

# APPLYING AN EXTENDED MULTI-REGIONAL INPUT-OUTPUT MODEL TO DETERMINE THE IMPACTS OF AGEING ON HEALTHCARE EXPENDITURE, EMPLOYMENT AND ECONOMIC GROWTH IN PORTUGAL – A FIRST APPROACH

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Políticas públicas para la salud:  
perspectivas desde la economía y la sanidad



**HELLO!**

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*It is a first analysis...*

*We tested a lot of things and had a lot of  
discussions!*

*Any input you can provide is very welcome.*

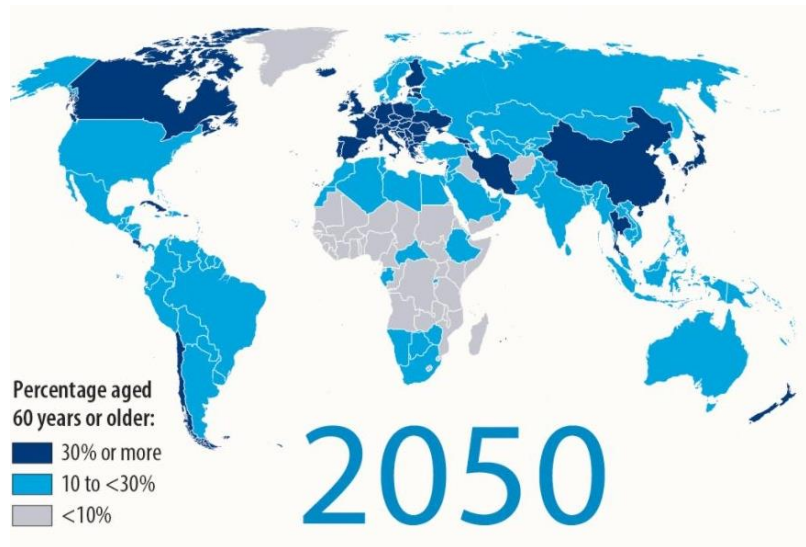
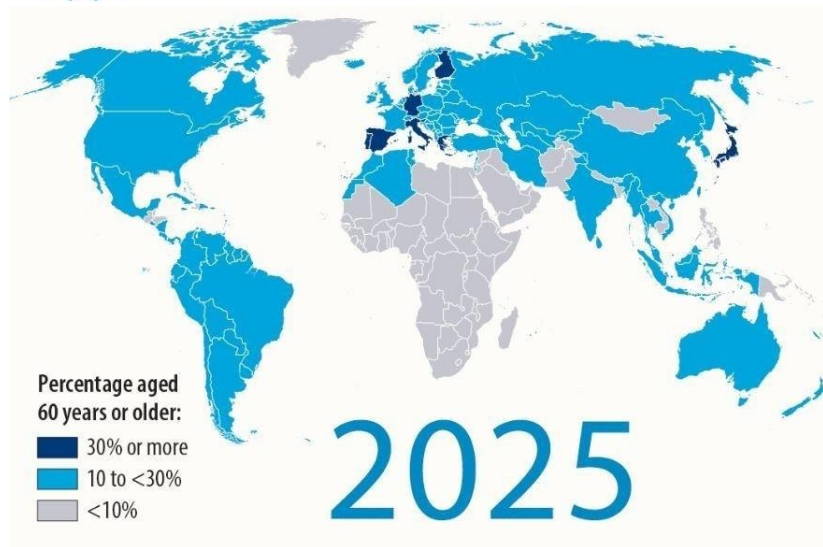
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## OUTLINE

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- Background/Introduction
- Aim
- Methods – The PreMMIA Framework
- Results (*very preliminary first results*)
- Main conclusions (*for now*)

## POPULATIONS ARE GETTING OLDER



# AGING IMPACT – ECONOMY AND HEALTH SYSTEMS

## Economic implications

- Labor market
- Pension systems
- Economic Growth
- Healthcare costs
- Consumer spending
- ...

