Pensions & Labor Supply

Population Economics – Lecture 6

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This block: Lectures 5–8

The fiscal side of population aging

L5 The generational economy & National Transfer Accounts

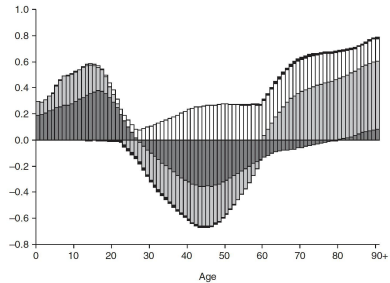
L6 Pensions & labor supply

L7 Aging & healthcare I: the red herring hypothesis

L8 Aging & healthcare II: steepening & forecasting

Where L5 left us

- L5 found the **lifecycle deficit**.
- When consumption exceeds labor income, the gap has to be financed.
- Past 60 that gap is closed mainly by **public transfers**.



So today we open that box

That is why **aging is a fiscal problem** — and the largest public transfer to the old is the **public pension**.

Learning outcomes

By the end of this lecture you should be able to:

- Decompose the pension expenditure ratio and assess the four policy levers.
- Read evidence on whether older workers' behaviour is already changing.
- Weigh the two routes to longer working lives — better jobs, or a higher statutory age.
- Discuss who bears the cost of indexing retirement to *average* life expectancy.

Readings

Part I — what determines pension spending

Bongaarts, J. (2004). Population aging and the rising cost of public pensions. *Population and Development Review*, 30(1), 1–23.

The accounting, the projections, and the four levers.

Part II — should people work longer?

Maestas, N., & Zissimopoulos, J. (2010). How longer work lives ease the crunch of population aging. *Journal of Economic Perspectives*, 24(1), 139–160.

Is the behaviour changing? Yes — the twentieth-century trend has already turned.

Maestas, N., Mullen, K. J., Powell, D., von Wachter, T., & Wenger, J. B. (2023). The value of working conditions in the United States and implications for the structure of wages. *American Economic Review*, 113(7), 2007–2047.

Could we make them *want* to stay more? Maybe — amenities might do the trick.

Vigezzi, S., & Strozza, C. (2024). Differences in mortality before retirement: The role of living arrangements and marital status in Denmark. *Demographic Research*, 50(20), 515–546.

Or do we *compel* them? We can — but with an eye to inequality.

Key questions (≈ 3 minutes)

- How does population composition affect public pension spending?
- What can be done to manage it?
- Which options exist to encourage longer working lives?
- In which ways do inequalities matter here?

PART I

What determines pension spending?

Aging pushes pension spending up — but policy-makers have four levers they might pull.

Bongaarts (2004)

The old-age dependency ratio

In a **pay-as-you-go** system today's workers pay today's pensions. So what we need to measure is the burden falling on them: **how many retirees must each worker support?**

A simple way is to count heads:

$$OADR = \frac{N_{65+}}{N_{15\text{–}64}}.$$

In words: how many people of pension age there are for each person of working age.

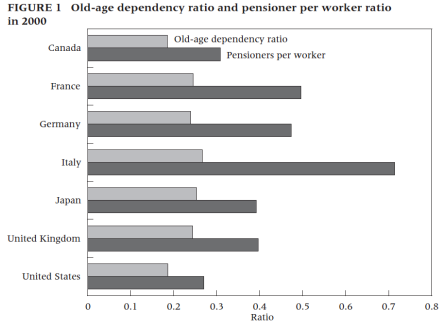
A warning about words

Bongaarts (2004) defines the **support ratio** as $1/OADR$. In L5, following Lee and Mason (2011), the support ratio weighted people by what they earn and consume. **Same name, different object.**

Question ($\approx$ 2 minutes)

Is *OADR* a good measure? Why?

Bongaarts (2004): OADR vs pensioners per worker



G7, 2000. The *OADR* (light) sits between **0.18** and **0.27** everywhere; pensioners per worker (dark) runs **0.27** in the US to **0.71** in Italy — **more than double** the *OADR* in France and Italy.

