The causal effect of early retirement on medication use across sex and occupation: Evidence from Danish administrative data

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Why?

Challenges in the literature:

- ▶ Directionality, size, reverse causality
- ▶ Adequate measures of health

Common patterns:

- ▶ self-reported health based studies: positive effect[1]

- ▶ administrative data: decline in doctors' appointments and hospital utilization[2]

- ▶ mental health & medication use: mixed results[3]

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[1] e.g. Coe & Zamarro (2011), Eibich (2015), Shai (2018), Gorry, Gorry & Slavov (2018)

[2] Bíró & Elek (2018), Nielsen (2019), Frimmel & Pruckner (2020), Perdrix (2020), Hallberg, Johansson & Josephson (2015), Kuusi, Martikainen & Valkonen (2020)

[3] Coe & Zamarro (2011), Mazzonna & Peracci (2012), Kolodziej & García-Gómez (2019), Biró & Elek (2018), Hagen (2018), Perdrix (2020), Gorry et.al. (2018), Frimmel & Pruckner (2020)

How?

Registry data:

- ▶ large administrative data source
- ▶ specific health conditions
- ▶ monthly data

Approach:

- ▶ recent reform −> eligibility age enforced by law instead of (financial) incentives −> improved identifiability
- ▶ heterogeneity by occupation, sex, medication types
- ▶ improved IV technique for binary outcomes[4]


[4]g-estimation, Vansteelandt, Bowden, Babnezhad & Ghoetghebeur (2011)

Reform

Table 1: Ages at which Early Retirement Pension (ERP) is available according to date of birth.

Date of Birth	ERP age
< 1954	60
≥ 01-January-1954	60.5
≥ 01-July-1954	61
≥ 01-January-1955	61.5
≥ 01-July-1955	62
≥ 01-January-1956	62.5
≥ 01-July-1956	63
≥ 01-January-1959	63.5
≥ 01-July-1959	64
> 1963	computed in relation to life expectancy

Labour market attachment age 58-63
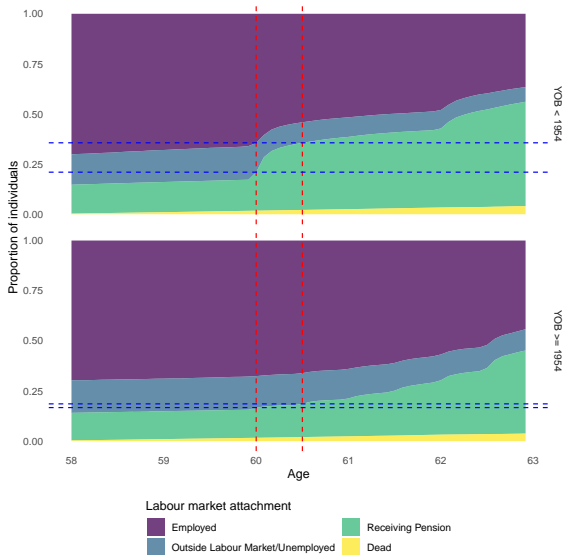
IV model
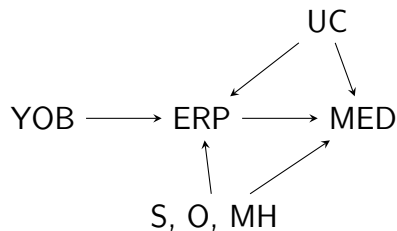
- ▶ ERP: retirement between age 60-60.5
- ▶ YOB: year of birth, pre-1954 (unaffected cohorts) or ≥ 1954 (affected cohorts)
- ▶ MED: medication use between age 60-60.5 (short-term) or 60-63 (long-term)
- ▶ MH: medication use between age 59.5-60, 0, ≤ 7, ≤ 31 or >31 daily defined doses a month
- ▶ S: sex (male/female)
- ▶ O: longest held occupation type between age 45-55.

IV model

$$P(\text{MED}_i = 1) = logit^{-1}(\beta_0 + \beta_1\text{ERP}_i + \beta_2\text{S}_i + \beta_3\text{O}_i + \beta_4\text{MH}_i + u_i)$$
$$P(\text{ERP}_i = 1) = logit^{-1}(\gamma_0 + \gamma_1\text{YOB}_i + \gamma_2\text{S}_i + \gamma_3\text{O}_i + \gamma_4\text{MH}_i + \nu_i)$$

Medication types

Painkillers[5]

- ▶ musculosceletal disorders

Medication to reduce blood pressure[6]

- ▶ job strain
- ▶ control over work

Antidepressants and medications for anxiety and sleep disorders[7]

- ▶ stress
- ▶ low physical activity
- ▶ shift work and insomnia

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[5]M02AA, N02A, N02B (antiinflammatory preparations, non-steroids for topical use, opioids, other analgesics and antipyretics) N02BE01, N02BE05, N02BA01, N02BA51, N02BB51 and 200 mg M01AE01 are not included