## Health system challenges

- Increased demand
- Chronic diseases
- Long-term care
- Policy responses
- ...

## Innovations and solutions

- Technology
- Healthy aging
- Interdisciplinary collaboration
- Workforce adaptation
- Age-friendly Environments..

# AGEING AND HEALTHCARE

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## EDITORIAL

### The “red herring” after 20 years: ageing and health care expenditures

Friedrich Breyer<sup>1</sup> · Normann Lorenz<sup>2</sup>

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JEL Classifications H51 · J14 · I10

#### Introduction

One of the most important controversies in the health economics discourse of the last twenty years concerns the question whether the imminent ageing of the population in most OECD countries will place an additional burden on the tax-payers.

It is that future population ageing will have a positive impact on HCE, but the size of this impact depends on the type of service, with a larger one for LTC than for acute care.

These systems are financed by cross-sectional data, if the elderly had higher health care expenditures (HCE) than the young, the trend of rising contribution rates would be reinforced. Considering that other branches of social insurance (total and in particular unfunded and in particular social insurance) are not able in the near

The view that per-capita HCE are rising because of population ageing has been questioned on methodological grounds in a path-breaking article by Zweifel, Felder and Meier [31], who attacked the practice of relying on a cross-sectional correlation when forecasting future HCE. In fact, they dubbed the observed correlation between a

paper, a large literature has emerged in which the “red herring hypothesis” (RHH) has been tested using different datasets, different empirical approaches and more refined methods. Furthermore, the implications of these findings for the forecast of future HCE have been examined in a

In any case, there is still room for improvement in the methodology of measuring the impact of population ageing on HCE. As data availability and quality improves, more precise measures will hopefully be possible.

#### The red herring hypothesis: theory

There is not a unique RHH, but in fact four different versions of it in the literature, which we shall call RHH-1 to RHH-4.

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<https://www.emerald.com/insight/1477-7296.htm>

JHOM  
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## Managing an ageing healthcare workforce: a systematic literature review

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#### Abstract

**Purpose** – The aim of this paper is to review research conducted on managing the ageing healthcare workforce and identify gaps for further research.  
**Design/methodology/approach** – A systematic literature search of studies in the English language was carried out in Scopus and Web of Science databases.

**Findings** – The published in recent inclusion criteria: a databases. The suggested for future changes and their workforce, motive Longitudinal study research by the authors. Originality/value: workforce, describe important future it for further research in academic journals. **Keywords** Ageing; Paper type: Literature.

#### Introduction

An ageing population drivers of increase in service shortages in the 2015, HKW's Murphy *et al.*, 1 ageing HCWs, opportunities at challenges associated with the crisis. HCW psychosocial C Greene and Gal. For severe infection 2 (SARS-COV-2



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 pp. 108–122  
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 1477-7296  
 DOI: 10.1108/JHOM-11-2020-0011

General category, topic	Suggestion
Supply, demand and health workforce planning Training and knowledge	<ul style="list-style-type: none"> <li>Challenges of healthcare labor market, focus on countries other than Australia</li> <li>Training possibilities and lifelong learning among ageing healthcare workers</li> </ul>
Retirement and succession planning	<ul style="list-style-type: none"> <li>Practice patterns of older health workers</li> <li>Employment patterns among health workforce and motives for early retirement</li> <li>Possibilities of replenishment of ageing doctors with younger medical graduates</li> <li>Association between physician retirement and patient outcomes</li> </ul>
Extending working lives	<ul style="list-style-type: none"> <li>Impact of different policies associated to the needs of older health workers in different countries</li> <li>Age-management as a tool to support longer working careers</li> <li>Work ability of ageing healthcare workers</li> </ul>
Health and lifestyle	<ul style="list-style-type: none"> <li>Lifestyle and behavioral risk factors among ageing healthcare workforce (focus on groups other than nurses)</li> <li>Psychosocial risk factors associated with health workers during COVID-19 emergency</li> <li>Health workers' attitudes and knowledge regarding their own health risks</li> <li>Age-related changes and their influence on working</li> </ul>
Retention and sustainability	<ul style="list-style-type: none"> <li>Factors affecting recruitment and retention of health workforce</li> <li>The impact of different strategies and policies regarding retaining health staff (focus on rural health workers)</li> <li>Aspects that might be associated with likelihood to remain at work among health workers (all groups)</li> </ul>
Working environments	<ul style="list-style-type: none"> <li>Relationships between ageing, OSH and relevant aspects of work organization</li> <li>Impact of the working environment and benefits packages on the level of satisfaction among health professionals</li> <li>Ageism – Nordic Age Discrimination Scale (NADS) among health workforce</li> </ul>