The *OADR* is flawed for two reasons:

- **Problem 1**: pensioners $\neq$ 65+.
- **Problem 2**: workers $\neq$ 15–64.

Bongaarts (2004) (cont'd): fixing the numerator and the denominator

One correction factor for each problem:

$$PR = \frac{N_{\text{pensioners}}}{N_{65+}}, \qquad ER = \frac{N_{\text{employed}}}{N_{15\text{–}64}}.$$

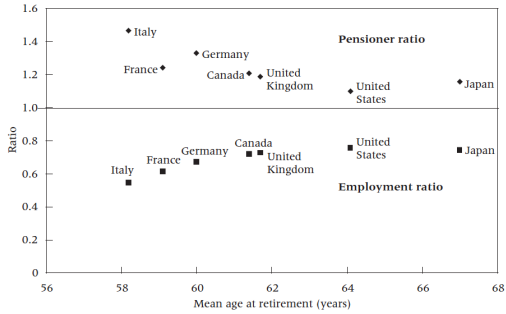
Put them together and the head counts cancel into something meaningful:

$$PWR = OADR \times \frac{PR}{ER} = \frac{N_{\text{pensioners}}}{N_{\text{employed}}}.$$

- **Pensioners per worker** is a better object: how many people draw a pension for each person paying for it.
- $PR > 1$ everywhere, $ER < 1$ everywhere — so PWR is always *worse* than the $OADR$ suggests. **That is the gap between the two bars on the last slide.**

Bongaarts (2004) (cont'd): both ratios move with the retirement age

FIGURE 2 Relationship between pensioner and employment ratios and mean age at retirement in 2000



NOTE: The pensioner ratio equals the ratio of pensioners to the population aged 65 years and older. The employment ratio equals the number of employed persons divided by the population aged 15–64. The mean age at retirement is estimated with the method proposed by Latulippe (1996).

Later retirement raises *ER* and lowers *PR*, so it improves *PWR* **twice over**. Italy retires at 58 (*PR* 1.47, *ER* 0.55); Japan at 67 (*PR* 1.16, *ER* 0.74).

Question ($\approx$ 2 minutes)

What are the pros and cons of *PWR* compared to *OADR*?

The pension expenditure ratio

PWR still counts *people*. What has to be financed is **money** — so one last step gives the measure we are really after:

$$PER \;=\; \frac{\text{public pension spending}}{\text{pre-tax earnings of workers}} \;=\; \underbrace{BR}_{\text{generosity}} \times \underbrace{PWR}_{\text{demography + behaviour}}$$

where the **benefit ratio** is the average pension per pensioner divided by average earnings per worker.

In full:

$$\boxed{PER \;=\; BR \times OADR \times \frac{PR}{ER}.}$$

Takeaway

Any policy that changes *PER* must operate through at least one of these four terms.

Bongaarts (2004) (cont'd): the numbers, seven countries in 2000

TABLE 1 Estimates of public pension expenditure, benefit, old-age dependency, pensioner, employment, and pensioner per worker ratios in 2000

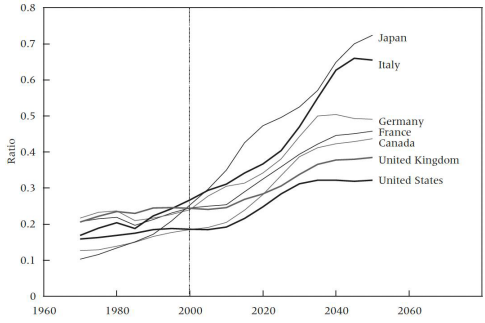
	Public pension expenditure ratio PER	Benefit ratio BR	Old-age dependency ratio ODR	Pensioner ratio PR	Employ-ment ratio ER	Pensioner per worker ratio PWR
United Kingdom	0.08	0.20	0.24	1.19	0.73	0.40
United States	0.08	0.31	0.19	1.10	0.76	0.27
Canada	0.10	0.33	0.18	1.21	0.72	0.31
Japan	0.14	0.36	**0.25**	1.16	0.74	0.39
Germany	**0.24**	**0.51**	0.24	**1.33**	**0.68**	**0.48**
France	**0.29**	**0.58**	**0.24**	**1.25**	**0.61**	**0.50**
Italy	**0.35**	**0.49**	**0.27**	**1.47**	**0.55**	**0.71**

Question ($\approx$ 3 minutes)

The two circled columns are the first object we defined today, the *OADR*, and the last, the *PER*. Compare them — what do you notice, and what does it imply?