[6]C02, C03, C07, C08, C09 (antihypertensives, diuretics, beta blocking agents, calcium channel blockers, agents acting on the renin-angiotensin system)

[7]N05B N05C, N06A, N06C (anxiolytics, hypnotics and sedatives, antidepressants, psycholeptics and psychoanaleptics in combination)

Results

Percentage point change in medication use if all would have retired
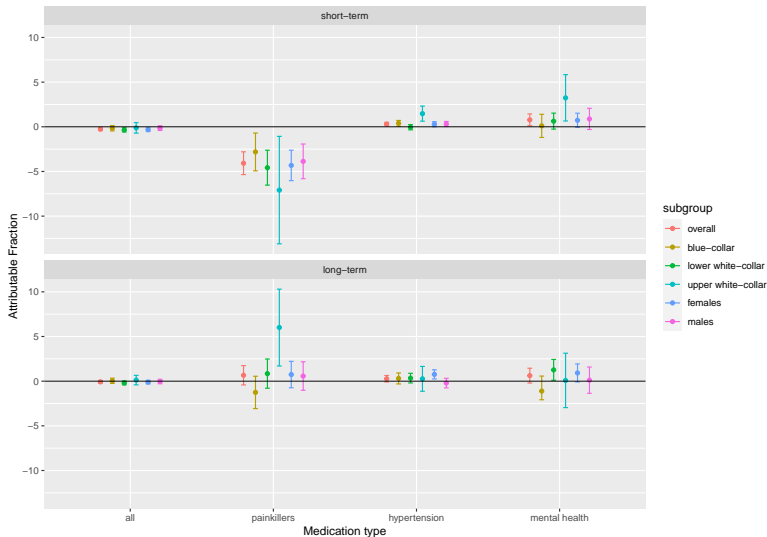
Discussion

- Upper white-collar, income/wealth effects

- No long-term effects?

- Effects on amount of medication use (IV models for count/zero-inflated outcomes)

- Different types of medication, split up mental health medication?

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Descriptives

		Year of birth					
		<1954 (N = 222,269)			**≥1954 (N = 231,722)**		
		All	**ERP = yes**	**ERP = no**	**All**	**ERP = yes**	**ERP = no**
S	male	0.51	0.39	0.54	0.51	0.45	0.51
	female	0.49	0.61	0.46	0.49	0.55	0.49
O	blue-collar	0.27	0.35	0.25	0.25	0.13	0.25
	lower white-collar	0.41	0.46	0.39	0.42	0.43	0.41
	upper white-collar	0.22	0.12	0.25	0.20	0.29	0.20
	no occupation	0.10	0.07	0.10	0.14	0.15	0.14
MH	0 DDD/month	0.30	0.26	0.31	0.30	0.22	0.30
	≤ 7 DDD/month	0.14	0.12	0.14	0.14	0.12	0.14
	≤ 31 DDD/month	0.19	0.19	0.19	0.19	0.19	0.19
	> 31 DDD/month	0.37	0.43	0.36	0.37	0.47	0.37
MH type	none	0.30	0.25	0.31	0.30	0.22	0.30
	hypertension	0.32	0.36	0.31	0.31	0.36	0.31
	painkillers	0.02	0.03	0.02	0.03	0.05	0.03
	mental	0.06	0.07	0.05	0.05	0.09	0.05
	other	0.30	0.29	0.30	0.31	0.29	0.31
ERP	no	0.80	0	1	0.98	1	0
	yes	0.21	1	0	0.02	0	1

Medication frequencies

Table 2: Most frequently used types of prescription medication ($\leq 15\%$) in the period 2008-2017 among individuals aged 58-63 that have used prescription medication at least once.

medication type (ATC)	percentage	subtypes ($\leq 10\%$)
antiinfectives for systemic use (J01)	68%	penicillins
antiinflammatory and antirheumatic products (M01)	46%	ibuprofen
analgesics (N02)	45%	paracetamol, tramadol
agents acting on the renin-angiotensin system (C09)	32%	ACE inhibitors (plain), Angiotensin II receptor blockers (plain)
lipid modifying agents (C10)	30%	HMG C0A reductase inhibitors
drugs for acid related disorders (A02)	29%	proton pump inhibitors
opthalmologicals (S01)	28%	antibiotics
corticosteroids, dermatological preparations (D07)	28%	corticosteroids, (potent, group III)
psycholeptics (N05)	21%	benzodiazepine derivatives + related drugs
antithrombotic agents (B01)	21%	platelet aggregation inhibitors
diuretics (C03)	20%	thiazides and potassium in combination
calcium channel blockers (C08)	19%	dihydropyridine derivatives
antifungals for dermatological use (D01)	17%	imidazole and triazole derivatives
beta blocking agents (C07)	17%	beta blocking agents (selective)
psychoanaleptics (N06)	17%	selective serotonin reuptake inhibitors
drugs for obstructive airway diseases (R03)	16%	selective beta-2-adrenoreceptor agonists
cough and cold preparations (R05)	16%	-
sex hormones and modulators of the genital system (G03)	15%	estradiol