 in the population as the UK and the Netherlands). Here we can see a relative vulnerability of the Italian healthcare system to this growth dependency.

A mix of factors likely contribute to the observed variation among our case studies. These include national healthcare expenditure, budgetary constraints, prescribing and pricing laws around generics, market competition, the effectiveness of cost-containment institutions (Fontrier et al. 2022), as well as demand-side factors such as health burden in the population (i.e., higher rates of morbidity will require greater quantities of medications). For example, in the UK, NICE operates as an arms-length health technology assessment body, evaluating medicines and technologies against a typical threshold of £20,000-£30,000 per QUALY (quality adjusted life year). Although the recommendations from NICE are not strictly legally-binding, the NHS is obliged to fund approved treatments, giving it a lot of effective power (Fontrier et al. 2022). Guidance from many NHS Trusts and commissioning groups also encourages general practitioners to write prescriptions using the international non-proprietary name for each drug, rather than brand

names, wherever possible (e.g., Latta 2018; Surrey Medicines Commissioners Group 2016). For a contrasting example, Italy has centralised national price-setting for medicines through its HTA, AIFA (De Belvis et al. 2022). However, beyond AIFA the implementation story is much more complex and the appearance of AIFA-approved medicines on local pharmaceutical formularies varies considerably by region, as do regional procurement and tendering processes for said drugs (Bortolami et al. 2024; Garattini et al. 2016). Further, a lack of cultural trust in generic drugs appears to be partially responsible for the observed consumer preference for branded alternatives (Zerbini et al. 2017).

With the data included in this chapter, it is not possible for us to make any clear assessment of what is and isn't effective in terms of mitigating this growth-dependency. However, it appears that robust cost-containment bodies, prescribing and dispensing policies, and cultural norms around generics are all vital parts of this picture. Such cost-containment pathways are complex and varied and there is need for further research to better map them, and to identify what is likely to determine their effectiveness in a post-growth context.

1.6.4 Mitigating predatory financial practices

The last growth dependency mechanism we are reflecting on is rent-seeking through predatory financial practices. As discussed in section 1.2, this creates a dependency on growing revenues in order to meet the demands of costly and risky financial structures and stave off financial collapse (Corlet Walker et al. 2024). Recent analyses have revealed the prevalence of private equity involvement in the healthcare systems of wealthy economies (Singh 2026). Among our four case study countries, the UK has seen by far the most private equity deals between 2013 and 2023 at 573, the majority of which have been in outpatient services (36%) and elder care (29%). This is a pattern that is repeated in Finland (56% and 25% respectively), though with may fewer total deals at 102. Italy, by contrast, has 133 private equity investment deals over the same period, with the majority in outpatient services (47%) and laboratory services (29%). This data highlights two things: 1) that the health system is not a monolith and private equity penetration varies significantly across different parts of the system; and 2) that hospitals are currently relatively well protected from private equity involvement across the board (EY Consulting 2024; Suzuki et al. 2025). Taking the healthcare system as a whole, Singh (2026) argues that Italy, Finland and the Netherlands have slightly fewer private equity deals than might be predicted based on their income per capita; meanwhile, the UK has far more. The authors attribute this differential to factors not captured in their model, such as "regulatory environment, payment policies, [and] contracting practices " (Singh 2026, p15). They also conclude that "relative to countries with a market-based health system, countries with a social health insurance system have lower likelihood of PE [private equity] entry" (Singh 2026, p23).

Private equity involvement in healthcare provision matters because the best evidence to date, from a range of countries, suggests that not only does it increase costs and heighten financial risks, but it also worsens working conditions and health outcomes, and has "mixed to harmful" impacts on healthcare quality (Corlet Walker et al. 2022; Borsa et al. 2023, p1; Kannan et al. 2023; Gupta et al. 2021). This is another clear example of cost-shifting, but this time off the balance sheets of financialised pharmaceutical companies and care providers and onto the backs of healthcare workers and patients. Country-specific data on the impacts of private equity involvement in healthcare is lacking; however, there have been many high-profile healthcare-provider collapses that spell out the potential implications of such a precarious financial model

underpinning a basic welfare service like healthcare (e.g., Four Seasons Healthcare in the UK) (Corlet Walker et al. 2022; Singh et al. 2026).

Taken together, all this points to the importance of robust financial regulation covering the whole of the healthcare system; something that is currently severely lacking. A recent review of seven high income countries, including Finland and the Netherlands, found that most regulatory responses to private equity were focused on disclosure and transparency, rather than attempting to regulate firm behaviour, ownership and profit-distribution, or limit the presence of private equity in the healthcare sector (Tracey et al. 2025). This seriously limits the potential effectiveness of such regulations and leaves the healthcare sector wide-open for business. In a post-growth context, if left unchecked, the kind of rent-seeking behaviours seen in the healthcare system today will likely result in negative health consequences, as they already are today in growing economies. To tackle this growth-dependency at the root, much stronger regulations around ownership models and financing structures will be needed. Indeed, there is a persuasive argument for removing the profit-motive altogether from the sector, since it not only shifts focus away from patient care and towards financial gain, but also opens the door to financial entities, who benefit from increasing demand, and will typically seek to find a loophole that allows for rent-extraction.

1.7 Towards growth independence

In this chapter, we have built on the growth dependency framework presented by Corlet Walker et al. (2024). The authors propose growing needs, labour productivity growth, and rent-seeking as core mechanisms through which growth dependency manifests in the welfare state. We have added to these the mechanism of technology-driven cost growth – something that emerged from our research as a particularly important growth dependency mechanism in the healthcare sector. We then developed health system profiles for our four case study countries: the UK, Italy, Finland and the Netherlands. These profiles summarise the structure and governance of each healthcare system, as well as providing information about the degree of privatisation. We further include several tables of comparable data across the four case study countries, including indicators of economic performance, health outcomes, accessibility of the health system and technology and pharmaceutical costs. This data was followed by a summary of how each health system faired in comparison to others in our sample, and any stand-out features of each.

To end this chapter, we therefore offer some tentative principles for designing a post-growth healthcare system, as a way to orient future research and steer national policy debates. However, our research has demonstrated that none of the case studies we analysed showed resilience across the board to our four growth dependency mechanisms. In fact, each country has multiple areas of vulnerability that are particular to their unique health system structure and socio-economic context. This emphasises the importance of situating any future policy design or research efforts that emerge from these principles concretely within the country-specific-context in which they would be implemented.

Our proposed principles for growth independent healthcare systems are as follows:

1. **Invest in the social and commercial determinants of health**; including preventative health programmes, food systems, housing, and transportation, as well as empowering individuals and communities to meet their health needs outside the formal healthcare system, where possible. This might include mutual aid groups, community exercise classes, and so on.
2. **Improve workers' rights to protect against cost-shifting in a resource constrained environment**. This might increase wage-related healthcare costs, but would support other normative goals of a post-growth healthcare system, including quality of care and working conditions. Given that growth-dependency is about the harmful impacts of low growth rates, embedding policies that protect workers and patients *first* must sit at the core of any growth-independent health system design. Other pillars can then be used to offset this additional cost (see redistributive point below).
3. **Redistribute funding away from damaging sectors (e.g., oil and gas subsidies) and towards health-creating sectors (e.g., food, housing, community programmes, etc)** - this will support healthcare systems to meet growing needs and costs, where they are unavoidable.
4. **Fund the health system through progressive, centralised taxation** (including wealth taxes), rather than through insurance models, to decouple healthcare funding as much as possible from wages. Ultimately, although tax-funded systems are still linked to wages to some degree, this link is weaker. And although they are more vulnerable to austerity politics, they also hold the greater potential for equitable and protective redistributive funding, if designed well.
5. **Develop strong, multi-level cost-containment pathways** – including formal bodies, prescribing and dispensing policies, and cultural norms around generics – in order to protect against pharmaceutical and technology-driven cost growth.
6. **Transition to a non-profit healthcare *system,*** including all core aspects of the healthcare sector from primary, secondary and tertiary care to pharmaceutical and technology development. At a minimum, there is an urgent need to significantly strengthen financial regulations around ownership models, debt leveraging and profit extraction, and to protect healthcare from the aggressive pursuit of rents by private actors using predatory financial practices.

There are many potential directions for future research on the basis of our initial investigations, from discerning where the most impactful investments might lie in the arena of improving the social and commercial determinants of health, to better understanding the implications of improving workers' rights on healthcare costs in a post-growth environment, and mapping and analysing different regulatory and institutional structures for cost-containment. All would be welcome additions to this nascent literature.

Chapter 2: Pensions in a Post-growth World - A comparative Analysis of Funded and Pay-As-You-Go Systems

Pension systems across the globe are currently facing several challenges, from steep demographic changes to poor financial sustainability (Heer et al., 2026), and pension provision is often the largest single item of social spending in government budgets (OECD, 2025d). The ability of developed countries' pension schemes to deliver a liveable income to pensioners is often deemed dependent on the continued growth of their economies (Barr, 2021). If we take a post-growth economy to be one that does not pursue GDP growth as an objective (as defined in Chapter 1), we expect *ceteris paribus* a transition to such an economy to exacerbate the pensions challenges in several ways.

To the best of our knowledge, only a handful of English-language peer-reviewed contributions (Wiman, 2024) and a small body of grey literature (Monserand, 2019; Palomera and Stark, 2026; Petschow et al., 2018) have explicitly studied pensions in a post-growth context. What is missing is an approach that looks at the structural differences between different types of pension systems, and how each of these might interact uniquely with a post-growth transition. This paper addresses that gap by examining two of the main pension architectures side by side: earnings-related public pay-as-you-go (PAYG) systems, using Finland and Italy as case studies, and hybrid systems combining a flat-rate PAYG pillar with a substantial funded occupational component, using the United Kingdom (UK) and the Netherlands.

The rest of this chapter follows a different structure compared to the previous one. Section 2.1 reflects on the main challenges facing pension systems, and how they could be exacerbated in post-growth scenarios. Section 2.2 presents post-growth criteria for evaluating pension systems and the structural pressures bearing on both PAYG and funded schemes. Section 2.3 introduces the four case studies. Section 2.4 provides a discussion combining the theoretical insights of the first sections with the case studies data.

2.1 Growth dependencies of pension systems: the post-growth challenge

There is a vast literature on pension sustainability and the challenges that national pension systems are currently facing (Barr and Diamond, 2006; Heer et al., 2026). Our first step is to understand how post-growth might affect or change these challenges. Important to the analysis is the concept of growth dependency illustrated in the previous Chapter. Specifically, we ask whether a lack of or decrease in economic growth is bound to undermine the pension system, either by jeopardising its financial viability or by negatively affecting the wellbeing of pensioners and workers. We first look at the growth dependency of pension system in general. Then, we devote Sections 2.1.2 and 2.1.3 to illustrating how growth dependencies differ between PAYG and funded systems.

2.1.1 The fundamental pension challenge

At its most simple, the core of the pension challenge is about distribution. The essential question is: how can national income be distributed between workers and pensioners? Both PAYG and funded systems are allocative instruments (Barr and Diamond, 2006). PAYG schemes rely on government legislation; funded systems rely on financial markets to distribute present and future national income between the two groups. They function under different conditions, but the essential distributional challenge is the same. Hence, the first question that we need to ask in relation to post-growth pension is: how does post-growth affect the distributional challenge of pensions?

Theoretically, economic growth is not needed to support a pension system. To illustrate this, consider a society with the following properties:

- A strictly stationary population. The size of the population and the share of workers and pensioners remain the same.
- A steady state economy. Income is constant and perfectly reproduced each year. We focus on real income, so inflation does not influence the picture.
- A fixed income distribution. The labour and capital share are fixed, and the amount of income allocated to pensioners is the same each year.

In such scenario, the pension system does not depend on growth. Workers and pensioners receive the same income each year; no one is worse off compared to the year before. Therefore, economic growth is not needed to support a pension system theoretically. However, our scenario requires a lot of unrealistic assumptions, such as constant fertility and mortality rates, constant life expectancy, a perfectly stable distribution of income and so on. If we play with these variables, we quickly realise why growth is often desirable.

For instance, population ageing is arguably the single biggest stressor on modern pension systems. In our theoretical scenario, if a larger share of the population retires (assuming a steady population) more income would need to be allocated to pensioners to maintain a steady average pension for retirees. This does not necessarily mean that less income will be available for workers. Because there are now fewer workers, a lower share of output would align with maintaining a constant average income for them as well. However, fewer workers would be required to produce the same output, which means that each worker should either work more or become more productive. In both cases, a larger share of what workers produce would go to pensioners (higher contribution rates). This effect could create distributional tensions between the two groups. Overall, we could argue that an ageing population creates a growth dependency in pension systems because, in the absence of growth, it requires a class to shoulder more heavily the distributional issue [6].

Increasing economic inequality would have a similar effect. In a stationary economy, it is straightforward to see that an increase in pension benefits would require higher contribution for workers, making pensioners better off and workers worse off. Even a change in the functional income distribution would result in distributional tensions. For instance, an increase in the capital share reduces the wage bill. Such reduction can lead to lower pension contributions,

[6] This argument is potentially contested. Wiman (2024) argues that aging should not be considered a growth dependency because the absence of growth does not change demographic projections. In other words, they see growth dependency in pensions only if no growth is actively causing a new issue, not just exacerbating an already existing one.

forcing an adjustment of the pension system. Contribution rates might be raised, or pension benefits lowered. In any case, someone will have to bear the burden of adjustment. Overall, a shift in income distribution can put pressure on pension systems – though the impact depends on the specific pension scheme, as the next two subsections discuss. In this sense, we could say that income inequality between workers and pensioners, but even within the two classes themselves, can constitute a growth dependency. Unequal distribution makes growth an appealing possibility to postpone or avoid the harder choice of redistribution. This is because a growing GDP allows to distribute more resources to every class without necessarily reducing their real income in absolute terms.

This last point is important. In both our examples, economic growth would not eliminate the distributional issue inherent to the pension system, but it would lower its impact. In other words, growth can be used to smooth distributional tensions. Fundamentally, when resources are scarcer, distributional issues become politically tenser. By turning redistribution into a zero-sum game, a lack of growth implies that one stakeholder will experience some form of harm. In this sense, welfare systems at large are growth dependent, as they are essentially distributive institutions. Pensions are no different. Hence, when we study the growth dependencies of pensions, the interesting question is not whether pension systems are growth dependent. Rather, we want to understand what key variables are supposed to grow to support the functioning of the system and how they could be managed to minimise the impact of post-growth on pension stakeholders. Importantly, the reliance on market institutions in funded systems generates different growth dependencies than in PAYG ones, and the two architectures are likely to fare differently under post-growth conditions. We thus first assess how PAYG and funded schemes are dependent on growth. Importantly, our analysis applies to both public and private schemes.

2.1.2 How are PAYG system growth dependent?

PAYG pension systems work by transferring each year income from workers, their contributions, to the population of pensioners. The long-run financial viability of a PAYG pension system depends on the fundamental requirement that – on average – workers' contributions match the pension outflows paid to retired individuals. Thus, a PAYG system is generally dependent on the wage bill [7]. Following Aaron (1966) and Samuelson (1958), the long-run implicit rate of return on a balanced PAYG system equals $n + g$, where n is the growth rate of the labour force and g the growth rate of real wages per worker. While n is plausibly bounded by demographic projection and is largely independent to the post-growth transition [8], real wages per worker g depends critically on which post-growth scenario is at play. A post-growth transition might see a contracting GDP and a growing wage bill. In Aaron–Samuelson terms, the implicit return $n + g$ can remain positive even when GDP growth is zero, provided the labour share is rising. In this sense, PAYG systems are not strictly dependent on GDP growth (Wiman, 2024). However, a stagnation or reduction in economic production likely means a contraction of workers' contributions.

A stagnation of the wage bill can essentially cause two harms. Contribution rates must be increased to meet pension obligation, thus reducing present workers' income. Or pension

[7] The exception is tax-funded universal schemes such as those in New Zealand or Denmark. These systems depend on the growth of the tax revenue. In practice, both are sensitive to similar macroeconomic and demographic drivers.

[8] This point might be contested. Currently, the link between post-growth and demographic trends has remained largely unexplored in the post-growth literature. Whether a post-growth economy will significantly change fertility, mortality and migration rates remains an open question.

benefits must be reduced to align with lower pension inflows, thus reducing pensioners' income. An alternative option is increasing the retirement age, which could be considered a negative impact on the older working population. The government can also compensate a deficit either by reallocating financial resources from other expenditure items in the public budget, or by increasing public debt. Public debt can thus be used to smooth distributional tensions in the pension system. However, increasing public debt is a distributional choice itself which affect the current and future income distribution of the larger population (Tabellini, 1991). Moreover, debt as a tool to reduce distributional conflicts is limited in a post-growth context if growth can no longer be used to stabilise the debt-to-GDP ratio.