Projections to 2050: OADR

FIGURE 4 Old-age dependency ratio, estimates 1970–2000 and projections 2000–2050

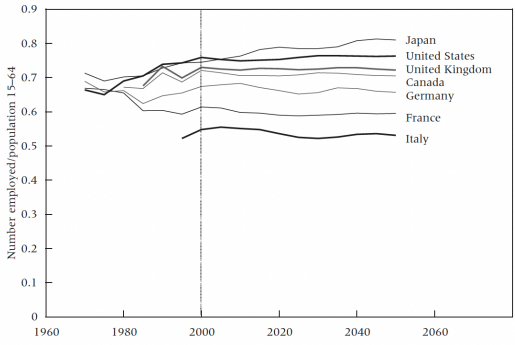


NOTE: The old-age dependency ratio equals the ratio of the population aged 65 years and older to the population aged 15–64.
SOURCE: UN (2003).

The ageing is not really a forecast: everyone who will be 65 in 2050 has already been born.

Projections to 2050: ER

FIGURE 5 Employment ratios, estimates 1970–2000 and projections 2000–2050

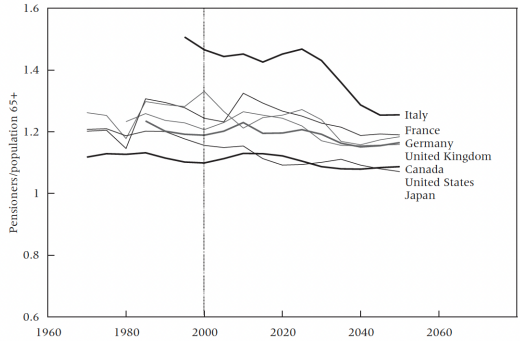


SOURCE: Up to 2000 OECD (see Appendix); 2000–50 see text.

Employment is assumed to stay roughly where each country already is.

Projections to 2050: PR

FIGURE 6 Pensioner ratio, estimates 1970–2000 and projections 2000–2050

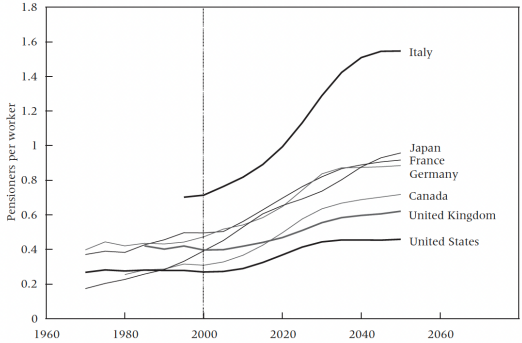


SOURCE: Up to 2000 OECD (see Appendix): 2000–50 see text.

Retirement ages drift up a little, so this is the one term moving in our favour.

Projections to 2050: PWR

FIGURE 7 Pensioners per worker, estimates 1970–2000 and projections 2000–2050

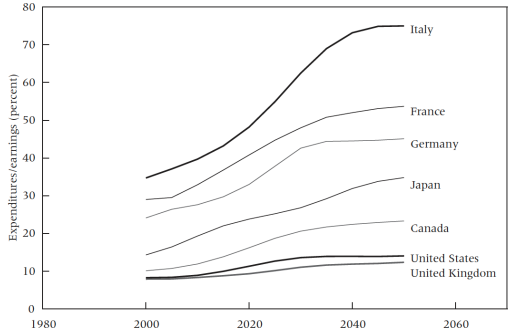


SOURCE: Calculated from estimates shown in Figures 4, 5, and 6.