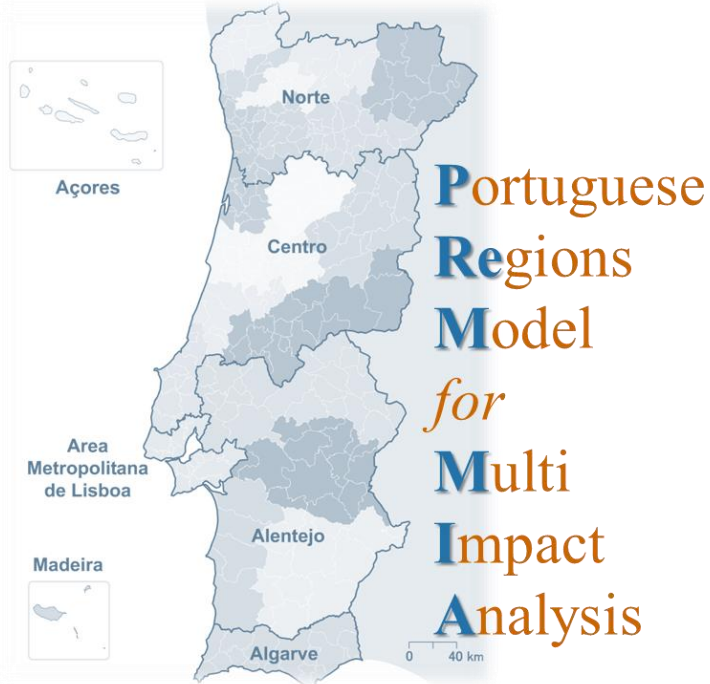
**Table 3.**  
 Suggested future research

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## AIM

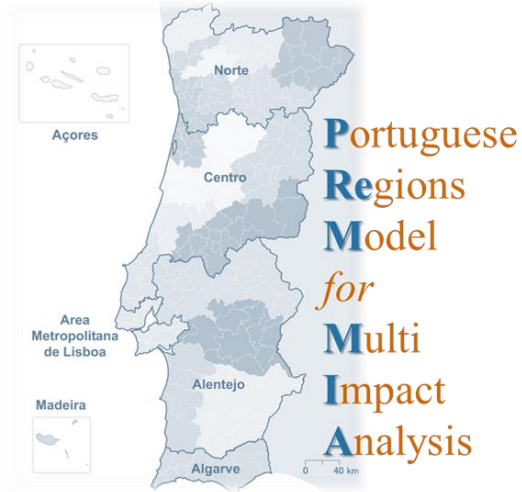
- Estimate the consequences of ageing at the sectorial level per region
  - Output
  - Gross value added (GVA)
  - Employment
- Special focus on health sector

## METHODS



- A *rectangular* bi-regional **Input-Output model** (2017) with very large sectoral detail:
  - 431 products
  - 125 industries
- *Main approach: grouping the NUTS II into two regions* (that exhaust the country – e.g.: *Centro Region-Rest of the Country*), settling a consistent estimation for inter-regional trade for these merged regions