The group of people who will have to bear to cost of rebalancing the system depends on many factors that are country dependent. It is not possible to offer a comprehensive summary; too many variables are at play for every pension system. A simple rule of thumb is that if a PAYG system is defined benefit (DB) [9], workers will have to pay higher contributions to the system. If the PAYG system is notional defined contribution (NDC) [10], pensioners will see their pension income adjust to the lower contribution inflows (Nisticò, 2019). However, this distinction is only theoretical. In practice, pension reforms and path dependency can end up changing the way the cost is distributed. In most cases, it is likely that policymakers will try to strike a balance between lower pensions and higher contributions. Regardless, what this distinction shows is that in DB schemes the growth dependency gives rise first to a financial viability issue. If contributions are not raised, the pension system becomes insolvent. Then, if contribution rates become too high, worker might see their net income shrink to poverty levels. Conversely, NDC systems are growth dependent because a reduction in contributions generates a potential pension adequacy issue among retirees. In other words, if contribution rates are kept constant but the wage bill shrinks, there will be less pension income available to distribute among pensioners, with the associated risk of increasing poverty levels among this class.

2.1.3 Growth dependencies in funded systems

In funded systems, workers' contributions are saved and invested by pension funds in financial markets. The accumulated financial assets and related inflows are then used to pay the pension of the worker once they retire. As funded schemes rely on financial markets to provide a pension income, they are not directly dependent on the growth of the wage bill. Rather, pension provision depends on the performance of asset returns. Drawing from Aaron (1966) and Samuelson (1958), the long-run implicit rate of return for a funded system is r, the real rate of return on the assets the funds hold. Asset returns are not strictly correlated with economic growth (Ritter, 2005) and historical evidence suggests that they tend to be significantly higher (Jordà et al., 2019). Nonetheless, over the multi-decade horizons relevant to pension accumulation, asset returns are

[9] A DB scheme generally defines the pension benefit an individual is entitled to as a share of that individual's pre-retirement income (usually computed as an average across a set number of years). The individual then receives that level of benefits for the rest of their retirement life.

[10] An NDC system is a PAYG system with a defined contribution structure . This means that pension benefits are not set as a share of the previous working income but depend on the total amount of contributions accumulated by the pensioner throughout their working career as if these where invested. However, in an NDC scheme there is no actual financial capital accumulated on which to compute the pension benefit, as the funding is guaranteed through a PAYG scheme. Therefore, NDC pensions pay an income stream to the retiring worker based on their notional accumulated fund. Where 'notional' means that there is no money invested in a fund as the pension contribution is actually used to pay the pension of currently retired people. Moreover, the government creates a notional rate of return for the notional fund to mimic the market rate of return on an actual financial fund.

likely to be bounded by GDP growth plus shifts in the profit share. Hence, it is important to notice that though GDP growth is significant in the long run for the overall performance of pension funds, funded schemes are not directly reliant on GDP growth (Wiman, 2024).

When it comes to assets performance, lower returns would either mean financial solvency problems for DB schemes, requiring an increase in funding from the scheme's sponsor, or low pension income for retirees in defined contribution (DC) [11] schemes. In both cases, either workers or pensioners will experience harm in the form of lower income. However, funded schemes have the significant benefit that financial assets are mobile. Though in theory funded and PAYG schemes equally rely on the income produced in a given period on a given territory, in practice it is unlikely that post-growth will happen simultaneously at the global level. Hence, in the potential scenario where post-growth lowered domestic asset returns, pension funds could purchase foreign assets to diversify from the post-growth risk. The ethical and macroeconomic dimensions of this option are non-trivial, and we engage them in Section 2.4. What matters for the present argument is that international financial mobility could provide a significant tool to reduce growth dependency on asset returns for funded systems and avoid the distributional pressure experienced in national PAYG systems.

2.2 Designing post-growth pension systems

We have established the main drivers of growth dependencies in pension systems. Now, we can reflect on how post-growth pensions should be designed to withstand a post-growth transition and address the inevitable distributional tensions emerging from it. A reflection on the design principles is essentially normative. Distributional issues in relation to post-growth pensions imply ethical considerations regarding what harm is 'acceptable' and what group should bear the burden of redistribution.

To answer these questions, we elaborate a framework of reference. Drawing on the post-growth welfare literature (Büchs, 2021; Corlet Walker et al., 2021), we outline a set of criteria that an ideal post-growth pension system should meet. These five criteria are presented as analytically distinct, but they are not fully independent of one another.

1. **Ecological sustainability.** The pension system should be able to operate within planetary boundaries (Richardson et al., 2023). Pension provision should not come at the cost of environmental degradation that endangers the wellbeing of future generations. This principle applies differently to PAYG and funded systems. Funded systems can have a direct impact on the environment through investment allocation. If pension funds invest in fossil fuels and highly polluting industries, pension provision becomes a driver of ecological degradation. Conversely, it is harder to measure the environmental sustainability of PAYG systems, as they directly transfer income from workers to pensioners. Arguably, an assessment of sustainable consumption of pensioners might be linked to PAYG. However, it would be logically tenuous to connect retirees' consumption patterns to the ecological impact of a pension system.

[11] In a DC scheme, the worker's contributions are invested in an individual account. Once the worker retires, they receive their pension based on the accumulated financial assets and related returns.

2. **Financial viability.** Post-growth economics reduces the focus on economic growth and profit maximisation. Yet accounting principles cannot be ignored. Post-growth pension systems will still need to be solvent. It is worth repeating that financial viability assumes fundamentally different meanings across scheme types. In PAYG systems, long-run financial viability means that pension benefits must be met by equal pension contributions. In funded systems, DB schemes promise a certain benefit level to their members. Hence, financial solvency means having enough assets to meet future pension liabilities. DC schemes do not promise a given pension benefit, hence the solvency risk is effectively transferred to the pensioner. If the value of a pension pot decreases, the pensioner will receive less pension benefits. Financial viability then becomes tightly linked to pension adequacy.
3. **Needs satisfaction.** Pension systems would need to provide an adequate income to pensioners to meet their basic needs. This principle is aligned with the traditional goal of pension adequacy or poverty alleviation in older age. However, once it is combined with the 'ecological sustainability' principle, the key priority becomes *sufficiency*. The focus turns from maximising pension income to providing sufficient pension income. The basic needs of pensioners could be assessed in a relatively objective way through deliberative democratic processes (Jungell-Michelsson and Heikkurinen, 2022; Vogel et al., 2024). Although covering the debate on how to define sufficiency is beyond the scope of this work, it is worth stressing that the notion of sufficiency is country and context dependent. A comprehensive measure of pension sufficiency would not only focus on the level of the pension annuity. It would also include the accessibility of other key services, such as healthcare, housing and long-term care, as well as maximum and minimum thresholds of resource consumption. This leads us towards something akin to Vogel et al.'s "effective cost of living" (2024, p3). In our analysis in this chapter, we primarily focus on the 'at-risk-of-poverty' rates to assess the adequacy of pension provision, but a more comprehensive set of indicators could be devised.
4. **Distributional equity.** The post-growth literature strongly emphasises the importance of a more egalitarian distribution of income and wealth (Cosme et al., 2017). Such focus has a normative foundation, but also a clear economic rationale. As the pursuit of ecological sustainability might lead to lower aggregate income/wealth, meeting the basic needs of every citizen while remaining financially viable makes inequality extremely costly and inefficient. Indeed, in a non-growing economy higher income of someone means a lower income for someone else. Providing a decent income to everyone while also allowing for high concentration of income for a minority of the population is harder the lower the national income is. We have also seen above how inequality is a driver of growth dependency. In the pension context, distributional equity means a fair income distribution within the pensioner class, between workers and retirees and from an intergenerational perspective. In funded systems, pension inequality is also shaped by (pension) wealth inequality.
5. **Democratic governance.** The post-growth literature emphasises participatory processes as a means of achieving socially just institutional outcomes (Soto-Oñate et al., 2026). In the pension context, this does not necessarily mean that pension systems should be publicly managed: a broad involvement of labour market institutions in the design of private funded schemes is also aligned with this principle. Whether public or private, post-growth systems must be accountable to and reflect the will of all stakeholders.

Ideally, these five criteria would guide post-growth policymakers (and the researcher assessing a pension system). We now turn to real-world case studies to apply this framework and gain policy-relevant insights.

2.3 Pension case studies

Our discussion has so far remained theoretical to lay down the foundation of post-growth pension thinking. The following four case studies allows us to illustrate how post-growth thinking can be applied in practice. We chose Finland and Italy to represent earnings-related public PAYG systems, the UK and the Netherlands to represent hybrid systems combining a flat-rate PAYG pillar with a substantial funded occupational component. All four countries have been experiencing prolonged economic stagnation or declining growth and rapidly ageing populations (Figure 1 and Figure 2) which makes them particularly well-suited for a post-growth analysis.

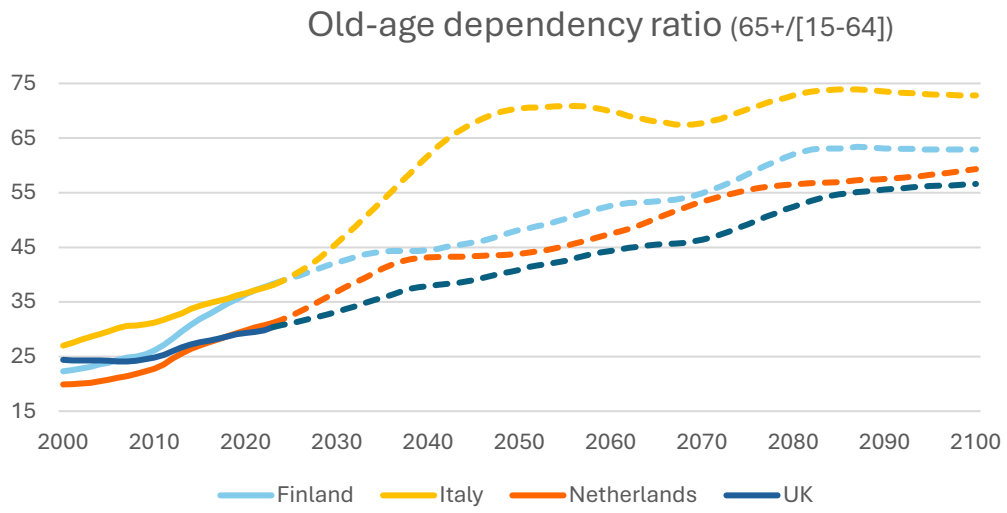

Figure 1. Old-age dependency ratio for Finland, Italy, Netherlands and the UK. Historical data (constant lines) and future projections (dotted lines) (UNPD, 2024)

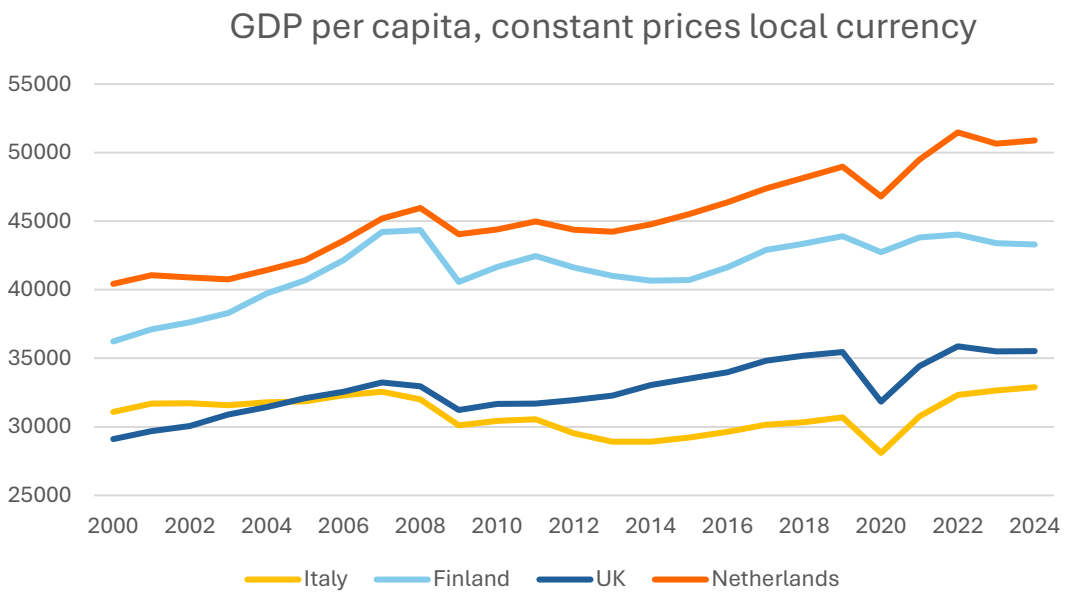

Figure 2. Real GDP per capita (constant prices in local currency) for Finland, Italy, Netherlands and the UK (World Bank, 2026b).

Throughout, we assess each system against the criteria outlined in the previous section. These case studies draw on in-depth secondary analysis for all four systems, complemented by semi-structured interviews with pension experts. Table 12 shows key pension data for the four case study countries, covering the post-growth criteria for which relevant indicators are available. Table 13 at the end of the section offers a summary of each country in relation to our post-growth criteria.

Table 12 Key pension data for the four countries (latest available year). Finland data (Tilastokeskus, 2024; Eurostat, 2024a; European Commission, 2024; OECD, 2025). Italy data (ISTAT, 2024; Eurostat, 2024a; European Commission, 2024; OECD, 2025). Netherlands data (Eurostat, 2024a; European Commission, 2024; OECD, 2025). UK data (ONS, 2025; DWP, 2026; OECD, 2025).

Post-growth criteria	Key pension variables	Finland	Italy	Netherlands	United Kingdom
Financial viability	Public spending as a share of pension spending	98.2%	94.0%	~55%	~70%
	Public pension spending as a share of GDP	12.9%	15.5%	4.7%	7.1%
	Public pension spending as a share of public budget	24.0%	29.5%	10.5%	17%
	Nominal contribution rates for public schemes	24.81%	33%	18%	~21.8%
	Mandatory contribution rates (OECD)	24.81%	33%	22%	26.6%
	Public debt-to-GDP ratio	88.5%	137%	43.3%	102%

Post-growth criteria	Key pension variables	Finland	Italy	Netherlands	United Kingdom
Needs satisfaction	Net pension replacement rates [12]	65.7%	79%	96%	54%
	Relative median income ratio [13] (65+)	0.85	1	0.76	0.77
	Poverty rate [14] [Pensioners, 65+], 2021-2025 average	12.8%	13.2%	14.42%	15.5%
	Poverty rate [15-64], 2021-2025 average	12.84%	19.14%	13.2%	14%
	Coverage ratio PAYG	Universal (residence-based)	Universal	Universal (residence-based)	~98% (contribution-based)
	Coverage ratio funded schemes	87% of workers; 86% of total pensioners	~9% of workers	87% of workers; 80% of pensioners	80% of all employees; 61% of pensioners
Distributional equity	S80/S20 [15] [65+], 2021-2025 average	3.15	5.29	2.95	4.60 [16]
	S80/S20 [15-64], 2021-2025 average	3.88	5.54	3.97	5.50 [17]
	Gini index for pension wealth	n/a	n/a	Lower than for wealth (Martinez-Toledano et al., 2023)	0.69
	Gini index for wealth	0.75	0.75	0.62	0.73

2.3.1 Finland

The Finnish pension system is widely regarded as one of the best performing in the world (Mercer, 2024). Its foundations were established in the early 1960s (Kangas, 2006). It is composed of a residence-based minimum pension supplemented with a mandatory earnings-related DB PAYG scheme. Crucially, Finnish policymakers began preparing for higher expenditure caused by an ageing population already in the 1960s (Hietaniemi and Ritola, 2007). Contribution surpluses have been consistently saved in pension funds, so that accumulated financial capital could be used to smooth the pressure on contribution rates. Hence, the Finnish pension system is partially funded. The DB PAYG system is now managed by a mix of public and private companies. The latter

[12] The net pension replacement rate is defined as the individual net pension entitlement divided by net pre-retirement earnings. It measures how effectively a pension system provides a retirement income to replace earnings, the main source of income before retirement. This indicator is measured in percentage of pre-retirement earnings (OECD, 2025).
[13] The relative median income ratio is defined as the ratio of the median equivalised disposable income of people aged above 65 to the median equivalised disposable income of those aged below 65.
[14] The poverty rate is the share of people with an equivalised disposable income (after social transfer) below the at-risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income after social transfers.
[15] The S80/S20 ratio is computed as the ratio of total income received by the 20 % of the population with the highest equivalised disposable income (the top quintile) to that received by the 20 % of the population with the lowest equivalised disposable income (the bottom quintile) (Eurostat, 2025).
[16] Own elaboration based on ONS (2025)
[17] Own elaboration based on ONS (2025b)

are heavily regulated and supervised by public bodies; for this reason, the Finnish system is considered a public pension system (OECD, 2025).