Three of the four terms: $PWR = OADR \times PR/ER$, so this is the last three slides combined. The burden roughly doubles almost everywhere, and Italy ends the period with **more pensioners than workers**.

Projections to 2050: PER

FIGURE 8 Public pension expenditures as a percent of earnings, baseline projections 2000–2050

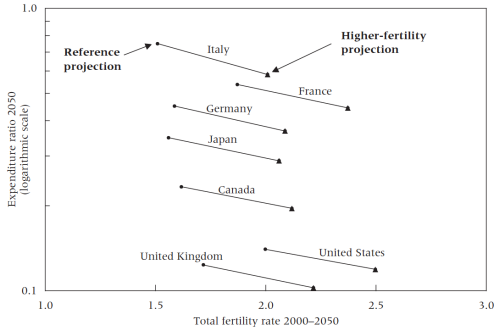


SOURCE: Calculated from estimates in Figure 7. Estimates for 2000 from OECD (2001b) and Dang et al. (2001). See Appendix.

Now all four: $PER = BR \times PWR$, the last slide times the benefit ratio — which gets no figure of its own because the projection **holds it fixed**. Three terms moving, one frozen by assumption, so read it as *what happens if nothing is done*.

Policy options: encourage higher fertility

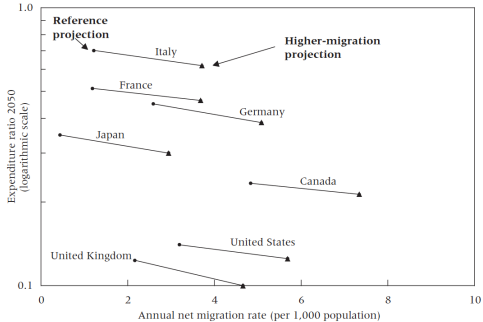
FIGURE 9 Effect of an increase in the total fertility rate by 0.5 births per woman (2000–2050) on the pension expenditure ratio in 2050: Comparison of reference and higher-fertility projections



More births eventually mean more workers — but only after twenty years as dependants, and they draw pensions of their own at the end of it.

Policy options: permit more immigration

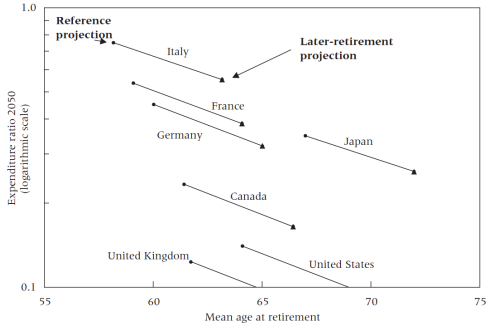
FIGURE 10 Effect of an increase in the annual net migration rate by 2.5 per 1,000 population (2000–2050) on the pension expenditure ratio in 2050: Comparison of reference and higher-migration projections



Migrants arrive as workers, so this one helps sooner. It still barely moves 2050, and for the same reason as fertility: **migrants age too**.

Policy options: raise the age at retirement

FIGURE 11 Effect of an increase in the retirement age by 5 years (2000–2050) on the expenditure ratio in 2050: Comparison of reference and later-retirement projections



The only lever that pulls both ways at once: fewer years drawing a pension, more years paying in.

Policy options: what each lever would have to deliver

TABLE 2 Change required in demographic, labor force, retirement, and benefit variables to reduce pension expenditures by 10 percent in 2050 (G7 average)

Policy variable	Change required
Fertility (2000–2050)	Increase of 0.27 births per woman
Net migration rate (2000–2050)	Increase of 1.8 net migrants per 1,000 population
Employment ratio (2050)	Increase of 9 percent[a]
Mean age at retirement (2050)	Increase of 1.6 years
Pension benefits (2050)	Reduction of 10 percent

Question ($\approx$ 3 minutes)

What is your interpretation of this table?