# METHODS



Population official estimates



Household Consumption



Macroeconomic Assumptions



Multi-Regional Input-Output model

Region of interest vs. Rest of the Country

431 products and 125 industries



Output per industry and region



GVA per industry and region



Productivity

Employment per industry and region

## METHODS

- Households consumption *per age group*, is *disaggregated by five types, according to their main source of income*: labor (employees and own-account workers), real estate rents (landlords), capital income, pensions, other social transfers
  - This relies on the assumption that household types have different marginal propensities to consume and different consumption structures  $\Rightarrow$  they are in the middle way to become Social Accounting Matrices
- The household consumption depends on the population; not only the absolute population but the different consumption patterns of aging groups
- The different consumption structures were estimated using the RAS method (Ferreira et al., 2022)

0-19
20-34
35-49
50-64
65-74
> 75

# METHODS

- It is possible to assess economic (and social) impacts of... changes in final demand, using techniques based on I-O analysis

$$x = (I-A)^{-1}y$$

		Products		Industries		Other Final Demand		Total		
		Region A	Rest of the Country (RC)	Region A	Rest of the Country (RC)	Region A	Rest of the Country (RC)			
Products	Region A	Leontief Inverse (multipliers)		IC <sup>AA</sup>	HC <sup>AA</sup> (Lab)	IC <sup>ARC</sup>	HC <sup>ARC</sup> (Lab)	Δ Final Demand		
	Rest of the Country (RC)			IC <sup>RCA</sup>	HC <sup>RCA</sup> (Lab)	IC <sup>RCR</sup>	HC <sup>RCR</sup> (Lab)		OFD <sup>RCA</sup>	OFD <sup>RCR</sup>
Industries	Region A	p <sup>AA</sup>	0	Input-Output Analysis (I-A) <sup>-1</sup>		Exogenous definition of a demand shock (Δy)		TPO <sup>RC</sup>		
	Rest of the Country (RC)	0	HI <sup>A</sup> (Lab)						0	0
Taxes less subsidies on products, falling upon intermediate consumption or final demand		0		T(IC) <sup>A</sup>	T(HC) <sup>A</sup> (Lab)	T(IC) <sup>RC</sup>	T(HC) <sup>RC</sup> (Lab)	T(OFD) <sup>A</sup>	T(OFD) <sup>RC</sup>	TT
International Imports destined to intermediate consumption or final demand		0		M(IC) <sup>A</sup>	M(HC) <sup>A</sup> (Lab)	T(IC) <sup>RC</sup>	M(HC) <sup>RC</sup> (Lab)	M(OFD) <sup>A</sup>	M(OFD) <sup>RC</sup>	TM
Total Intermediate Consumption / Final Demand, at purchasers' prices		0		TIC <sup>A</sup>	THC <sup>A</sup> (Lab)	TIC <sup>RC</sup>	THC <sup>RC</sup> (Lab)	OFD <sup>A</sup>	OFD <sup>RC</sup>	TIC + TFD
Gross Value Added which is not directly distributed to households		0		NHVA <sup>A</sup>	0	NHVA <sup>RC</sup>	0	0	0	TNHVA
Total		0		S <sup>A</sup> (Lab)		S <sup>RC</sup> (Lab)				TS

Socio-economic impacts

Δ In Total Output

## METHODS

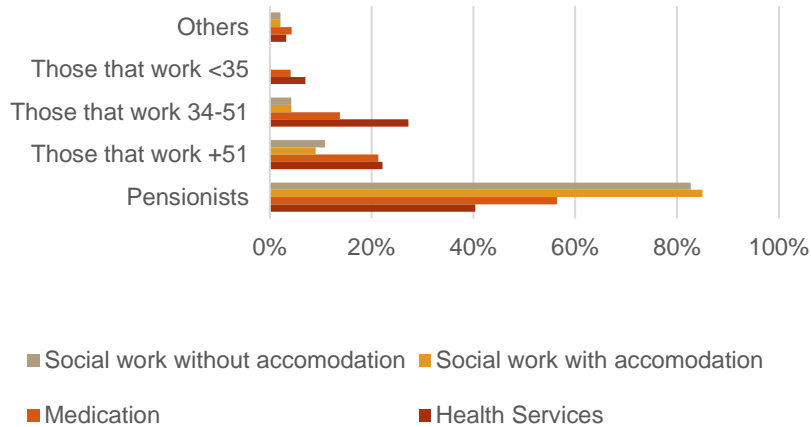
- There are several macroeconomic assumptions that are followed in this input-output model