Financial viability. Public pensions accounted for 12.9% of GDP and 24% of total government spending in 2024, the second highest in our group and above the European average. Contribution rates are around 24.8% of average gross wages and are expected to increase to 26% by 2070, among the highest in the OECD (OECD, 2025). However, pension finances are robust: contributions exceed expenditures and are expected to continue to do so (Tikanmäki et al., 2023). The funded component covers approximately 20/25% of yearly pension expenditure, its returns have been consistently above projections, and its assets are forecast to grow steadily for the next 50 years based on assumptions of growth in the global economy.

Needs satisfaction. The net pension replacement rate in Finland is approximately 52%, slightly below the European average and the second lowest in our sample. However, relative median income of people above 65 compared to people below 65 is 0.85, the second highest in our sample. Poverty statistics also paint a positive picture, with Finnish pensioners experiencing the lowest poverty rate in our sample. Only 0.5% of pensioners have an income below 40% of the median, indicating that the system is effective in ensuring basic living standards.

Distributional equity. The S80/S20 ratio among people older than 65 averaged 3.15 in the past 5 years, more egalitarian than the distribution among the active population (3.88) and well below Italy and the UK (and the EU average). Wealth distribution is unequal, but this measure plays a negligible role in the Finnish pension system.

Democratic governance. Historically, Finnish pension stakeholders have proved capable of organising effectively to address new challenges, consistently reforming the system to adjust retirement age and benefits when financial sustainability required it (Kuivalainen and Kuitto, 2022). Labour market institutions and a broad coalition of stakeholders is consulted and involved throughout the reform process (Kuivalainen and Kuitto, 2022; Valkonen, 2020).

Environmental sustainability. The largest Finnish pension insurers have been comparatively early movers on climate alignment, with public commitments to net-zero portfolios by 2035–2050 and active engagement strategies (TELA, 2026). Several funds offer detailed reporting of carbon emissions and biodiversity impact of their investments (Gu, 2024; Varma, 2025). However, independent research and data remain scarce, making it difficult to have a full picture of the investment landscape.

Summary. Finland's economy has been stagnating for the past 15 years, and its old-age dependency ratio has increased by more than 50% in the same period. Nonetheless, the Finnish pension system remains fair and sustainable. If a post-growth transition led to continued stagnation, the viability of the system might be challenged. However, the strong institutional tradition and funding position suggest that the required reforms could be implemented progressively and without major upheavals.

2.3.2 Italy

The Italian pension landscape is dominated by its public PAYG system. The booming postwar economy and a young population allowed progressive expansion of pension benefits and the introduction of early-retirement options (Ferrera and Jessoula, 2005). By the early 1970s, the political establishment had introduced extremely generous pension benefits to secure political consensus (Canziani and Demekas, 1995). Declining economic performance and falling fertility in subsequent decades exposed the unsustainability of these policies. Contribution rates rose to

33% of the average wage, among the highest in the world. Stabilisation required drastic reforms, notably the 1995 shift from a DB system to a notional defined contribution (NDC) system (Guardiancich et al., 2019). The NDC reform was introduced with particularly generous transitional rules, so that many workers retiring now still benefit from the old DB rules – a situation that will only fully end around 2040 (Mazzaferro, 2023).

Financial viability. The Italian government spent 15.5% of GDP (29.5% of the budget) on pensions in 2024, well above the other countries in our sample and the European average. Despite the highest contribution rate in the OECD, the system is in deficit and needs to be subsidised through general taxation (INPS, 2023). With a public debt-to-GDP ratio of 131%, there is little room to address the deficit through indebtedness. The NDC reform is projected to lower the pension-to-GDP ratio by 2 percentage points by 2070. Nonetheless, the ratio is expected to peak to 17% in 2040.

Needs satisfaction. The net pension replacement rate in Italy is 79%, well above the European average. The current net median income of a person aged 65 or above is 100% of the net median income of someone aged below 65, the highest in our sample. According to ISTAT (2022), an Italian household has a substantially lower chance of being in absolute poverty if a pensioner is part of it. The average Italian pensioner thus enjoys a privileged position compared to the average worker.

Distributional equity. Statistics on pension adequacy mask substantial inequalities. The S80/S20 ratio among the elderly in Italy is 5.22, more than one point above the European average. In 2024, 31.9% of retirees received a pension below €1000 per month, together accounting for 11% of total pension expenditure, while a top 3% received over €4500 per month accounting for almost the same share of total spending (ISTAT, 2024). The system is also intergenerationally unfair, as many current pensioners receive benefits that vastly exceed their historical contributions (Mazzaferro, 2023).

Democratic governance. Though the system is public and under the control of a democratically elected government, it could be argued that the Italian pension system has been insulated from participatory processes. The system comes from a history of "myopic policymaking" (Franco, 2002, p.212), where the main parties expanded pension provision for electoral purposes. When these proved to be unsustainable, only technocratic governments were able to pass the major reforms of 1995 and 2011. Elected parties have consistently shied away from reform for fear of electoral losses (Fornero, 2018).

Environmental sustainability. The Italian pension system is overwhelmingly PAYG. The supplementary funded component held approximately €240 billion in assets in 2023 (COVIP, 2024), 11% of the national GDP. Sustainability-linked disclosure is patchy and not harmonised; overall, there is a lack of data and analysis on the environmental impact of Italian pension funds.

Summary. Italy has been in economic stagnation for more than 20 years and has one of the oldest populations in the world – its old-age dependency ratio projected to worsen significantly in the coming decades. The Italian pension system is very generous, but financially fragile and highly unequal. The lack of political capital to implement necessary reforms is a further weakness which could play a significant role in a post-growth transition.

2.3.3 United Kingdom

The British pension system combines a mandatory public PAYG flat-rate system, called State Pension, based on years of contributions, with a quasi-mandatory fully funded component. The State Pension aims to shield the elderly from poverty, with further means-tested benefits for those with particularly low entitlements. The goal of securing pension benefits that maintain working-age living standards is left to occupational funds. In the public sector, most occupational schemes are unfunded PAYG DB schemes; the private sector relies on funded DB and DC schemes. Since the late 1990s, employers have gradually moved from DB to DC schemes to cut costs and shield themselves from higher life expectancy (Bridgen and Meyer, 2005). Most private DB schemes are now closed to new members, while DC membership has risen from less than three million in 2011 to more than 30 million in 2024 (TPR, 2024). In the long run, the private workplace pension landscape in the UK will be fully dominated by DC schemes. In 2024, there were over 6,000 pension schemes in the UK (DWP, 2024), making the market highly decentralised. Since the introduction of automatic enrolment in 2012, the share of enrolled employees rose from 47% to 80% in 2023 (DWP, 2023). In 2023, workplace pension schemes managed about £2.21 trillion of assets, circa 81% of UK GDP; other voluntary private pension funds managed £790 billion. Overall, the funded system accounts for approximately 30% of total pension expenditure (OECD, 2025).

Financial viability. The relatively light form of public pension insurance allows the UK government to keep State Pension expenditures as a share of GDP below the European average – 7.5 per cent against 11.4 per cent in 2022 (OECD, 2025). The State Pension accounts for less than five per cent of GDP, while the rest of the expenditure is partly due to further subsidies to pensioners and unfunded DB payments. The sustainability of the occupational pension system must be assessed from a different perspective, namely by evaluating whether pension funds can meet their financial obligation towards their members. DB schemes are more vulnerable to solvency issues than DC ones, for they have more rigidly defined expected liabilities. In the past 10 years, the low-interest rate environment created serious challenges for DB schemes, which have struggled to keep health funding levels. Nonetheless, recent years of higher rates have led to a significant improvement of the funding ratio (TPR, 2026). Moreover, as the UK private pension landscape is poised to move from DB to DC pension funds, financial sustainability risks will become less marked in future, though at the cost of higher uncertainty in retirement income for UK pensioners.

Needs satisfaction. Before the early 2000s, the UK pension systems had consistently failed to protect pensioners from poverty. The poverty rate before housing costs for retirees peaked above 40% in the early 1990s (Francis-Devine, 2025). Recent improvements in the indexation of the State Pension and more generous means-tested benefits have significantly improved the situation (Cribb et al., 2024). However, UK pensioners still display the highest poverty rate among our sample. The income provided by private pensions is relatively less important than the State Pension. Two fifths of retirees do not receive any private pension (Cribb, et al., 2024). Low-income pensioners rely largely on the State Pension and have little to no pension savings (DWP, 2025).

Distributional equity. The structure of the UK public PAYG system – a flat rate equal for everyone regardless of the amount of contribution – improves the progressivity of the income distribution among pensioners. Indeed, the S80/S20 ratio among pensioners was 4.6 in 2023, almost one point below the UK working population (5.57). Though income is distributed more equitably among pensioners, the UK remains a country with high levels of income inequality when compared to our sample and the EU in general. This picture is worsened when we look at wealth inequality, a relevant indicator to assess the distributional impact of the UK funded component. Estimates

from the Office of National Statistics (ONS, 2025a) put the Gini index for private pension wealth at 0.69 in 2022. In other words, the poorest 50 percent of UK households has an extremely low or non-existent pension wealth (Brain et al., 2024). Furthermore, Bonizzi et al. (2025) show that the transition to individual DC schemes exacerbate pension wealth inequality.

Democratic governance. The UK pension system is relatively fragmented. The PAYG component is democratically controlled through the government, and its reforms have often involved numerous rounds of consultation with independent commissions and government departments. The occupational sector developed as a fragmented, firm-based system without industry-wide pooling, with coverage concentrated among higher-skilled, better-paid workers (Bridgen and Meyer, 2007; Nijhuis, 2013). UK funds have fiduciary duties towards their members, but labour institutions do not play a significant role in shaping investment decisions (Fox, 2014). Overall, the UK funded sector has a weak participatory governance.

Environmental sustainability. Data on asset allocation of UK pension funds is not easily available (Wells, 2024). It is thus difficult to assess the exposure of pension funds to fossil fuels and environmentally damaging industries. Several reports (Schepers et al., 2025b; ShareAction et al., 2024) estimate that exposure to asset stranding varies from 19 to 88 £ billion for the UK pension sector. To address these risks, most pension funds have adopted or are developing net-zero plans for their portfolios (TPR, 2025). However, independent reports find that British funds perform poorly in terms of actual initiatives to phase out fossil fuel and deforestation investment (Gurova and Willi, 2025; Schepers et al., 2025b). Gurova and Willi (2025) suggest that this is partly explained by the highly fragmented pension landscape, with small pension funds lacking resources to implement serious climate policies.

Summary. In contrast to other European countries, the UK pension system is less affected by financial sustainability issues and more by sufficiency and distributional ones. Though current pensioners are better off than past ones (Cribb et al., 2024), the low level of the State Pension, decreasing rate of home ownership among the working population (Brain et al., 2023) and high levels of pension wealth inequality risk to expose a significant share of future pensioners to low standards of living. The funded occupational component has expanded significantly in the past decade. However, it is affected by high numbers of small funds and a dominance of DC schemes, which do not offer collective risk sharing features. Though consolidation of the pension sector is underway, the government is explicitly attempting to use pension savings to boost economic growth (HM Treasury, 2025), leading to policy choices that might be at odds with a post-growth transition.

2.3.4 Netherlands

The Dutch pension system consistently ranks among the best in the world according to the Mercer ranking (Mercer, 2024). Its structure resembles that of the UK system. The *Algemene Ouderdomswet* (AOW) – a flat-rate PAYG public pension – is coupled with mandatory occupational schemes. However, there are important differences that improve its performance. First, the AOW is residence-based, making it more inclusive than the British State Pension; for individual pensioners in 2025, a full AOW pension is matured after 50 years of residence, and its gross value is 42.7% higher than the British New State Pension at purchasing power parity. Second, the assets managed by the second pillar were approximately 170% of nominal GDP in 2024 (DNB, 2025), making it the third biggest pension market relative to GDP in the world. There were only 242 pension schemes in 2025, making the Dutch market highly consolidated. Industry-wide funds dominate the landscape, managing 77% of total assets, and their management is shared by social

partners such as trade unions and employers. This governance structure ensures a collectivisation of risk-sharing (Owadally et al., 2022). Most schemes are DB but concerns over the financial viability of DB schemes led to a major 2023 reform mandating that all DB schemes convert to DC by 2028 (Westerhout et al., 2024). Even if this can be interpreted as a further financialisation of the system, the collective nature of these funds is retained: collective defined contribution (CDC) schemes do not offer individual accounts linked to each worker's contributions but rather pool all the assets of the fund together. The pooling of assets means individual pensioners are less directly affected by market fluctuations, and collective investments smooth volatility risks [18].

Financial viability. In 2024, AOW expenditure equalled 52.5 € billion (SVB, 2025), i.e. 4.7% of the Dutch GDP. This figure is very low compared to the rest of the EU (10.6%). Future projections (European Commission, 2024) estimate that AOW expenditures could increase to 6.3% of GDP by 2070, emphasising the sustainability of Dutch public pensions. Moreover, public finances have a track record of responsible management (Bos, 2007). Occupational funds have struggled in the past 20 years with lower-than-expected returns due to a low-interest rate environment, forcing them to halt the indexation of pension benefits for prolonged periods of time (IMF, 2024). However, their solvency ratio remains sound (DNB, 2024) and the move to CDC will further relax pressure on the funds. Moreover, the pension fund system is still in an accumulation phase, namely cash inflows are larger than outflows (IMF, 2024).

Needs satisfaction. The poverty rate among retirees has averaged 14.42% in the past 5 years, the second highest in our sample (but below the EU average). Approximately 80% of current pensioners receive pension benefits from the second pillar, making occupational schemes an important source of income even for those in the bottom 50% of the income distribution (Biesenbeek et al., 2024).

Distributional equity. The Dutch system is exceptionally equitable by international standards: the S80/S20 ratio among Dutch people older than 65 has averaged 2.95 in the past five years, the lowest in our sample. The AOW has a key role in increasing the progressivity of retirees compared to the working population (Bruil et al., 2022; Luiten et al., 2023). The distributional implications of the second pillar in the Netherlands are more nuanced. The Dutch Gini index for net personal wealth was 0.62 in 2023, down from an average of 0.79 in the 1950s (WID, 2026). Though still highly unequal when compared to income, Dutch wealth inequality is the lowest in our sample. Furthermore, Martinez-Toledano et al. (2023) show that wealth inequality is substantially lower among the Dutch population once pension wealth is included, highlighting that its distribution is significantly more equitable than other forms of wealth.

Environmental sustainability. Data on Dutch pension investment is not widely available. Schepers et al. (2025a) return a bleak picture of the socio-environmental credentials of the ten biggest pension funds in the Netherlands, with an average nature-protection score of 1.7 out of 10. On climate, the largest funds have divested from the fossil fuel sector but remain exposed to other carbon-intensive industries. Overall, the Dutch pension sector is far from sustainability credentials, though arguably at the forefront of the international movement.

Summary. The Dutch pension system is widely regarded as one of the best in the world. Our analysis show that it provides sufficient income to most of its elderly population, while remaining

[18] This assessment of the 2023 reform should, however, be qualified. Whether CDC retains genuinely collective risk-sharing properties or simply individualises DC risk under a collective label while ceding the formal benefit guarantee, is a live empirical question.

financially sound and distributionally fair. The funded sector is consolidated and has robust risk sharing mechanisms. The major room for improvement remains a rigorous transition to socio-environmentally sustainable asset allocation.

Table 13. A simple classification of the pension systems of our four case studies based on the post-growth criteria defined in Section 2.2.

Post-growth criteria	Finland	Italy	Netherlands	United Kingdom
Financial viability	High	Low	High	High
Needs satisfaction	High	High	Medium	Medium
Distributional equity	High	Low	High	Low
Democratic governance	High	Low	High	Low
Environmental sustainability	Medium	N/A	Low	Low

2.4 Discussion

Drawing our four case studies together, we provide several policy-relevant reflections on pensions in a post-growth context. We consider 'post-growth' a scenario where GDP growth is broadly stagnant in the long run with temporarily fluctuations around this average. Importantly, our assumption is that GDP stagnation is not a policy goal, rather economic stagnation comes as an indirect outcome of a radical transition to an environmentally sustainable economy.

2.4.1 Funded or PAYG?

A first reflection revolves around whether PAYG or funded systems should be preferred in a post-growth economy. In the literature, Wiman (2024) has argued that PAYG are likely to fare better.

Theoretically, we have shown that both systems can work. However, the picture changes significantly once we approach it from a practical perspective. Our case studies show quite two important lessons.

First, the major benefit of funded schemes is that they allow to diversify risk from the domestic economy, dramatically reducing the growth dependency of the national system. This possibility rests on the idea that – realistically – post-growth will happen unevenly, with high-income economies transitioning sooner than developing ones (Leoni et al., 2026). The strategy of investing abroad to reduce the post-growth risk could be criticised on the ground that it would be tantamount to fostering financial extractivism abroad – especially in developing countries (Hickel et al., 2022). One counterargument could be that it is not necessarily true that investment abroad would be equal to exploitation. Generally, the broad statement that financial mobility would improve risk diversification does not need to contradict environmental and social ethos. However, we have shown that in practice pension funds are poorly addressing environmental and social concerns around their investment. Hence, though it is theoretically possible to have ethical, diversified investment, practically the likelihood that investment abroad would align with financial predatory practices is very high. Overall, more work is needed to assess the environmental and ethical implications of pension funds' investments in foreign economies.