PART II

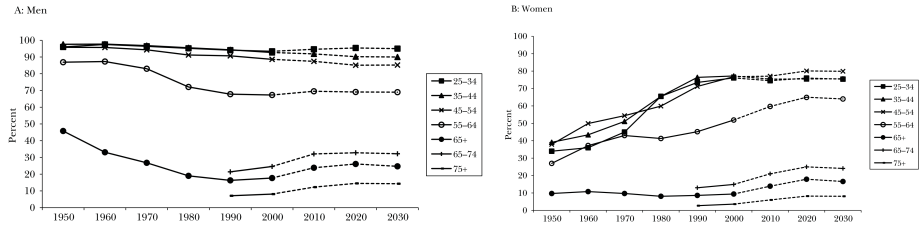
Can people work longer — and is it *fair* to ask?

$$PER \;=\; BR \times OADR \times \frac{\mathbf{PR}}{\mathbf{ER}}$$

Part I identified the levers. Part II turns to the empirical evidence on the two that mean working longer.

Maestas & Zissimopoulos (2010) · Maestas et al. (2023) · Vigezzi & Strozza (2024)

Maestas and Zissimopoulos (2010): ER is already moving



Labor force participation by age; dashed are BLS projections. Men 65+ fell for four decades and **turned upward after 1990**; women rose at every age.

- **Not more entry — less exit.** Participation among *younger* men actually fell; what changed is that older men stopped retiring so early. For women both margins moved at once.
- **Education does most of the work.** Each cohort arrived better schooled, and the better schooled work longer — paid more, more fulfilling work, lighter physical demands.
- **Couples retire together.** Both spouses working at 51–56 rose from 53% to 60% between 1992 and 2004; a quarter of the men's rise is attributed to their wives staying on.
- **Pension reform came second.** Only about a sixth of the rise among men 65–67 is attributed to Social Security changes — **the reversal was not mostly a policy achievement**.

Maestas et al. (2023): the jobs older workers already hold

	Age group			
	25–34 (9)	35–49 (10)	50–61 (11)	62+ (12)
Mean hours per week	39.40 (9.17)	40.42 (10.17)	39.73 (9.22)	36.49 (12.02)
Mean wage (in 2015 $)	30.68 (44.68)	29.17 (33.30)	30.50 (33.59)	33.28 (33.16)
log wage differential	−0.143 (0.086)	−0.081 (0.065)	−0.038 (0.060)	
% with each working condition				
Set own schedule	57.0	54.2	56.5	64.6
Telecommute	33.2	37.2	35.7	44.6
Heavy physical activity	16.4	22.0	18.4	13.1
Moderate physical activity	43.8	32.7	38.6	46.2
Mostly sitting	39.9	45.3	43.0	40.7
Relaxed pace	23.5	29.0	32.4	42.3
Choose how do work	90.9	85.2	85.7	80.7
No paid time off (PTO)	14.0	13.0	13.9	22.4
1–14 PTO days	29.8	26.8	22.9	21.5
15+ PTO days	56.2	60.2	63.2	56.1
Team-based, evaluated as team	16.1	21.4	18.3	14.9
Team-based, evaluated on own	57.3	45.9	45.7	49.3
Work by self	26.6	32.7	35.9	35.7
Training opportunities	78.5	70.2	65.6	59.4
Frequent opp. positive impact	30.6	37.4	34.8	33.0
Observations	285	525	676	252

- **Their jobs are gentler.** More relaxed pace, own schedule, telecommuting, less physical work and hours.
- **Training and autonomy fall.**
- **Careful: selection.** A cross-section of the *employed*.

Question ($\approx$ 2 minutes)

Any ideas on how to get people to work longer, from this?

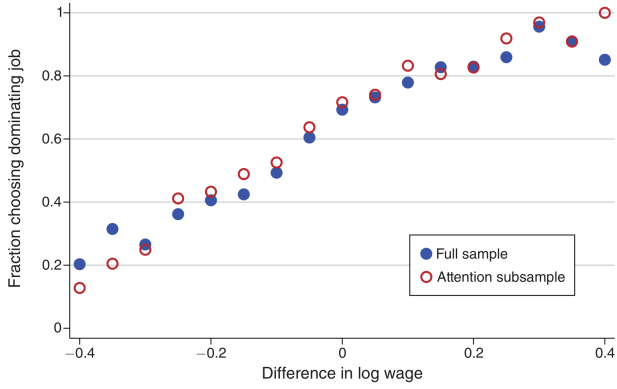
Maestas et al. (2023) (cont'd): how do you price a relaxed pace?