Annual Rate	2017/2025	Source	After 2025 / 2050	Source
Household consumption	1.7%	National Statistical Office (INE)	2.0%	Portuguese Public Finance Council (CFP)
Public Expenditures	1.5%	INE	1.5%	CFP
Investment	3.5%	INE	1.2%	CFP
Exports	3.2%	INE	2.2%	CFP
Tourism expenditures	3.8%	INE	2.0%	Own assumption
Labor Productivity	0.3%	INE	2.1%	CFP

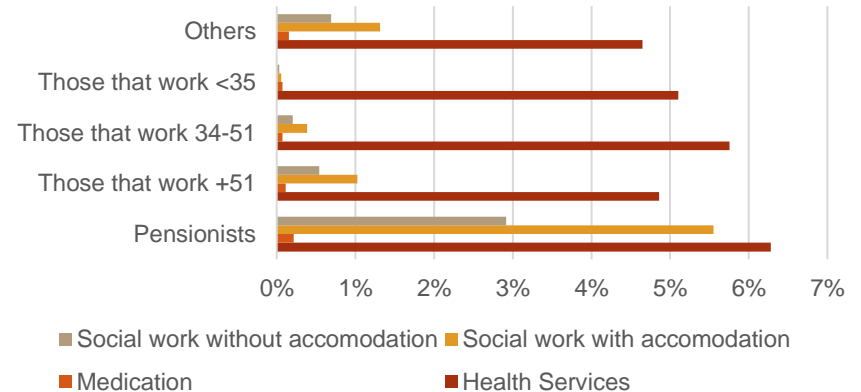
# METHODS

- How (monetary) health expenditures depend on age

**Weight of each age group in the total expenditure**



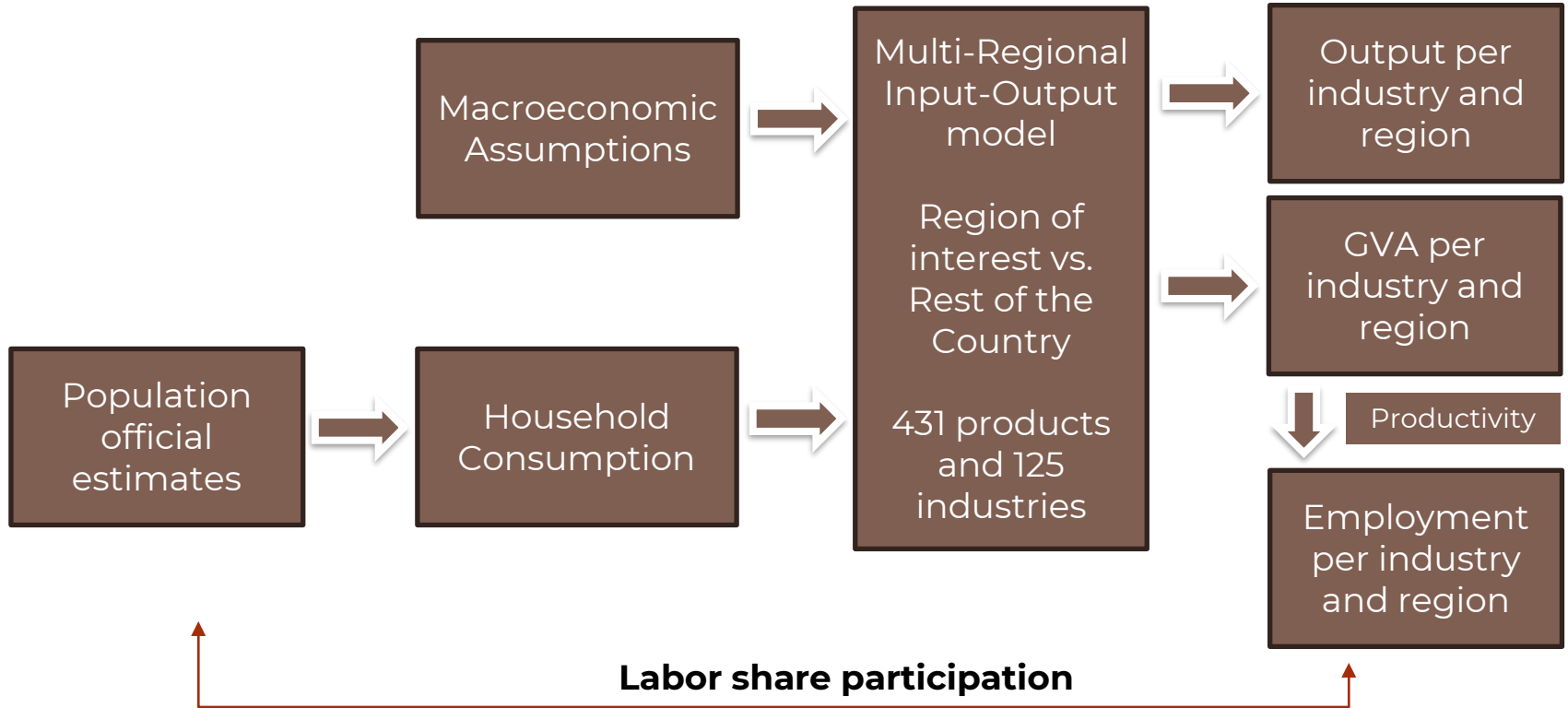
**Weight of each expenditure in the total expenditures of each households group**