On the other hand, by their very design, funded schemes are generally not well aligned with post-growth principles of sufficiency, environmental sustainability and distributional equity. This observation comes merely from the fact that in the UK and Netherlands – the two countries in our

sample where funded schemes are most prominent – funded schemes provide the earnings-related part of pension income. The flat-rate PAYG schemes of both countries play the largest role in ensuring a sufficient retirement income and in reducing inequalities. These two properties are a higher priority in a post-growth economy. Moreover, empirical evidence has shown that decentralised funded systems exhibit significantly higher administrative costs than large centrally administered schemes (Bikker and De Dreu, 2009; Broeders et al., 2016), and there is evidence that centrally managed PAYG schemes are more cost-effective (Barr and Diamond, 2008; CBO, 2004). When income is scarcer, as in a post-growth economy, it is crucial that the pension system devotes as much resources as possible to pension provision rather than to administrative and investment fees. This is a significant practical drawback of funded systems.

Theoretically, it is possible to design a highly centralised, fully funded scheme that worked exactly like the State Pension or the AOW, where workers are required to contribute to a national fund that then invest their contributions and uses the returns to pay a flat rate pension to every eligible citizen. However, this policy option is severely limited by path-dependency. Indeed, transitioning from a PAYG to a funded system is extremely expensive. Workers need to contribute both to their pension savings and the pension benefits of the present generation of retirees, the so-called 'double burden' problem (Sinn, 2000). Historical experiences (Chile and Mexico in particular) have made this issue very clear (Nisticò, 2019; Ruiz-Tagle and Castro, 2001). Hence, even if it is true that funded schemes could be designed according to post-growth principles, the reality is that most national systems are already locked into PAYG schemes that more closely align with those principles. Path dependency dominates policy possibilities.

Importantly, there is an asymmetry in the path-dependency argument that the post-growth pensions literature has not yet addressed. The transition from PAYG to funded is expensive because of the double burden problem. The reverse transition – funded to PAYG – has no analogous obstacle: in principle, accumulated pension assets can be liquidated and converted into PAYG entitlements, with the proceeds used to finance the transitional generation of retirees. If post-growth conditions made funded returns persistently disappoint, the political path of least resistance could be a partial reverse transition.

We thus agree with Wiman (2024) that PAYG systems seem better aligned with post-growth. However, it is worth stressing that this is a practical, path dependent argument rather than a theoretical conclusion. We now look at how the funded components of our case studies could be reformed in a post-growth environment.

2.4.2 Policy reforms for funded components

The main areas of conflict between our post-growth principles and the funded components analysed above can be summarised as:

1. The funded component is primarily earnings-related; hence it has a marginal role in supporting need satisfaction for all pensioners.
2. Pension wealth tends to be highly unequally distributed. Empirical research suggests that funded pension systems tend to replicate or even exacerbate inequalities (Been et al., 2017; Bonizzi et al., 2025).
3. Pension funds' investment allocation is poorly regulated and can be a driver of environmental and social harm.

A further important dynamic exacerbating the growth dependency of funded schemes is financialisation. Since the 1990s, the pension sector of many countries has been under the growing pressure of financialisation (Ebbinghaus, 2011), with management increasingly delegated to private financial services and pensioners' livelihoods becoming dependent on the performance of financial markets (Hassel et al., 2019). A key dimension of this shift is the transfer of risk from the collective to the individual, epitomised by the move from DB to DC schemes in many OECD countries (OECD, 2025e). Financialisation also introduces substantial fees and charges: Han and Stańko (2020) estimate that pension balances across their country clusters were between 14.7% and 23.1% lower than they would have been without fees, despite the trend towards lower fee caps.

A dynamic that is linked to financialisation (but not strictly caused by it) is socially and environmentally damaging investment. Pension funds are deeply entwined in the economy at large: pension policy is not only a social policy that affects retirement income, but also a financial one that impacts savings rates, corporate finance and, indirectly, corporate behaviour (Hassel et al., 2019). Where pension funds choose to invest can shape the economic, social and environmental landscape – military and fossil fuel investments are good examples. In Europe, 7% of pension funds' equity portfolio is exposed to fossil fuels (Egli et al., 2022), creating exposure to stranded-asset risk. At the same time, how pension funds behave as investors can impact the sectors and companies they back. Investments in UK adult social care, for example, have been linked to private equity funds promoting predatory financial behaviours – over-leveraging care companies, asset stripping, exploiting workers and cutting corners on service delivery (Corlet Walker et al., 2024). Looked at this way, financialised pensions can be seen as a transfer of wealth from workers and pensioners to investment fund managers through fees, charges, and the knock-on effects of extractive investment strategies.

Based on our post-growth principles, we could argue that reversing the financialisation of pensions would be a priority for a post-growth economy. For instance, the individualisation of risk could be disastrous as stagnant or decreasing economic output might result in lower returns and assets prices, damaging pension wealth and benefits. The absence of risk sharing, particularly if coupled with inadequate public safety-nets, could leave many pensioners at risk of poverty. Lastly, as mentioned above, high management fees would damage pension provision in a context of already scarcer financial resources.

We can thus argue that post-growth pension reforms for funded systems would promote:

1. Consolidation of funds to minimise administrative costs and optimise savings management.

2. Collective risk sharing mechanisms such as solidarity reserves (buffers), collective investment pools and minimum pension guarantees (Antolín et al., 2011; Gollier, 2008) to protect the most vulnerable pensioners.
3. Rigorous regulation and guidelines on sustainable socio-economic investment. Semieniuk et al. (2023) estimate that even if ambitious climate policies would lead to financial losses for pension funds, these would mainly affect wealthy pensioners, who can better bear the financial impact.
4. Participatory policies for pension management and reform. Transparency on where pension savings are invested would need to improve greatly to allow effective oversight of financial allocation, boosting the accountability of pension markets. Pension funds' governance and reform processes would also need to include labour institutions and a broader set of stakeholders.

Looking at our case studies, we can claim that these reforms would have different relevance for each country. They would have a marginal relevance in Italy. They are already partly met in the Netherlands, especially when it comes to participatory processes, consolidation and risk sharing mechanisms (CDC reform). These policies would probably have the most impactful effect on the UK, giving the highly decentralised and individualised nature of its funded system. Finland is the most aligned country to our policy package. It already has a tightly regulated and consolidated funded system. Lastly, all the four countries in our hypothetical scenario would need to implement more ambitious regulation for pension assets allocation.

2.4.3 Policy reforms for PAYG systems

We have seen that PAYG systems have been designed in ways that align them more closely with our post-growth principles. Though they cannot diversify risk at the level of funded schemes, they offer strong risk-sharing protection, as pensions are basically backed by the entire national economy. Moreover, government have more direct control over the system, making reform technically more straightforward (though not politically easier). An important distinction must be made between flat-rate and earning-related systems. The formers tend to be the most aligned with post-growth, as long as the flat-rate benefit is high enough (and appropriately indexed) to support decent living standards and the eligibility criteria are inclusive (residence-based). They have a strong redistributive impact on the income distribution and – by focusing on the provision of a basic income – their cost on public budgets is relatively low.

Earnings-related PAYG systems can offer a more comprehensive pension provision, but this comes with the weakness of weighting heavily on public finances, especially when pensions are poorly managed (Italy). Moreover, it is important that such systems do not replicate the unequal distribution of the labour market. The risk is that this could translate in expensive pension systems that might not meet sufficiency needs for all pensioners because a significant share of the pension budget goes to high-income pensioners. In a post-growth context, earning-related PAYG systems would probably need to incorporate the idea of a pension ceiling, i.e. cap pension income to a maximum threshold. This policy would both improve financial viability and distributional equity.

Another reflection is around whether defined benefits or notional defined contribution schemes are preferrable in a post-growth economy. Theoretically, NDC schemes offer the most actuarially fair outcome (Nisticò, 2019). They are also more financially manageable as pension benefits adjust to pension contributions. In practice, the assessment depends on the state of the national

pension system. In Finland, the DB system works well. In Italy, the NDC reform was needed to move out of an unfair and unsustainable DB system.

When we look at our case studies, a few simple policy recommendations emerge in the case of a post-growth transition. The UK would benefit from increasing the level of the State Pension to offer an adequate basic pension to its retired population [19]. The State Pension could also become residence based to expand its coverage to vulnerable groups. The Netherlands present a well-balanced example of a flat-rate pension that is both generous and financially viable. Italy would ideally need to cap the maximum pension benefits to improve financial viability and distributional equity. Finland offers an excellent example of a generous flat-rate pension coupled with a financially sustainable earnings-related component. Only minor reforms would need to be implemented to adapt the system to the pressures of post-growth.

2.4.4 The politics of transition and inequality

Across all four cases, the central lesson is that the viability of pension systems in a post-growth transition is fundamentally a political question. In Finland, pension stakeholders have consistently displayed the capacity to negotiate and reform the system when necessary (Kangas, 2006); this provides reason to be optimistic about the country's ability to cope with the difficulties arising from a post-growth transition. In Italy, by contrast, the political establishment has a consistent track record of avoiding the reforms required to avoid dramatic increases in pension expenditure, and this reluctance – rather than demography or economics – is the main challenge. In the Netherlands, the participatory governance structure gives social partners the capital to rearrange the system. In the UK, the combination of fragmentation, weak participatory governance, and explicit policy use of pension savings to boost growth means that the most significant structural reforms are also the politically hardest.

Two broader points emerge. First, in the context of an ageing population, lack of economic growth makes both PAYG and funded pensions harder to manage, but not impossible. Second, inequalities are a core factor underpinning the dependency of pension systems on growth: greater income inequality – both among pensioners and between workers and pensioners – makes economic growth more desirable to meet the needs of all groups and keep the system viable. Targeting reductions in pension inequality can underpin two distinct post-growth policy goals. In systems with high inequality among pensioners, redistribution from richer to poorer retirees allows sufficiency goals to be met without increasing overall spending. In systems with high levels of pension expenditure over total GDP, cutting higher pension benefits can improve financial viability while protecting sufficiency. Growth is arguably a politically easier solution to the pension crisis than redistribution, but it is neither necessary nor the only one.

2.4.5 An ideal post-growth pension system?

Our analysis points to a clear set of features that a post-growth pension system should have. First, a universal basic PAYG pension should be the foundation of the system. It should be generous enough to meet sufficiency needs while remaining financially viable. A mandatory or quasi-mandatory earnings-related component could be either funded or PAYG, depending on previous institutional history. If the system is fully funded, pension funds should be consolidated as much

[19] The DB PAYG offered to public employees would probably benefit from a sustainability assessment, as recent reports show that they are far too generous and actuarially unfair (Record, 2014).

as possible, risk-sharing mechanisms should be introduced and investment should be tightly regulated. Labour institutions should be extensively involved in the management and design of the system. CDC schemes are probably a good compromise between safeguarding pensioners and reducing pressure on financial viability. An earnings-related PAYG system should prioritise financial viability and distributional equity.

The country in our sample that most closely resembles our 'ideal' is Finland (Table 13), as it combines elements of both PAYG and funded systems (the latter being tightly regulated), paired with strong participatory governance and a long-term institutional willingness to reform. The Dutch pension system is also close to our description. Ultimately, both systems have long enjoyed an international reputation for their exceptional performance (Jensen et al., 2020). Therefore, we could argue that what makes a pension system sound and sustainable is not going to dramatically change in a post-growth world. Robust institutions and responsible policymaking are and will remain the most important ingredients to ensure the long-term sustainability of pensions.

We now turn to a modelling exercise that simulate pension and healthcare spending in a potential UK post-growth scenario to deepen our previous analyses through a stronger quantitative focus.

Chapter 3: UK pension and healthcare in a post-growth environment: a quantitative SFC analysis

We have looked at pension and healthcare systems both from a theoretical and case study perspective. To deepen our analysis, we present a quantitative study of both sectors in the UK under post-growth conditions. We use an expanded version of PADME (Leoni et al, 2026), a post-Keynesian stock-flow consistent (SFC) model, fully calibrated on the UK economy, which we call henceforth UK-PADME. The original model was composed of seven sectors: manufacturing, resource, services, households, government, banking and central bank. New features added to UK-PADME include:

1. A full demographic module calibrated on the UK population.
2. A healthcare sector split between private and public provision
3. State Pension and non-pension welfare benefits.
4. Occupational pension sector divided between public DB PAYG schemes, and fully funded DB and DC schemes.

The structure of UK-PADME allows us to investigate the fiscal viability of pensions and healthcare in the UK under different post-growth assumptions. We can also simulate policy responses to reduce the impact of post-growth on these two sectors. Our modelling exercise will try to explore the question: are UK pension and healthcare sectors post-growth resilient?

As mentioned in the previous chapter, there is no peer-reviewed modelling work that has produced a quantitative estimate of pension and healthcare in a post-growth context. Monserand (2019) has produced a degrowth study of pension in a PAYG context. However, their work is not peer-reviewed and deal with a theoretical economy. Katsimigas and Papatheodorou (2025) and Silva et al. (2021) have produced SFC models to investigate pension dynamics in Greece and Brazil respectively. Still, their work is not post-growth oriented and does not model a sophisticated funded sector. We thus provide a first attempt to investigate the post-growth challenge of pensions and healthcare from a quantitative perspective, fully grounding our analysis in an empirically calibrated model.

The rest of the chapter is structured as follows. Section 3.1 describes the most relevant equations of UK-PADME governing the healthcare sector and the pension sector. Section 3.2 introduces the scenarios that we are exploring and the simulation results. Section 3.3 discusses the results.

3.1 The UK-PADME model

The PADME model has been described in detail in several publications (Leoni, 2024; Leoni et al., 2026, 2025). It is a post-Keynesian input-output stock-flow consistent model with endogenous growth driven by labour productivity growth. In this document, we do not present the entire model but focus on describing the novel sectors that have been added and the new empirical calibration on the UK economy.

Figure 3 provides a stylised scheme of the structure of UK-PADME. It has 10 sectors. The energy, manufacturing, services and healthcare sectors produce goods and services that are consumed by the rest of the economy. Importantly, technological innovation is endogenous and follows a cost-induced hypothesis (Acemoglu, 2002; Naqvi and Stockhammer, 2018). In other words, the higher the cost of a production input (labour, energy, intermediate inputs), the faster the growth in its productivity, and vice versa. The main consumers of goods and services are the household and government sectors. Households receive wages, pension and capital income from the other sectors. The government receives income through tax collection (income tax, National Insurance, Capital tax etc.). The financial sectors, Central Bank, Banks, Pension Funds and the Foreign Sector manage and allocate the wealth of the economy. The only assets modelled are bonds and loans, to keep the model more tractable. The next subsections will cover the modelling of the healthcare sector (3.1.1), pension sector (3.1.2) and the empirical calibration based on UK data (3.1.3).

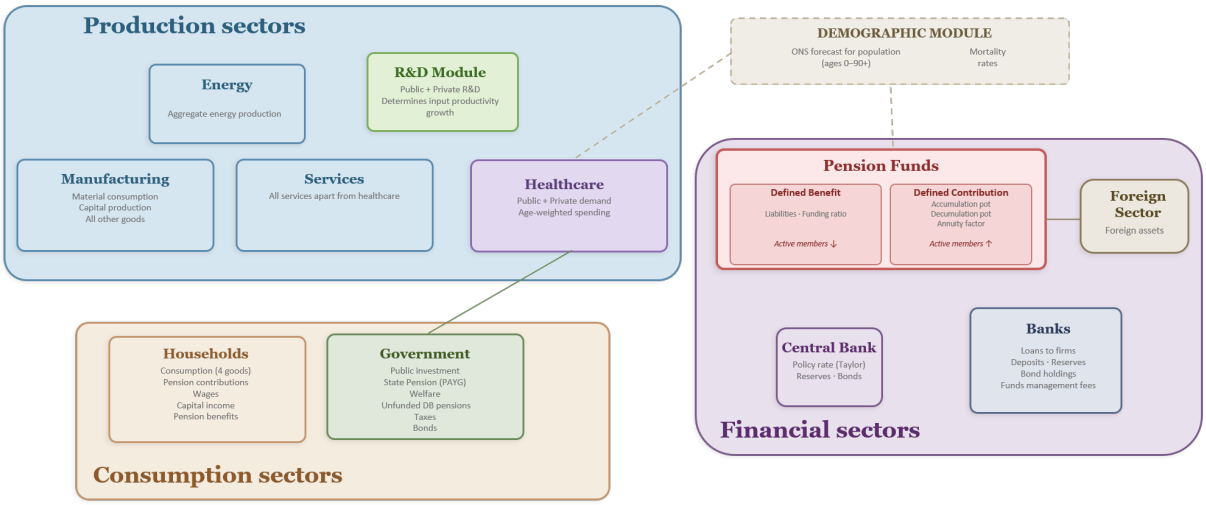

Figure 3. A graphical illustration of the main sectors and modules in UK-PADME.