No market price exists, so they build one. Each respondent describes **their own job**; it comes back twice, with exactly **two attributes** and the **pay** changed, and everything else stated to be identical.

	Job A	Job B
Hours	Part-Time - 20 hours per week	Part-Time - 20 hours per week
Control Over Hours	Set your own schedule	Set your own schedule
Option to Telecommute	No	No
Physical Demands	Moderate physical activity	Heavy physical activity
Pace	Relaxed	Relaxed
Independence	You can choose how you do your own work	Your tasks and procedures are well-defined
Paid Time Off (Vacation and Sick Leave)	None	None
Working with Others	Mainly work by yourself	Mainly work by yourself
Training	You have the skills for this job and there are opportunities to gain valuable new skills	You have the skills for this job and there are opportunities to gain valuable new skills
Impact on Society	Occasional opportunities to make a positive impact on your community or society	Occasional opportunities to make a positive impact on your community or society
Pay	$18.50 per hour ($370 per week)	$19.50 per hour ($390 per week)

	Strongly Prefer Job A	Prefer Job A	Prefer Job B	Strongly Prefer Job B
Which job do you prefer?	○	◉	○	○

Maestas et al. (2023) (cont'd): people do trade



The curve slopes up, as it must. Look at the far left: that job pays **40% less, and a fifth of respondents still take it**.

Maestas et al. (2023) (cont'd): and the old value them most

Table 7—Estimates of Willingness to Pay, by Age Group

	Age group			
	25–34 (1)	35–49 (2)	50–61 (3)	62+ (4)
Set own schedule	0.071	0.092	0.088	0.147
[Schedule set by manager]	(0.012)	(0.012)	(0.011)	(0.024)
	0.005	0.044	0.027	
Telecommute	0.034	0.045	0.043	0.062
[No telecommuting]	(0.013)	(0.014)	(0.010)	(0.022)
	0.272	0.495	0.422	
Moderate physical activity	0.088	0.134	0.183	0.305
[Heavy physical activity]	(0.018)	(0.017)	(0.015)	(0.038)
	<0.001	<0.001	0.003	
Sitting	0.071	0.115	0.141	0.241
[Heavy physical activity]	(0.020)	(0.016)	(0.016)	(0.037)
	<0.001	0.002	0.013	
Relaxed	0.047	0.030	0.051	0.079
[Fast pace]	(0.014)	(0.013)	(0.011)	(0.024)
	0.234	0.069	0.276	
Choose how do work	0.042	0.017	0.051	0.120
[Tasks well defined]	(0.015)	(0.010)	(0.011)	(0.025)
	0.007	<0.001	0.011	
10 days PTO	0.140	0.176	0.163	0.190
[No days PTO]	(0.017)	(0.015)	(0.016)	(0.036)
	0.216	0.727	0.496	
20 days PTO	0.196	0.239	0.239	0.277
[No days PTO]	(0.017)	(0.018)	(0.019)	(0.032)
	0.026	0.302	0.310	
Team-based, evaluate own	0.014	0.068	0.095	0.140
[Team-based, evaluate team]	(0.020)	(0.017)	(0.016)	(0.030)
	<0.001	0.036	0.186	
Work by self	0.038	0.101	0.095	0.179
[Team-based, evaluate team]	(0.019)	(0.016)	(0.018)	(0.034)
	<0.001	0.040	0.029	
Training opportunities	0.074	0.044	0.047	0.056
[Already have skills]	(0.013)	(0.013)	(0.009)	(0.026)
	0.547	0.682	0.753	
Frequent opp. to serve	0.043	0.041	0.024	0.038
[Occasional opp. to serve]	(0.013)	(0.013)	(0.011)	(0.025)
	0.845	0.913	0.612	
Best job	0.475	0.535	0.589	0.745
[Worst job]	(0.031)	(0.027)	(0.026)	(0.038)
	<0.001	<0.001	0.001	
Observations	5,700	10,500	13,520	5,040

- Every amenity is worth more at 62+.
- The exception is training.