## RESULTS

- The application of these assumptions tells us that some scenarios are not possible due to the lack of people to work in the Portuguese economy
  - Ageing and economic growth imply net positive migrations
  - We assume an increase in labor share participation of the group 65-74 similar to the “aging report”

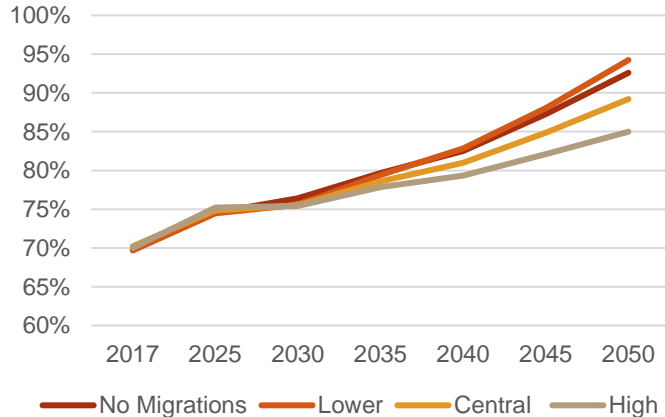
## RESULTS



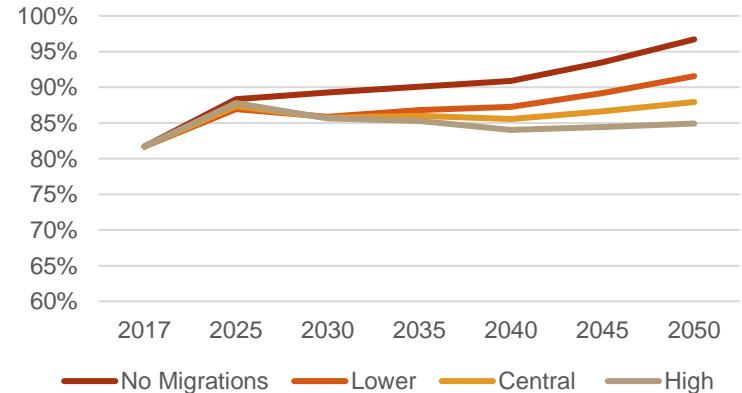
# RESULTS

- When happening simultaneously, aging and economic growth imply net positive migrations