3.1.1 The Healthcare sector

The healthcare sector in PADME is modelled in a similar way to the other production sectors (Leoni et al., 2026). It uses labour, capital, energy and intermediate goods (provided by the manufacturing and service sectors) to produce its output. The productivity of each input is determined by their relative costs. Total profits are then derived as total sales minus input costs and debt servicing. A share of profits is used to finance investment and R&D investment, another share is paid in taxes, and the remaining amount is distributed as profits. All these equations are not reported here to limit the length of the document. The structure for such equations can be found in previous publications (Leoni, 2024; Leoni et al., 2026, 2025).

Here, we want to highlight only few novel additions. For instance, the split between public and private healthcare. Throughout the equation description, we use the suffix HC to denote the healthcare sector. This split is modelled at the demand level, meaning that the provision of public healthcare is represented by the share of healthcare ϑ_{G} consumed by the government sector G_{HC}:

$$G_{HC} = \vartheta_{\mathrm{G}} S_{\mathrm{HC}} \tag{1}$$

$$CONS_{HC} = S_{HC} - G_{HC} \tag{2}$$

Where S_{HC} is the nominal output of the healthcare sector and $CONS_{HC}$ is nominal consumption of healthcare by the household sector. ϑ_G is exogenous and based on historical data. The equation of nominal output S_{HC} is equal to real output s_{HC} times healthcare prices p_{HC}:

$$S_{HC} = p_{HC} \cdot s_{HC} \tag{3}$$

p_{HC} is empirically calibrated using the price indexes developed by the ONS. Its evolution is then modelled through a traditional post-Keynesian pricing equation, i.e. an exogenous mark-up over intermediate costs (labour, energy and intermediate goods).

s_{HC} is a particularly important variable for our analysis as it departs from conventional SFC equations. Indeed, its equation is taken from the econometric estimates published by the Office for Budget Responsibility [20] in their report on healthcare (OBR, 2024):

$$s_{HC} = s_{HC_{-1}} \cdot \left(1 + \dot{Age} + \varrho \dot{y} + chronic + tech\right) \tag{4}$$

Where $\dot{y}$ is real GDP growth and ϱ its an exogenous coefficient. This component captures the income effect of healthcare spending. $tech$ is an exogenous variable capturing the increased costs of healthcare driven by technological progress. Similarly, $chronic$ captures the higher pressure on healthcare spending due to expected increases in chronic conditions among the British population. The values for these parameters are summarised in Table 14 below.

Table 14. Econometric parameters of the real healthcare output equation (OBR, 2024).

Exogenous coefficient	OBR econometric estimate
ϱ	0.8
$chronic$	0.0015
$tech$	0.0009

Lastly, $\dot{Age}$ represents the growth rate of healthcare spending in real terms per age cohort. The cost per age cohort $cost\_age$ are taken from OBR estimates (OBR, 2024) and applied to the demographic projection of the ONS (2024):

$$Age = \sum_{i=0}^{90+} cost\_age_i \cdot age\_cohort_i \tag{5}$$

The OBR equation for health output includes a Baumol cost disease component based on aggregate national labour productivity. We have removed it from the equation 4 as in UK-PADME the Baumol effect is captured endogenously by the different sectoral productivity growth rates. This is an important reason why the UK-PADME baseline forecast of healthcare spending slightly differs from that of the OBR (see Figure 6 below).

To show how the Baumol effect is represented in UK-PADME, we first show the equation determining labour productivity in the healthcare sector λ_{HC}:

$$\lambda_{HC} = \frac{\lambda_{HC_{-1}}\left(k_{HC_{-1}} - \delta k_{HC_{-1}}\right) + \lambda_{HC}^{new}(inv_{HC})}{k_{HC}} \tag{6}$$

Equation 6 means that labour productivity is embedded in the capital stock k_{HC}. Each new capital vintage inv_{HC} embeds a new level of productivity λ_{HC}^{new}, while the depreciated capital removes older technologies with different levels of productivity $\lambda_{HC_{-1}}\left(k_{HC_{-1}} - \delta k_{HC_{-1}}\right)$. As mentioned above, new labour productivity depends on the prices of inputs, meaning that if wages grow faster than other

[20] The Office for Budget Responsibility is an official independent fiscal watchdog set up by UK government in 2010 to provide authoritative analysis of the UK's public finances.

input prices, labour productivity accelerates and vice versa. Labour input is then determined using λ_{HC}:

$$N_{HC} = \frac{s_{HC}}{\lambda_{HC}} \tag{7}$$

However, sectoral wages grow according to aggregate labour productivity. Indeed, nominal wages of the healthcare sector W_{HC} follow a partial adjustment approach:

$$W_{HC} = W_{HC_{-1}} + \varpi_3\left(\overline{w} * p_{CPI} - W_{HC_{-1}}\right) \tag{8}$$

Where $\overline{w}$ is the real wage target:

$$\ln(\overline{w}) = \varpi_0 + \varpi_1 \ln(\lambda_{av}) + \varpi_2 \ln(E) \tag{9}$$

Equation 9 shows that $\overline{w}$ depend on the employment level E and aggregate labour productivity λ_{av}. $\varpi_0, \varpi_1, \varpi_2$ and ϖ_3 are exogenous parameters and p_{CPI} is the consumer price index.

Finally, to fully understand how the Baumol effect comes into play, we need to include the price of healthcare p_{HC}. As mentioned above, this is an exogenous mark-up η_{HC} over unit costs:

$$p_{HC} = (1 + \eta_{HC})\left(\frac{W_{HC}}{\lambda_{HC}} + \frac{IC_{HC}}{\pi_{HC}}\right) \tag{10}$$

Where $\frac{IC_{HC}}{\pi_{HC}}$ is the other intermediate costs divided by their productivity. $\frac{W_{HC}}{\lambda_{HC}}$ is the crucial component here. Equation 8 shows that W_{HC} grows in line with aggregate labour productivity, while λ_{HC} is sectoral labour productivity. Empirically, $\dot{\lambda}_{HC} < \dot{\lambda}_{av}$, namely the growth rate of λ_{HC} is below the growth rate of λ_{av}. Hence, p_{HC} grow faster than the prices of sectors where the sectoral labour productivity grows faster than aggregate labour productivity (for instance, the manufacturing sector). This set of equations govern the Baumol cost disease dynamic in UK-PADME.

3.1.2 Pension sector

The pension sector is particularly complex in the UK case because it includes several different components (see section 3.3 for a detailed description). We start the description of the sector by looking at the PAYG schemes. Then, we move to the funded ones.

PAYG schemes.

The most important PAYG pension scheme in the UK is the State Pension. The State Pension is managed by the government and provides a flat rate to all people above a certain age who have reached a minimum number of National Insurance contribution year. In addition to the State Pension, there are further Pension Credits that are allocated to vulnerable pensioners. In UK-PADME, we aggregate all pension-related payment under the variable $SP_{benefits}$:

$$SP_{benefits} = SP_{benefits_{-1}} \cdot \left(1 + \max\left[\dot{CPI}, \dot{W}, 0.025\right]\right) \tag{11}$$

$\max\left[\dot{CPI}, \dot{W}, 0.025\right]$ represent the modelling equivalent of the current indexation rule adopted by the British government, the so called 'Triple Lock'. The Triple Lock establishes that each year the State Pension grows at the highest rate among CPI inflation $\dot{CPI}$, the growth rate of aggregate wages $\dot{W}$ or 0.025. Total State Pension spending SP is then equal to:

$$SP = SP_{benefits} \cdot Pensioners_{SP} \tag{12}$$

Where $Pensioners_{SP}$ is the number of eligible people:

$$Pensioners_{SP} = Pensioners_{SP_{-1}} \cdot \left(1 + \alpha_{SP} \cdot \dot{Pensioners}\right) \tag{13}$$

$\dot{Pensioners}$ is the growth rate of people aged equal or above the State Pension retirement age. α_{SP} is an exogenous coefficient capturing the fact that not all people within the State Pension retirement age will receive the State Pension or the maximum flat rate.

Other PAYG schemes in the UK are the defined benefit occupational schemes for public employees like NHS workers, teachers, armed forces and civil servants. These schemes account for approximately 2% of GDP spending according to the OBR (2025). We model them in a simplified fashion as little data is available to properly specify them. The average benefit $DB\_PAYG_{benefits}$ is computed as its lagged value (derived from historical series) indexed to the inflation rate:

$$DB_{PAYG_{benefits}} = DB_{PAYG_{benefits_{-1}}} \cdot \left(1 + \dot{CPI}\right) \tag{14}$$

This formulation likely underestimates future pension spending for these schemes, however the difference from OBR projection is small (less than 0.5 percentage points of GDP). Total spending is then:

$$DB_{PAYG} = DB_{PAYG_{benefits}} \cdot Pensioners_{DB_{PAYG}} \tag{15}$$

Where $Pensioners_{DB_{PAYG}}$ is determined as a constant share of public employees N_{Public}:

$$Pensioners_{DB_{PAYG}} = \alpha_{DBPAYG} \cdot N_{Public} \tag{16}$$

The number of public employees and the ratio α_{DBPAYG} are derived from historical series.

Funded DB schemes.

The funded occupational pension component of the British pension system requires a more sophisticated approach. Specifically, funded schemes must be divided between DB and DC, as their structure has significant macroeconomic implications (see section 3.2). However, this division requires adopting a different modelling specification for the two schemes. We first look at funded DB schemes.

DB pension benefits are computed as:

$$DB_{benefits} = DB_{benefitsPast} + DB_{benefitsNew} \tag{17}$$

Where $DB_{benefitsPast}$ refers to the benefits in payment to current pensioners, while $DB_{benefitsNew}$ refers to the benefit for new pensioners. $DB_{benefitsPast}$ is equal to total lagged benefits minus the benefits of those pensioners who have deceased in the current year:

$$DB_{benefitsPast} = \left(DB_{benefits_{-1}} - \frac{DB_{benefits_{-1}}}{Pensioners_{DB_{-1}}} \cdot \frac{Pensioners_{DB}}{Pensioners_{PF}} \cdot Pensioners_{deaths}\right) \cdot \left(1 + \dot{CPI}\right) \tag{18}$$

Where $\frac{DB_{benefits_{-1}}}{Penionerss_{DB_{-1}}}$ is the average pension benefit for DB pensioners in the previous year, $\frac{Pensioners_{DB}}{Pensioners_{PF}}$ is the share of funded DB pensioners over total pensioners in occupational schemes and $Pens_{deaths}$ is the number of pensioners in occupational schemes who died in the current year. The sum is then indexed by CPI inflation.

$DB_{benefitsNew}$ is computed as:

$$DB_{benefitsNew} = \alpha_{DB} \cdot \bar{W}_{career} \cdot Pensioners_{DB_{new}} \tag{19}$$

α_{DB} is the benefit rate and is exogenously determined using historical data. $\bar{W}_{career}$ is the average career salary computed as an inflation-adjusted average of the past 20 years of salary. $Pensioners_{DB_{new}}$ is the number of new pensioners in funded DB schemes:

$$Pensioners_{DB_{new}} = \Delta Pensioners_{DB} + \frac{Pensioners_{DB}}{Pensioners_{PF}} \cdot Pensioners_{deaths} \quad (20)$$

This equation means that new pensioners are equal to the change in current DB pensioners $\Delta Pensioners_{DB}$ plus the number of pensioners deceased. Using only $\Delta Pensioners_{DB}$ would underestimate the new number of pensioners by not considering the deceased ones.

The other important component of funded DB schemes is contribution inflows. Total contributions are computed as:

$$DB_{ctrb} = \varsigma_{DB} \cdot W_{yearly} \cdot Active\_members_{DB} \quad (21)$$

Where W_{yearly} is the yearly average wage and $Active\_members_{DB}$ are the total number of active members in funded DB schemes. ς_{DB} is the contribution rate, which is endogenous and depends on the funding ratio of the schemes. Specifically:

$$\varsigma_{DB} = \varsigma_{floor} + \frac{\varsigma_{ceiling} - \varsigma_{floor}}{1 + e^{-solvency_{DB}}} \quad (22)$$

Equation 22 means that the contribution rate moves between an exogenous floor ς_{floor} and ceiling $\varsigma_{ceiling}$ to ensure that DB pension funds remain solvent. To remain solvent, the schemes' funding ratio, i.e. assets divided by liabilities, must remain above 1. $solvency_{DB}$ is:

$$solvency_{DB} = solvency_{DB_{-1}} + \mu\left(Target\_solvency_{DB} - solvency_{DB_{-1}}\right) \quad (23)$$

Where μ is an exogenous adjustment parameter and $Target\_solvency_{DB}$ is the target the DB pension funds want to reach for their funding ratio, namely assets higher than liabilities. The computation of liabilities is simplified in UK-PADME as we can only model an aggregate measure. $Liabilities_{DB}$ is defined as current benefits in payment $DB_{benefits}$ divided by the discount rate δ:

$$Liabilities_{DB} = \frac{DB_{benefits}}{\delta} \quad (24)$$

Equation 24 values defined-benefit liabilities as a perpetuity: the present value of the stream of annual DB pension payments is the annual cashflow divided by a discount rate. We econometrically estimate the discount rate δ using a dynamic equation:

$$\delta = \beta_0 + \beta_1 \delta_{-1} + \beta_2 r_{-1} \quad (25)$$

Where r_{-1} is the lagged policy rate. Equation 25 implies that the discount rate follows the trajectory of the policy rate, though with a lag and a strong hysteresis effect generated by the lagged discount rate component $\beta_1 \delta_{-1}$. In subsection 3.1.3, we show how equation 25 fits the actual data.

Once contributions and benefits are defined, we can determine wealth accumulation for DB funds. Total assets of DB schemes V_{DB} are:

$$V_{DB} = V_{DB_{-1}} + DB_{ctrb} + F_{DB} - DB_{benefits} \quad (26)$$

Where $V_{DB_{-1}}$ is previous period wealth (derived from historical data for its initial values) and F_{DB} is profits generated by the pension investment. The funding ratio is thus $FR_{DB} = \frac{V_{DB}}{Liabilities_{DB}}$. DB pension wealth is allocated following empirical evidence, hence approximately 40% is invested in domestic bonds B_{DB} and the rest in foreign assets FS_{DB}. Total profits F_{DB} is thus determined as:

$$F_{DB} = r_{g_{-1}} B_{DB_{-1}} + r_{FS_{-1}} FS_{DB_{-1}} \quad (27)$$

With $r_{g_{-1}}$ being the return on domestic bonds and $r_{FS_{-1}}$ the exogenously determined return on foreign assets.

Funded DC schemes.

DC schemes operate differently from DB ones. DC funds do not need to compute their liabilities as benefits are not a promised percentage of the worker's salary, but rather they are paid according to the performance of the pension pot. Hence, there is no need to model the discount rate or estimate the liabilities of DC schemes in UK-PADME. $DC_{benefits}$ is determined as:

$$DC_{benefits} = \frac{V\_DEC_{DC_{-1}}}{\iota_{DC}} \tag{28}$$

Where $V\_DEC_{DC_{-1}}$ is the share of DC wealth in the phase of decumulation, meaning the pension wealth that is being used to pay current pensioners, while ι_{DC} is the annuity factor. V_DEC_{DC} is derived as:

$$V\_DEC_{DC} = V\_DEC_{DC_{-1}} + V_{NewRetirees_{DC}} + F_{DEC_{DC}} - DC_{benefits} \tag{29}$$

In short, equation 29 means that pension wealth in decumulation is equal to past decumulated wealth plus the wealth of newly retired pensioners $V_{NewRetirees_{DC}}$ and the profits F_DEC_{DC} deriving from the invested assets minus the benefits paid to retirees. The annuity factor ι_{DC} estimates the share of wealth that can be paid each year to the pensioner while ensuring a steady flow of income for the rest of their expected life. ι_{DC} is computed as a standard present-value annuity factor:

$$\iota_{DC} = \frac{1 - (1 + \pi_{DC})^{-life\_expectancy_{65}}}{\pi_{DC}} \tag{30}$$

Where π_{DC} is the rate of return of DC assets and $life\_expectancy_{65}$ is the average life expectancy at 65 in the UK. The latter variable is taken from the population projection tables of the ONS (2024). It is worth pointing out that our approach assumes that every pensioner receives annuities each year instead of opting for lump sums at the start of their retirement age (or a combination of the two). This is a necessary simplification as we treat the DC sector at the aggregate level.