Takeaway

Job design could be the cheaper instrument: the whole bundle is worth **three-quarters of a wage** at 62+, and few redesigns cost that much.

Question ($\approx$ 5 minutes)

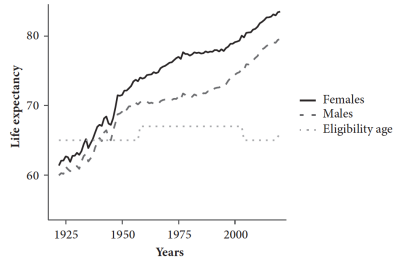
(a) What are the limitations of this paper?

(b) Why might older workers value amenities so much?

The other way to move *PR*

Maestas et al. (2023) price the **carrot**. The **stick** is cheaper, faster, and the one governments actually use: **move the eligibility age and the choice disappears.**

- Danish life expectancy rose, eligibility age stayed flat. Every year of added life became a year of retirement.
- Denmark, and a growing number of other countries, now **index** the statutory age to life expectancy.
- Denmark targets **14.5 years of retirement for the average Dane**.
- **67** today, legislated to reach **70 by 2040**.

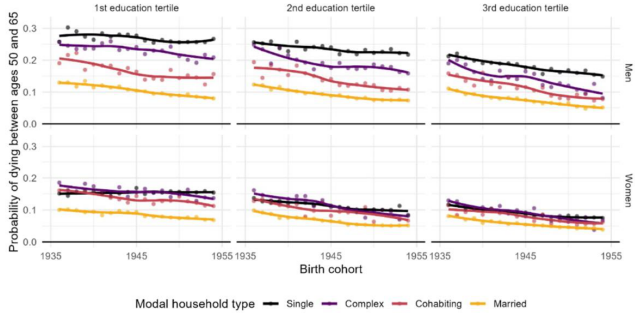


Question (≈ 3 minutes)

What do you make of indexing the retirement age to *average* life expectancy?

Vigezzi and Strozza (2024): nobody is the average Dane

Figure 2: Probability of dying between ages 50 and 65 by household type, length of education, and sex. Birth cohorts 1936–1954



Almost every line falls across cohorts.

The exception is top left: single men with the least education have barely moved in twenty birth cohorts.

More than a quarter die before 65, against about **one in twelve** married men with the same schooling.

So how would you build a fairer rule?

Question ($\approx$ 5 minutes)

How can a fair retirement scheme be designed to accommodate longevity differences?

Summary

Part I — what determines pension spending

1. The *OADR* is the wrong measure: pensioners are not the 65+, workers are not the 15–64.
2. Fix both and you get one identity, $PER = BR \times OADR \times PR/ER$. **Four terms, four levers.**

Part II — can people work longer, and is it fair to ask?

3. **It is already happening.** Employment at 65+ turned upward after 1990.
4. **The carrot.** Job design is a real retention instrument.
5. **The stick.** Indexing the retirement age to *average* life expectancy assumes everyone is the average Dane.

Back to the key questions

1. **How does composition affect pension spending?** Only through one term of $PER = BR \times OADR \times PR/ER$ — and it is the *smallest* of the three. Across the G7 the $OADR$ varies by a factor of **1.5**, PER by a factor of **four**. Institutions set the magnitude.

2. **What can be done to manage it?** Four terms, four levers, and each alone can cut projected 2050 spending by a tenth. But only **later retirement** is a change governments have actually legislated — and it is the one lever that moves **two** terms at once.

3. **Which options encourage longer working lives?** The **carrot** — job design, which older workers value enough to trade a large share of the wage for — or the **stick**, a higher statutory age. And the behaviour is *already* turning: employment at 65+ has risen since 1990.

4. **In which ways do inequalities matter?** Indexing to *average* life expectancy fixes the average years in retirement and lets the variance fall where it may. The least educated start work earlier and die earlier — they pay in over *more* years and draw out over *fewer*.