### Labor share in Centro region

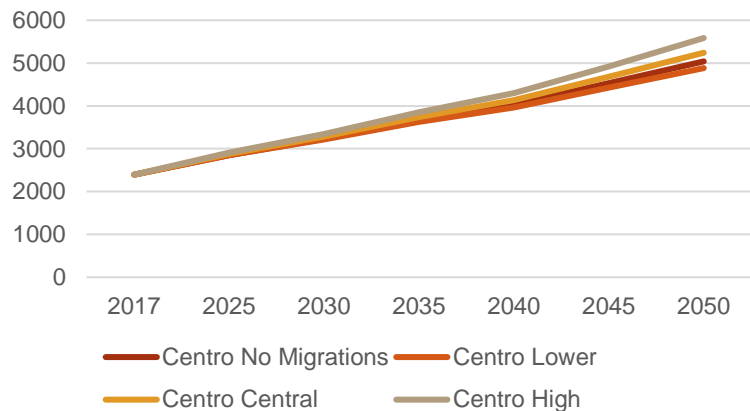


### Labor share in LMA

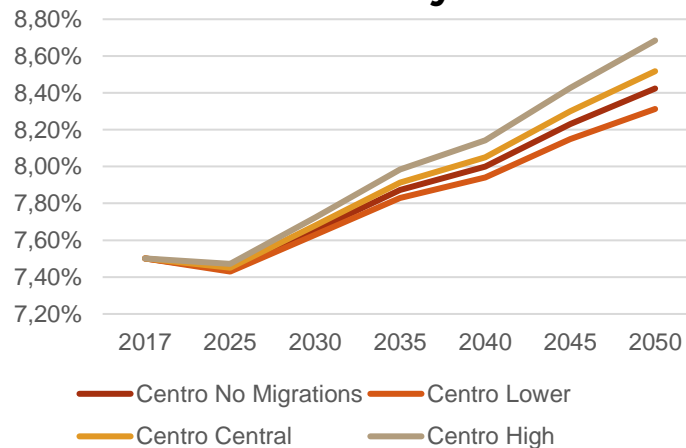


- The higher the migration and the population, the more the GDP impact and the higher the weight of the sector in the region

**Centro region – GDP in real prices**



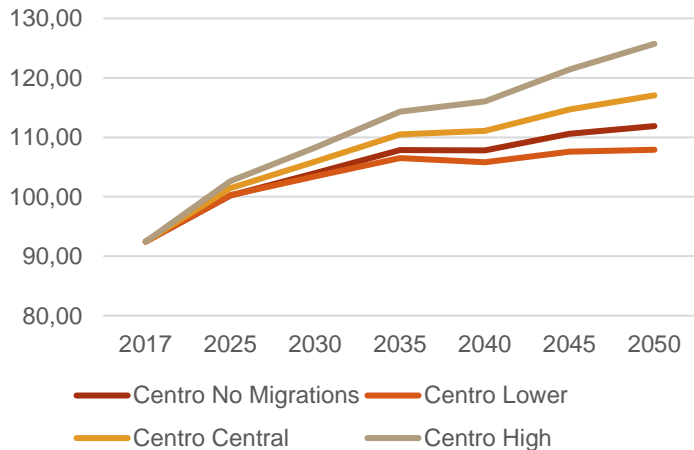
**Centro region – % in the regional economy**