The contribution side of DC schemes is relatively straightforward to model. Aggregate contributions DC_{ctrb} are:

$$DC_{ctrb} = \varsigma_{DC} \cdot W_{yearly} \cdot Active\_members_{DC} \tag{31}$$

The contribution rate ς_{DC} is exogenously determined based on current estimates. $Active\_members_{DC}$ is the total number of active contributors to DC schemes, which is simply calculated as a residual:

$$Active\_members_{DC} = Active\_members_{PF} - Active\_members_{DB} \tag{32}$$

Where $Active\_members_{PF}$ is the share of the UK working population actively contributing to occupational pension schemes and it is derived empirically.

The pension accumulated by the active members is defined as V_ACC_{DC}. V_ACC_{DC} is determined as:

$$V\_ACC_{DC} = V\_ACC_{DC_{-1}} + DC_{ctrb} + F\_ACC_{DC} - V_{NewRetirees_{DC}} \tag{33}$$

Meaning accumulated wealth is equal to past accumulated wealth plus contributions plus profits earned on the past accumulated wealth $DC_{ctrb} + F\_ACC_{DC}$ minus the wealth of newly retired people, which is transferred to V_DEC_{DC} (equation 29).

$V_{NewRetirees_{DC}}$ is an important variable for DC schemes. However, it is not easy to estimate from an aggregate perspective. In UK-PADME, we estimate $V_{NewRetirees_{DC}}$ as the product of new retirees $Pensioners_{DC_{new}}$ times their average pension pot $\bar{V}_{pot}$:

$$V_{NewRetirees_{DC}} = \bar{V}_{pot} \cdot Pensioners_{DC_{new}} \tag{34}$$

$Pensioners_{DC_{new}}$ is computed as above for DB benefits:

$$Pensioners_{DC_{new}} = \Delta Pensioners_{DC} + \frac{Pensioners_{DC}}{Pensioners_{PF}} \cdot Pensioners_{deaths} \quad (35)$$

However, $\bar{V}_{pot}$ requires making certain assumptions around the average contributory years of new retirees. Indeed, data on the average number of years of contributions are not available but are required to estimate the pension pot of a new pensioner. The equation for $\bar{V}_{pot}$ is the standard formula to estimate the future value of an annuity:

$$\bar{V}_{pot} = \frac{DC_{ctrb_{-1}}}{Active\_members_{DC_{-1}}} \cdot \frac{\left(1 + \bar{\pi}_{DC_{-1}}\right)^{t_{ctrb}} - 1}{\bar{\pi}_{DC_{-1}}} \quad (36)$$

In short, equation 36 estimates the pot of someone at the end of their accumulation career. $\bar{V}_{pot}$ is the sum of the average yearly contribution of a new retiree $\frac{DC_{ctrb_{-1}}}{Active\_members_{DC_{-1}}}$ across its contribution years t_{ctrb} and revalued at the average return $\bar{\pi}_{DC_{-1}}$ on assets generated over those contributory years until retirement. Because UK pension funds are transitioning to DC schemes, we assume in our model that the average career length for DC contributors t_{ctrb} increase substantially throughout the simulation.

3.1.3 Calibration

This subsection briefly outlines how the calibration of UK-PADME has been carried out.

First, UK-PADME has been empirically calibrated to reproduce the structure of the UK economy from 2000 until 2024. The calibration approach proceeds in several layers, reflecting the heterogeneous nature of the UK-PADME's parameters. Where possible, all stocks and flows are initialised from observed data imported directly into the model. Particularly important data sources are summarised in Table 15.

Table 15. Main datasets employed for the empirical calibration of UK-PADME

Source	Dataset(s)
ONS	National accounts - Supply and use tables, Employment and labour market, Population projections, Inflation and price indices, Funded occupational pension schemes in the UK, Wealth and Assets Survey
OBR	Fiscal risks and sustainability – Supplementary documents
World Inequality Database	Pension wealth statistics
DWP	Stat-Xplore for household and pensioners income
OECD	Pensions at a glance
The Pensions Regulator	Occupational defined benefit landscape in the UK, Occupational defined benefit scheme funding analysis

Where data is absent, structural parameters are recovered by inverting the model's accounting and behavioural relations so that the base year is reproduced exactly. For instance, sectoral mark-ups are backed out from observed labour shares and value added; sectoral nominal wages are obtained from labour shares, sectoral output and employment; and effective tax rates on wages, consumption and profits are computed from observed tax receipts relative to their respective bases. This 'inverse calibration' guarantees internal consistency of the initial dataset within the SFC accounting framework.

A small number of behavioural equations, principally in the financial block, are estimated econometrically on UK time series. The deposit-rate and loan-rate equations take a partial-

adjustment / interest-rate pass-through form, relating each retail rate to the policy rate (and, for deposits, to its own lag), with the reported coefficients obtained from regression. One example is that of the discount rate presented above (equation 25). Figure 4 shows how our estimate of the discount rate fits into historical data.

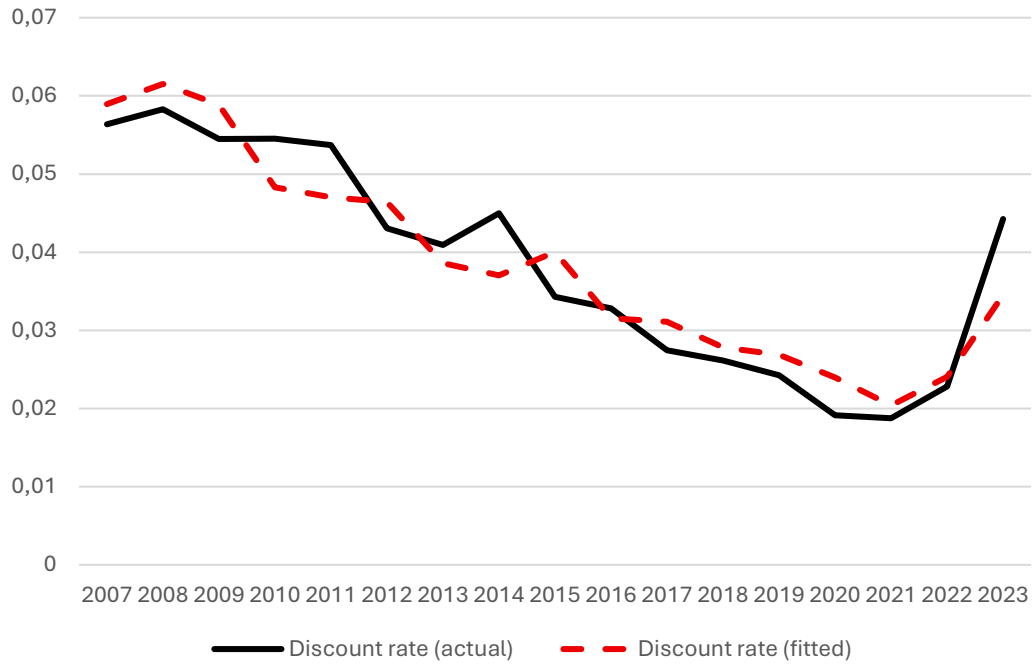

Figure 4. Discount rate equation: actual vs. partial-adjustment form. Fit statistics: adjusted R^2 = 0.86, Durbin–Watson = 1.79. Both slope coefficients β_1 and β_2 significant ($p < 0.003$).

The residual parameters that govern adjustment speeds and behavioural sensitivities (the speed of capital, government-spending and wage adjustment, the price-substitution elasticities, the Taylor-rule responses, and the productivity-to-R&D sensitivities) are not separately identified from the data and are instead calibrated so that the model attains a stable steady state. The values of these parameters are taken from the stock-flow consistent literature to ensure consistency with previous modelling works. Throughout, stock-flow consistency is verified by checking that the balance-sheet residual is zero in every period, which serves as the central consistency test of the calibration.

3.2 Scenario analysis

The scenario analysis comprises five scenarios. Our narrative develops incrementally and follows a precise narrative order. First, our baseline is an exponential growth, business-as-usual (BAU) scenario based on OBR assumptions. We then add a set of policies to start a post-growth transition, namely taxes on resources and carbon. We continue our analysis by introducing pension policies to reduce the pressure of public pensions on the fiscal budget. A fourth scenario adds health policies that limit the expansion of healthcare spending. Lastly, we present a scenario that introduces further conventional post-growth policies to stabilise the public debt. The next subsection describes the scenarios in more depth. Subsection 3.2.2 presents the results of our simulations. Table 16 summarises the scenarios and the key policies simulated in each of them.

Table 16 Key policies simulate in each scenario.

Scenarios	Environmental policies	Pension policies	Healthcare policies	Other policies
Baseline				
Post-growth	Stringent carbon and material taxes.			
Post-growth + Pension Policy (PPP)	Stringent carbon and material taxes.	Increased retirement age for State Pension; Abolition of Triple Lock; Pause to CPI indexation for unfunded DB pensions.		
PPP + Healthcare (PPPH)	Stringent carbon and material taxes.	Increased retirement age for State Pension; Abolition of Triple Lock; Pause to CPI indexation for unfunded DB pensions.	Investment in preventative and community care; reduced focus on hyper medicalisation.	
Full Post-growth	Stringent carbon and material taxes.	Increased retirement age for State Pension; Abolition of Triple Lock; Pause to CPI indexation for unfunded DB pensions.	Investment in preventative and community care; reduced focus on hyper medicalisation.	Working hours reduction; Low policy rate.

3.2.1 Scenarios description

The *Baseline* scenario replicates a BAU simulation roughly based on OBR assumptions regarding the trajectory of the UK economy. Some differences apply as we use updated demographic projections from the ONS and we assume labour productivity growth trends more aligned with historical evidence, which tend to be lower than the ones assumed by the OBR. Nonetheless, the Baseline scenario manages to effectively approximate the results of UK-PADME to those of the OBR long-term forecast. Table 17 shows how the assumptions of the Baseline scenario differ from those of the OBR (2024).

Table 17. Key assumptions of UK-PADME Baseline scenario compared to OBR projections

Key Macroeconomic variables (average 2022-2070)	OBR (2024)	UK-PADME Baseline scenario
Real GDP growth	1.75	1.5
Labour productivity	1.40	1.13
Population growth	0.39	0.37
CPI	2.20	1.85
Treasury Gilt rate	4.26	3.4

Figure 5 and Figure 6 demonstrate the similar trajectories of public healthcare spending and the State Pension spending as a share of GDP between the UK-PADME Baseline scenario and the OBR projections (2024 and 2025). Instead, Figure 7 shows that both the OBR and the UK-PADME baseline project a significant growth in the public debt-to-GDP ratio by 2070, though with a difference in the evolution and speed of the increase in the ratio. This difference is driven by the more complex endogenous interplay of variables in UK-PADME, which is not replicated in the OBR model.

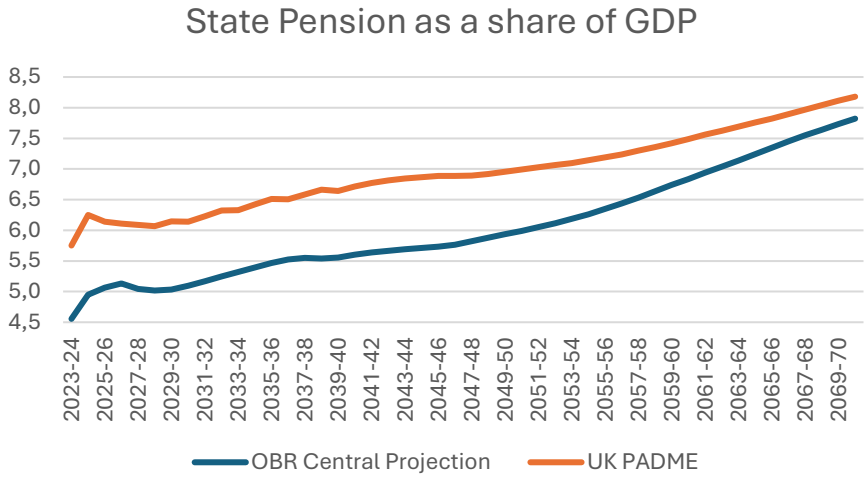

Figure 5. Projected increase in State Pension spending (% of GDP). Comparison between the OBR Central projection (OBR, 2025) and the UK-PADME Baseline scenario.

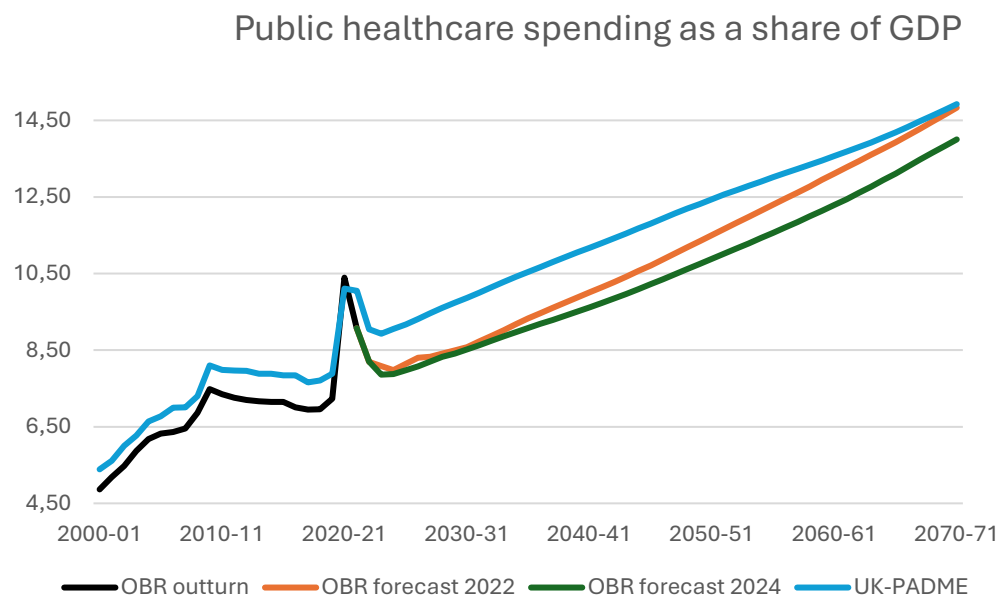

Figure 6. Projected increase in public healthcare spending (% of GDP). Comparison between the OBR 2022 and 2024 projections (OBR, 2024) and the UK-PADME Baseline scenario. The black line represents historical data.

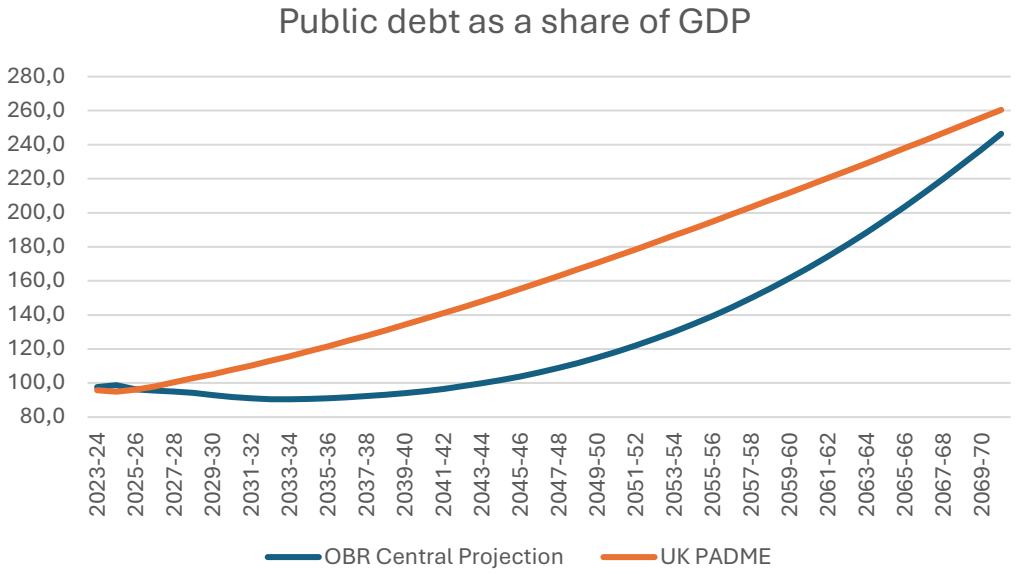

Figure 7. Projected increase in public debt (% of GDP). Comparison between the OBR Central Projection (OBR, 2024) and the UK-PADME Baseline scenario.

The *Post-growth* scenario assumes that in 2030 the British government introduces progressively growing taxes on carbon and material use, which increase the cost of energy and manufactured goods (as the manufacturing sector consumes resources to produce its output). Figure 8 shows the trajectory of carbon and resource tax income. The carbon tax brings no income in the long run as fossil fuels are phased out. Conversely, the resource tax brings a growing source of income as the UK economy reduces material consumption but cannot fully stop consuming resources.

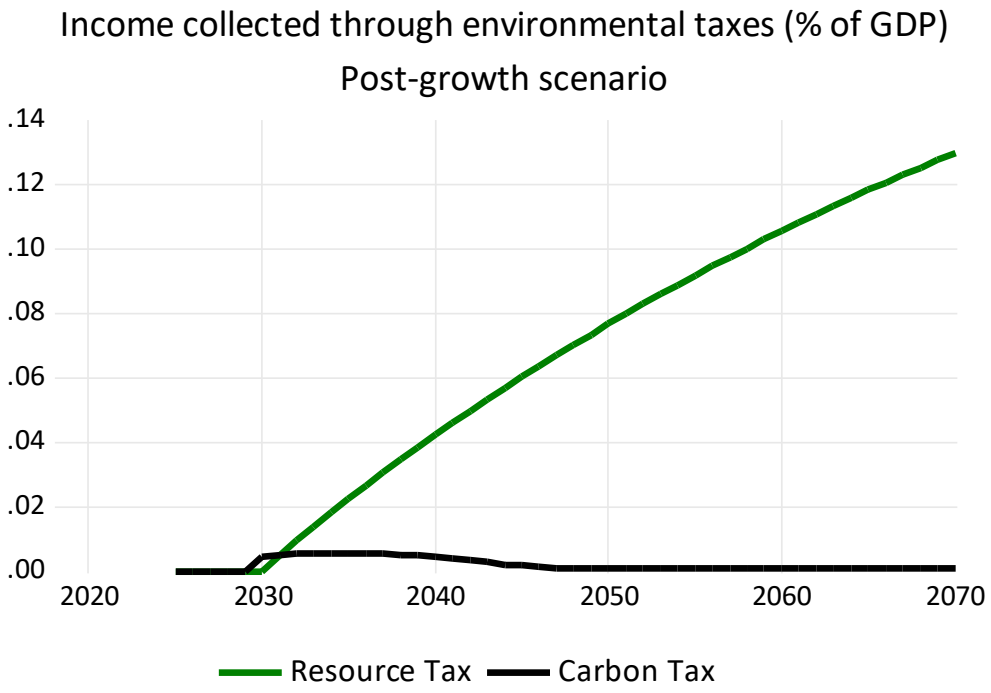

Figure 8. Projected increase in UK tax revenue (% of GDP) due to the introduction of carbon and resource taxes, post-growth scenario UK-PADME.

The *Post-growth + Pension Policy (PPP)* scenario adds several pension policies to the *Post-growth* scenario, aimed at reducing public pension spending to preserve fiscal viability. The indexation of the State Pension is changed (equation 6). Specifically, the 'Triple Lock' is halted in 2040 and replaced by CPI inflation. Moreover, the retirement age for the State Pension is increased to 69 by 2050 and to 70 by 2062 [21]. Lastly, the CPI indexation of PAYG DB pensions for public employees (equation 14) is stopped from 2040 until 2060. All these measures try to reduce the pressure on public finances without significantly harming the adequacy of pension provision.

The fourth scenario, *PPP + Healthcare (PPPH)*, adds a healthcare policy dimension to the *PPP* scenario which tries to capture higher investment in preventative and community care and improved health outcomes due to better environmental quality. From a modelling perspective, *PPPH* assumes that the technological and chronic disease terms in equation 4 are turned to zero. The first assumption reflects a reduced focus on hyperspecialized cures and hospital-centred care that might be expected in a post-growth economy (see section 1.6.1). The second assumption tries to capture the allegedly better health outcome deriving from higher environmental quality and sustainable food policies. Lastly, healthcare spending for the elderly is lowered by eight percentage points by 2070 in real terms to capture less focus on overmedicalisation. Figure 9 shows how spending changes compared to the baseline scenario. It is worth highlighting that these assumptions are somewhat arbitrary. UK-PADME cannot directly model specific health policies like more investment in prevention and community care. Hence, we can only guess indirectly their impact on aggregate costs.

[21] Currently, the retirement age is expected to reach 68 around 2046.

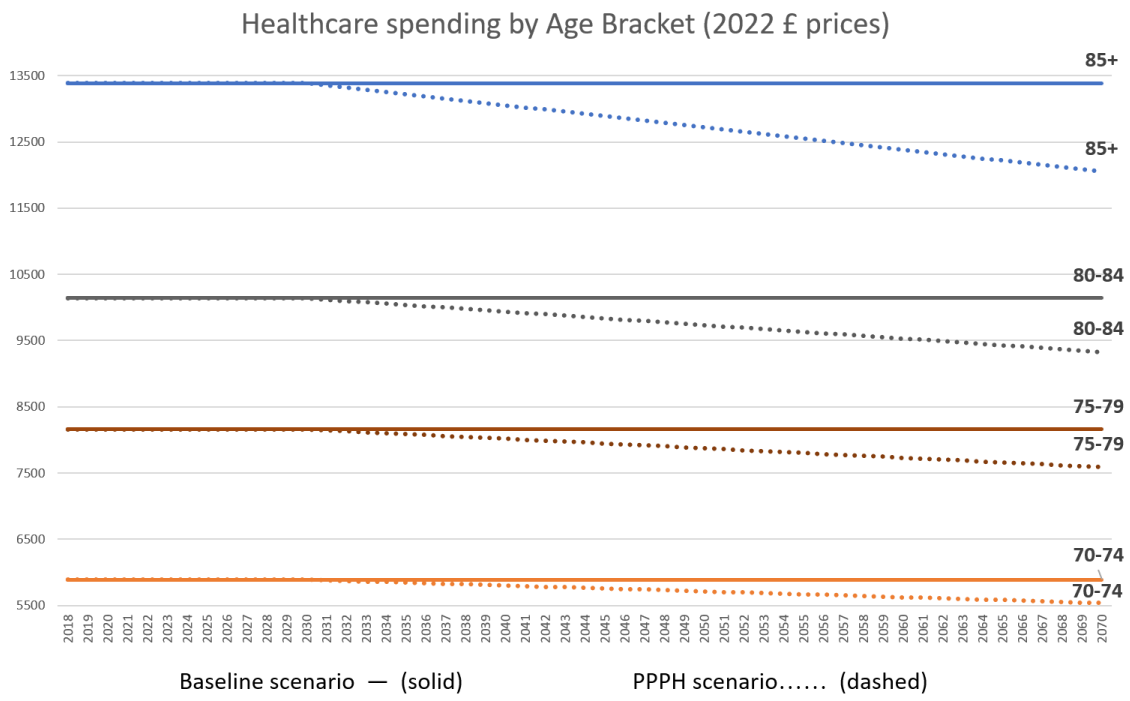

Figure 9. Projected real healthcare spending for each age bracket in UK-PADME. Constant lines are the values derived from the OBR report (OBR, 2024)

The last scenario, *Full Post-growth*, combines all the policies above and further adds two traditional post-growth policies to manage macroeconomic imbalances. The first one is a progressive reduction in working hours to counteract higher unemployment. Average yearly working hours are linearly reduced by 20% (from 1522 hours in 2025 to 1218 in 2070) to replicate a nation-wide adoption of a 4-day working week by the end of the simulation. The second policy is a permanent reduction in the policy rate to improve public debt sustainability by reducing interest payments.

This set of scenarios should allow us to explore in depth the financial viability of pension and healthcare in a post-growth transition. Clearly, this is one of the many potential narratives that could be studied using UK-PADME. The next subsection describes the key results of the simulation exercise.

3.2.2 Simulation results

We start the description of the simulation results by looking at general macroeconomic indicators. These are represented in Figure 10. The dashed vertical line marks the end of historical data and the beginning of the simulations; the constant vertical line marks the start of the post-growth policies.

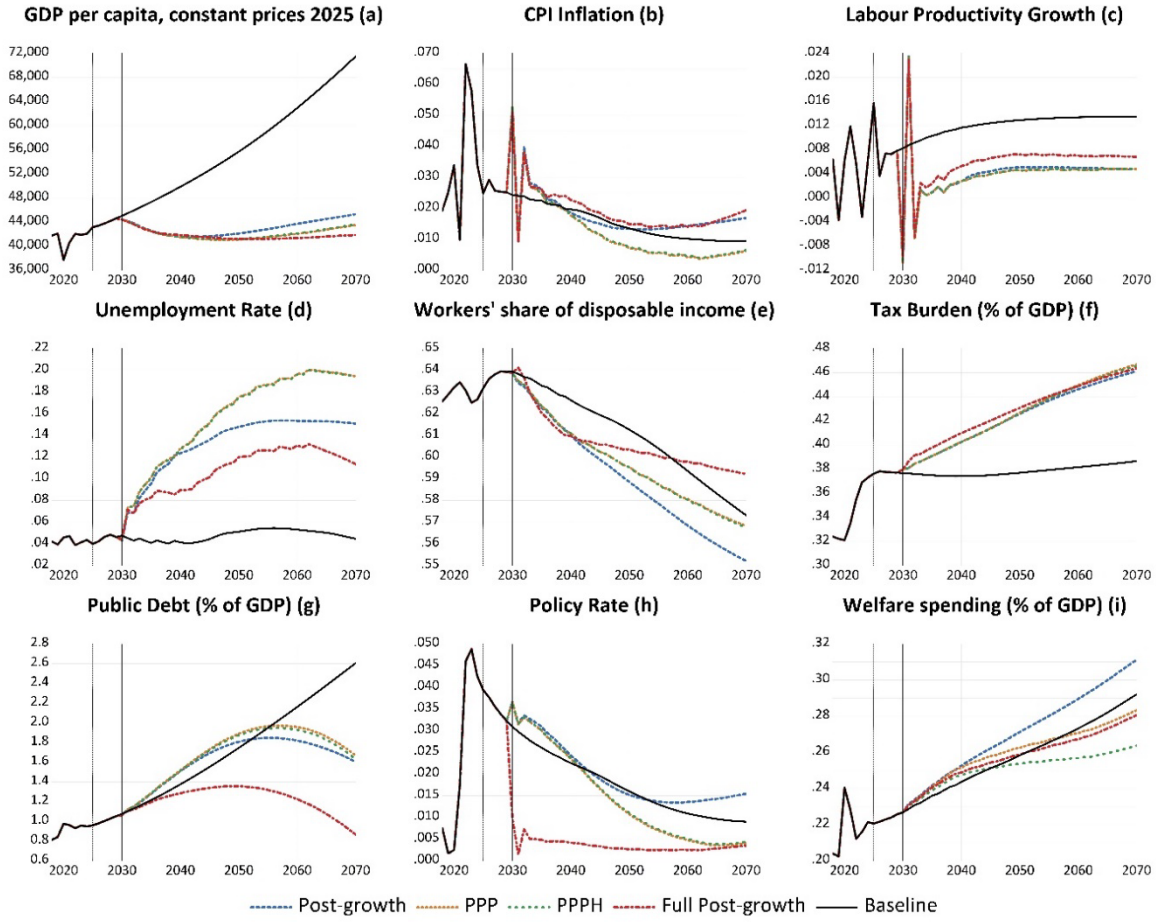

Figure 10. Key Macroeconomic variables.

Compared to the *Baseline* scenario, all the post-growth scenarios show a significantly lower GDP per capita, which remains stagnant around the 2022 level (Figure 10a). They also show higher short-term inflation caused by the environmental taxes, followed by declining inflation rates as a result of high unemployment rates (Figures 10b and 10d), which depress the bargaining power of workers resulting in lower wages. The unemployment rate increases in all the post-growth scenarios due to a stagnant GDP coupled with low but positive labour productivity growth. The *Full Post-growth* scenario shows the lowest increase in unemployment because of the assumption of lower working hours. Labour productivity growth remains far below the baseline scenario in the post-growth scenarios (Figure 10c) due to higher energy and resource prices shifting innovation from labour-saving to energy and material-saving technologies (Leoni, 2024).

The share of workers' disposable income declines in all scenarios (Figure 10e), including the *Baseline*, as population ageing means that a larger share of income is owned by pensioners. However, in the post-growth scenarios, this reduction is more pronounced as higher

unemployment rates lower the bargaining power of workers, reducing (in relative terms) their real wages. The tax burden is significantly higher in the post-growth scenarios as a result of higher environmental taxation (Figure 10f). Such level of taxation can be seen in France and in Scandinavian economies. The higher tax revenue helps reducing the debt-to-GDP ratio (Figure 10g). The *Full Post-growth* scenario shows the most significant reduction thanks to a combination of lower unemployment benefits, reforms of pensions and healthcare (see Figure 11 and Figure 12) and low interest rates (Figure 10h), which dramatically decrease debt servicing for the UK government. Lastly, Figure 10i shows that welfare spending as a share of GDP grows in all scenarios. However, the *PPP*, *PPPH* and *Full Post-growth* scenarios, where pension and healthcare policies are introduced, display lower shares than the *Baseline* one. To explain these trends, we now look in detail at pension and healthcare spending.

This overview of the macroeconomic outcome of our post-growth scenarios helps to provide a general context for the more specific results of the pension and healthcare sectors. Figure 11 display some key indicators for the performance of pensions in our simulations. We look at State Pension, unfunded DB public pensions and funded occupational schemes.

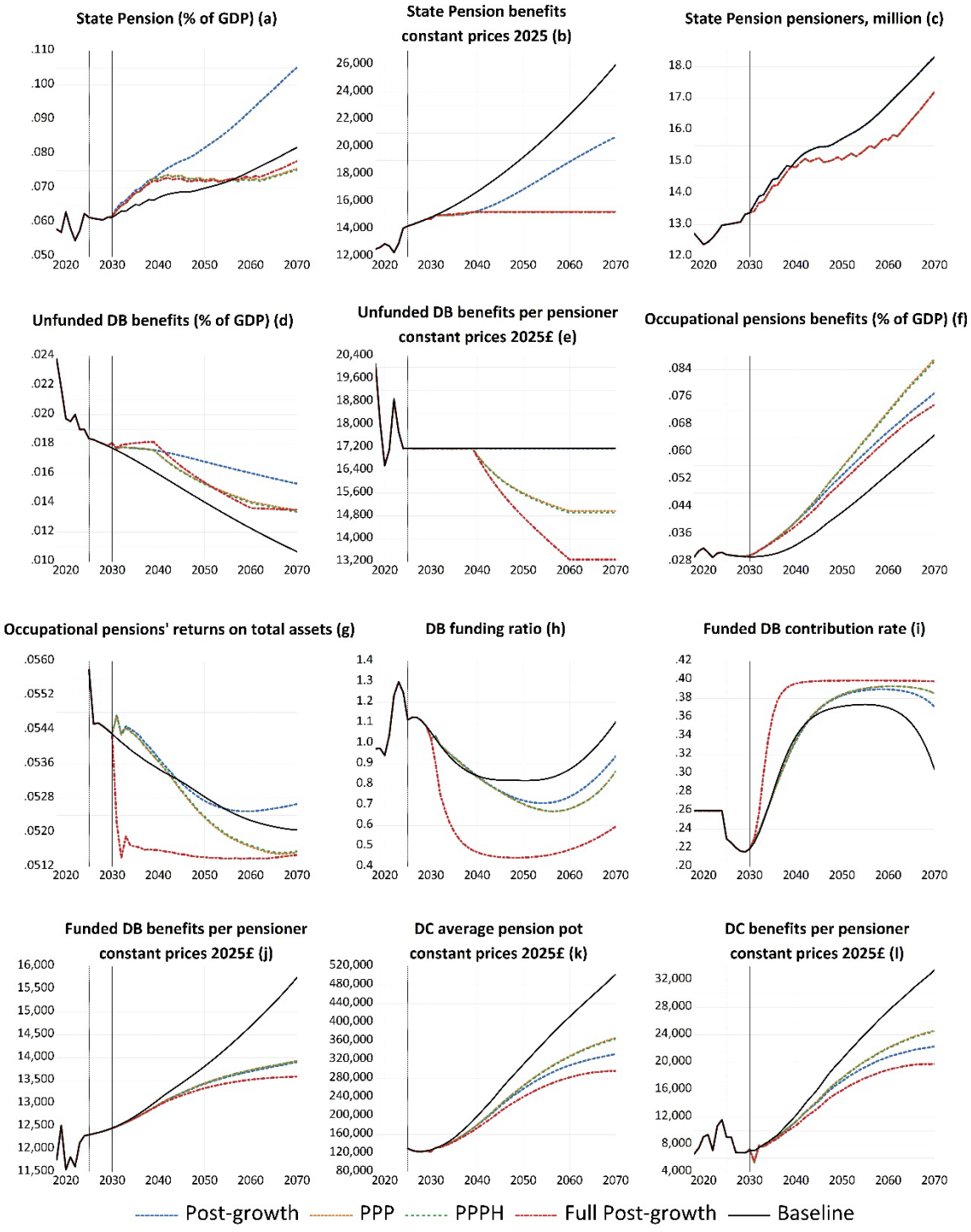

Figure 11. Key pension variables.