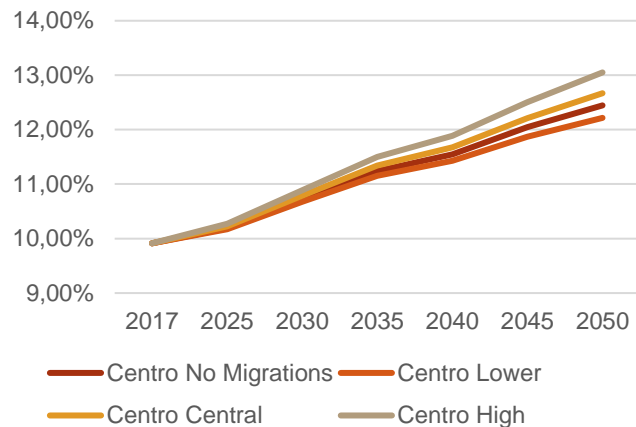
## • RESULTS | RELEVANCE OF THE HEALTH SECTOR •

- The higher the migration and the population, the more the need for health professionals and the higher the weight of the sector in the region

### Centro region – Employment in the sector

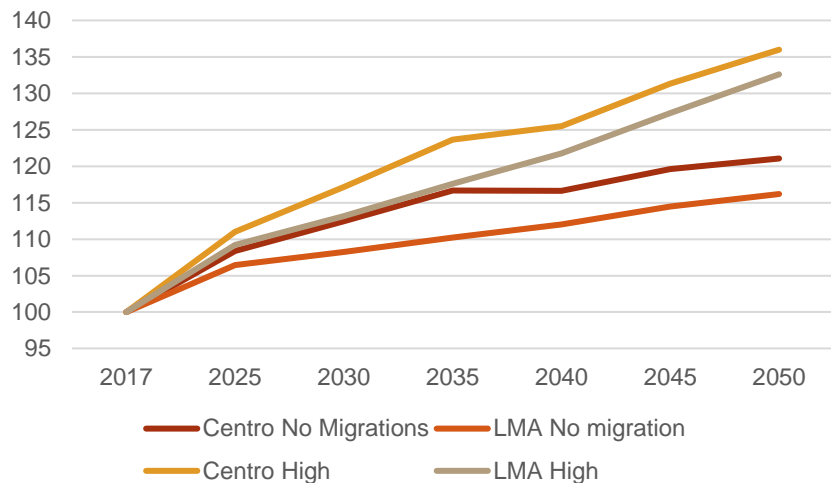


### Centro region – % in the regional employment

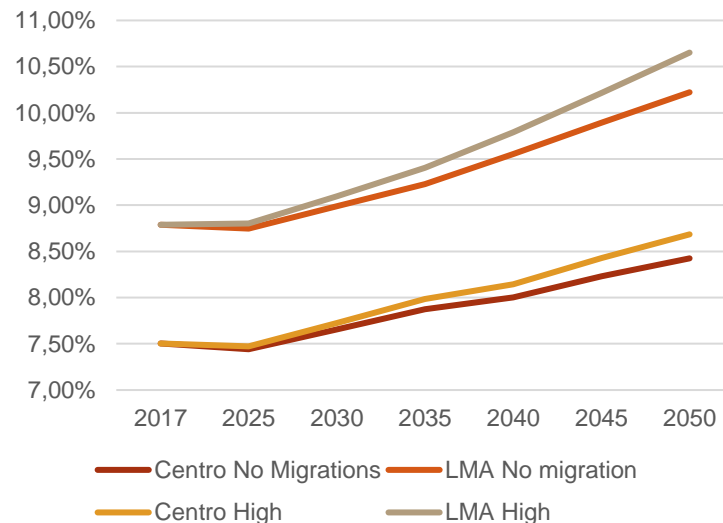


○ Comparison across regions

**Centro vs LMA – Employment evolution**



**Centro vs LMA – Share of employment in the regional economy**



## MAIN CONCLUSIONS

- Health requirements will increase as the population of the country increases and ages
- Health will be a pressured sector as its weight in regional economies will increase, being the relative increase due to migration higher in ageing regions.
- The main issue for the Portuguese economy will be the lack of labour (or growth) in a scenario where in-migration is limited
- The changes might look small (similar to the conclusion of the ageing report), but they imply a growing need for more professionals and jobs in the sector
- More migrations will imply more investment as the pace of ageing seems persistent across all the scenarios

**THANKS!**

*Any questions or  
suggestions?*

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