Figure 11a shows that post-growth without further pension policies would lead to a substantial increase in State Pension spending as a share of GDP (*Post-growth* scenario). However, delaying the retirement age (Figure 11c) and stopping the Triple Lock leads to lower-than-baseline results. Such policies would result in an average State Pension (including extra pension credit/benefits) of 15000£ per year in 2025 prices (Figure 11b). It is difficult to estimate whether this would

constitute a sufficient income for pensioners without further savings. However, it would imply a 10% increase in real terms compared to the State Pension in 2024. A similar picture is shown for the unfunded DB component. Pausing CPI indexation (*PPP, PPPH* and *Full Post-growth* scenarios) allows a significant reduction in spending, though this remains higher than the *Baseline* scenario (Figure 11d). Overall, this is one of the most generous pension schemes in the UK (Figure 11e), hence reducing pension benefits would not have a dramatic impact on pension adequacy for the recipients.

Figure 11f displays the performance of the funded occupational schemes. Total pension benefits as a share of GDP becomes significantly higher as more people retire. Because post-growth scenarios show a reduction in GDP, their occupational benefit-to-GDP ratio is higher than in the *Baseline* (Figure 11f). The *Full Post-growth* scenario shows the lowest increase in this metric as lower domestic interest rates slightly reduce pension funds' financial returns (Figure 11g). The impact is relatively marginal as most of the pension assets are invested abroad. However, low interest rates in the UK negatively impact the discount rate used by defined benefits schemes to compute their liabilities (equations 24 and 25). A lower ratio increases the liabilities of DB funds (Figure 11h), meaning that higher contribution rates are needed to cover the funding gap (Figure 11i). It is worth noting that funding remains problematic for all scenarios after 2035. However, The *Full Post-growth* scenario shows a persistent inability to close the funding gap, even if contribution rates increase to unprecedented levels (40%). This result suggests that monetary policy faces a trade-off between improving public debt sustainability and preserving DB funds' funding position. Specifically, if monetary policy is targeted at reducing the public debt-to-GDP ratio (Figure 10g) by keeping the policy rate low, policymakers should expect a worsening of DB pension funds' funding ratio. Conversely, higher interest rates improve the funding ratio but might result in higher government spending on debt repayment.

DC pension schemes are less impacted by the post-growth transition by design. Figure 11k shows that the average real pension pot is significantly lower in post-growth scenarios than in the baseline. However, DC benefits outperform DB benefits in the long run thanks to longer working careers and wider participation in the schemes (Figures 11j and 11l). Ultimately, these simulations show that DC schemes can reduce financial viability issues while still providing substantial return. We reflect on the assumptions needed to obtain this result in the discussion section.

Lastly, Figure 12 shows the performance of the healthcare sector for the five scenarios. Interestingly, total and public healthcare spending as a share of GDP grow the most in the *Baseline* scenario (Figures 12a and 12b). The difference between the *Baseline* scenario and the *Post-growth* and *PPP* scenarios is driven by the Baumol cost disease. In other words, high labour productivity growth in the manufacturing sector drives up labour cost in the health sector in the *Baseline*, while a lower labour productivity growth in the post-growth scenarios depresses the Baumol effect (Figure 12c), lowering the cost of healthcare in relative terms (see equations 8, 9 and 10). The *PPPH* and *Full Post-growth* scenarios show an even more marked reduction of healthcare spending because of the further healthcare assumptions introduced. Overall, these simulations show that healthcare spending can be significantly lower than in the baseline if labour productivity differentials across sectors are reduced by the post-growth transition. At the same time, Figure 12d shows that all post-growth scenarios forecast a significant increase (+56% in *Full Post-growth*) in healthcare provision (in real terms) compared to 2025, though this increase is significantly higher in the *Baseline* scenario as a result of continuous economic expansion. In other words, a post-growth scenario is compatible with higher levels of pension provision.

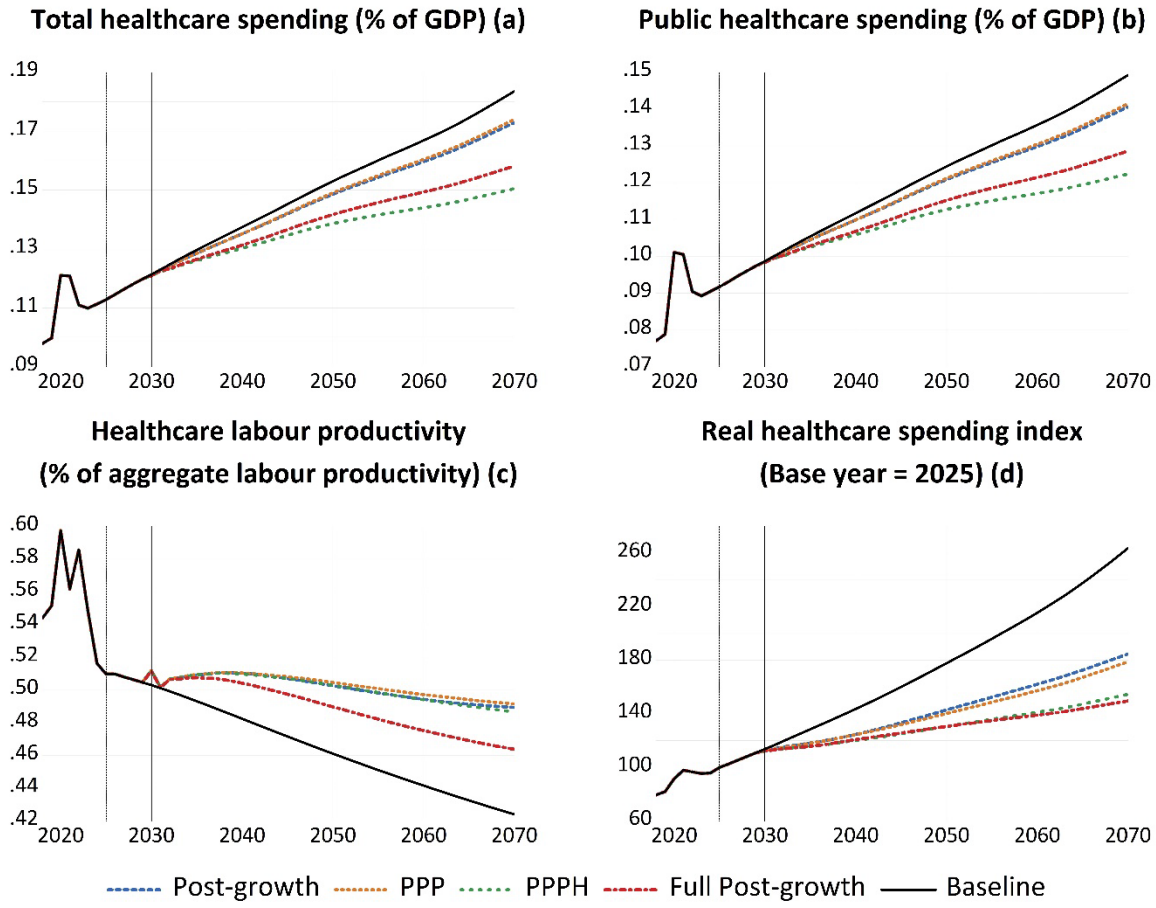

Figure 12. Key macroeconomic variables for the Healthcare sector.

3.3 Discussion

The results show that a post-growth transition initiated through high environmental taxes reduces economic output and increases unemployment. However, without appropriate policies the welfare system, particularly public pension and healthcare, becomes financially unsustainable. The UK public debt grows even if the tax share increases substantially compared to a BAU scenario. A combination of pension and healthcare policies has the potential to significantly reduce the cost of welfare — from 31% of GDP in the *Post-growth* scenario to 26.3% in the *PPPH* scenario in 2070. Such policies include a higher retirement age for State Pension, ending the Triple Lock, suspending indexation of PAYG DB pensions and investing in preventative and community care. Nonetheless, they do not offer an improvement in public debt sustainability, as higher real interest rates and a lower GDP offset the cost cuts in welfare-related spending. The *Full Post-growth* scenario offers an improved outcome by including working-time reductions and a monetary policy targeted at keeping the policy rate lower than in the other scenarios. These two policies ensure that unemployment is contained while public debt returns to pre-Covid levels by the end of the simulation period.

The *Full Post-growth* scenario reveals an important trade-off once pension systems are included in post-growth considerations. Lowering the interest rate to prioritise public debt sustainability

generates a funding gap for defined benefits pension schemes. This result derives from the dependency of the discount rate on the policy rate (equation 25). A lower discount rate implies higher total liabilities, meaning that pension funds need to find more resources to meet future pension obligations. In UK-PADME, this triggers a sharp increase in contribution rates [22], which is still insufficient to bring back to parity the funding ratio. How can this trade-off be resolved?

We provide three reflections. First, a technically simple solution would be to lower promised benefits by changing the benefit formula of the funded DB schemes. A second option would be to change the way the discount rate is defined. Keating et al. (2021) offer an interesting critique of the logical inconsistency of using time-variant, exogenously determined discount rates (the current practice that has been replicated in UK-PADME). They suggest using the Contractual Accrual Rate (CAR) as discount rate to return a more accurate picture of the liability burden of DB pension funds. Though it is beyond the scope of this work to compute a proxy of the CAR, it could offer a meaningful change to the results of the model. Lastly, DB schemes could be reformed into CDC schemes as in the Netherlands. Though the consequences of the CDC reform remain unclear and the implications still need to be assessed, it could solve the interest rate trade-off by allowing DB schemes to stop computing their liabilities while still providing risk sharing mechanisms to fund members.

This last point connects to a wider argument on whether DB or DC schemes are preferrable in a post-growth economy. This modelling work shows that DC schemes will provide better pension benefits in the long run. However, several assumptions underpin this result. First, we assumed that the average career length for DC contributors increase substantially throughout the simulation as a result of auto-enrolment. This assumption creates a substantial contributory base. We also do not model distribution of pension wealth, hence the average benefit that we estimate in Figure 11 does not necessarily mean that a worker with a median income will receive a decent pension. We cannot also model individual risk and the impact that a decentralised DC landscape might have on the most vulnerable members of the funds. Lastly, we assume that most of DC assets are invested abroad and that foreign returns are significantly higher than domestic ones. Though this is a reasonable assumption based on historical evidence, it poses again the ethical issue of whether relying on the rest of the world to pay for the British pensions is acceptable. Moreover, it is likely that returns on foreign assets will also experience a decline if other developed economies start a post-growth transition. The current version of UK-PADME is also unable to explore exchange rate dynamics that would be caused by this higher inflow of pension income from abroad in relation to a smaller domestic economy. These are all areas of future development for research on post-growth pensions.

Regarding the reforms of the State Pension, two issues remain unexplored. The first one is what level of basic income would be considered enough to protect most pensioners from the risk of material deprivation. Our simulation returns 15000£ per year in 2025 prices as a minimum floor. However, it does not offer an assessment of whether this figure would constitute enough to protect pensioners from poverty. A more comprehensive assessment is needed. Moreover, one problematic feature of the State Pension is that by being contribution-based, it can exclude vulnerable categories from being eligible to receive it. Changing the eligibility criterium from contributory to residence-based would ensure that the State Pension provides a more

[22] We assume that contribution rates would not go beyond 40% of the salary as rates higher than that would probably be unrealistic.

comprehensive coverage for all British citizens. However, such policy cannot be directly simulated in UK-PADME.

Lastly, our results show that healthcare costs are highly dependent on labour productivity assumptions and the Baumol cost disease. If labour productivity grows quickly in the manufacturing sector, healthcare will be more expensive regardless of the rate of economic growth. If the assumption that higher costs of material and energy lead to a relative reduction in labour productivity growth is accepted (Leoni, 2024; Leoni et al., 2026), it can be argued that a post-growth economy will experience a compression and convergence of labour productivity differentials across sectors. Hence, the Baumol cost disease will have a more modest effect on healthcare costs, helping to maintain healthcare spending more financially viable. At the same time, one limitation of the UK-PADME model is its inability to capture health-specific policy changes like community-based reforms and higher investment in preventative care. It cannot also meaningfully capture the health benefits deriving from a healthier natural environment or the negative effects of lower available income at the aggregate level. Our assumptions on how these effects will reduce healthcare costs can only be understood as indirect estimate. Improving the connection between healthcare spending, environmental quality and population health is an important future research avenue for post-growth healthcare studies.

Conclusion

This deliverable reports the research conducted in Task 3.2 “Making healthcare and pensions growth-resilient” for the MAPS project. Our exploration into the growth dependencies of European pension and healthcare systems, focusing primarily on four case study countries – the UK, Italy, Finland and the Netherlands – to anchor our analysis in real-world examples.

In chapter 1 we investigated how healthcare systems in wealthy economies might fare under conditions of low or no economic growth. We adapted Corlet Walker et al.'s (2024) growth dependency framework, originally developed for the adult social care, to the particularities of the healthcare sector. As part of that, we identified ‘technology-driven cost growth’ as an additional growth dependency mechanism of particular relevance to healthcare. We developed four health system profiles for our chosen case study countries, and drew on secondary data to identify potential vulnerabilities and areas of resilience relating to each of our four growth dependency mechanisms. We find that no system is holistically more or less resilient to a post-growth transition; rather, each exhibits a different configuration of vulnerabilities, shaped by its socio-demographic profile, welfare financing model, governance structures, and cost-containment institutions. A consistent thread is that growth dependencies are already present in every healthcare system. Their impacts are simply masked and displaced, most often onto healthcare workers through pay freezes and understaffing, or onto patients through unmet need and catastrophic spending. And where financialised provision is in the mix, existing strains are compounded by the demands of rent-extraction. Our analysis is an exploratory first step in mapping this terrain and future research should seek to draw on a wider range of cases, and explore different institutional design choices, cost-containment options and financial regulations.

In chapter 2 we examined pension systems through a post-growth perspective. Our analysis shows that a post-growth economy can exacerbate financial sustainability issues in both PAYG and funded pension schemes. However, it is possible to manage these stressors through appropriate policy packages, which are necessarily country dependent. A general conclusion is that a post-growth pension system would emphasise the importance of equitable income distribution – among pensioners and between workers and pensioners – as a key dimension for policy intervention. Capping pension income above certain thresholds, expanding redistributive taxation, and consolidating and democratising governance emerge as powerful tools to reconcile financial viability with sufficiency and equity. Wiman (2024) argues that PAYG systems are more suitable for a post-growth economy, and our analysis partially supports this view. However, system resiliency may ultimately be better supported by diverse, pluralistic approaches, such as a combination of funded and PAYG schemes like in Finland and the Netherlands. Ultimately, path dependency is the key factor in determining what is the best pension design for a specific country. Quantitative analyses of how regulated, sustainable investment practices would impact returns for funded schemes, and how labour-market reforms could interact with PAYG pensions under post-growth conditions, are promising areas for further research.

Lastly, chapter 3 set out to answer the question: are the UK’s pension and healthcare sectors post-growth resilient? Using UK-PADME, an expanded and fully calibrated stock-flow consistent model of the UK economy, we simulated five scenarios that move incrementally from a business-as-usual baseline towards a comprehensive post-growth transition. The exercise shows that a post-growth transition with no welfare-specific policies generates a sharp rise in pension and healthcare spending as a share of a shrinking GDP, and public debt climbs even if the tax take

increases substantially. However, a carefully designed policy package can lower welfare spending without dismantling the adequacy of provision. When these measures are combined with a progressive reduction in working hours and an accommodative monetary stance, the simulations show that unemployment can be contained and public debt returned to pre-pandemic levels by the end of the projection period. These findings should be read as a first exploration rather than a definitive verdict. There are plenty of different ways in which a post-growth transition could be started that are not explored here. Moreover, UK-PADME aggregates heterogeneous schemes, abstracts from distributional detail, and cannot fully represent important details of health and pension reforms. A more sophisticated modelling of liabilities, individual risk, and health-policy mechanisms would return a clearer picture. Taken together, however, the evidence suggests the potential for the UK's pension and healthcare systems to be made post-growth resilient, but not passively. Their viability depends on deliberate institutional reform and on confronting the trade-offs that a post-growth transition brings out.

In conclusion, the central argument running through this deliverable is deceptively simple: the growth dependencies embedded in European healthcare and pension systems are not a future risk to be managed — they are a present reality, already generating harm, even in growing economies. Workers absorb them through stagnating pay and understaffing, or higher contribution rates in unfairly generous pension systems (e.g. Italy). Patients absorb them through unmet needs and catastrophic out-of-pocket spending. Pensioners face them through the individualisation and marketisation of pension markets and cost containment of minimum pension provision. Future generations absorb them through rising public debt and deteriorating environmental conditions. Economic growth has, until now, acted as a cover that allows these tensions to remain unresolved. A transition towards a post-growth economy – whether planned or arrived at passively through secular stagnation or crisis – removes such cover, and ultimately asks us to face these realities more honestly and more directly. What this deliverable has demonstrated is that the question of post-growth welfare resilience is tractable: analytically, empirically, and in policy terms. What is needed now is more resources devoted to broadening and deepening this research agenda.

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