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?
- 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)

Why?

Medication data:

- large administrative data source
- specific health conditions

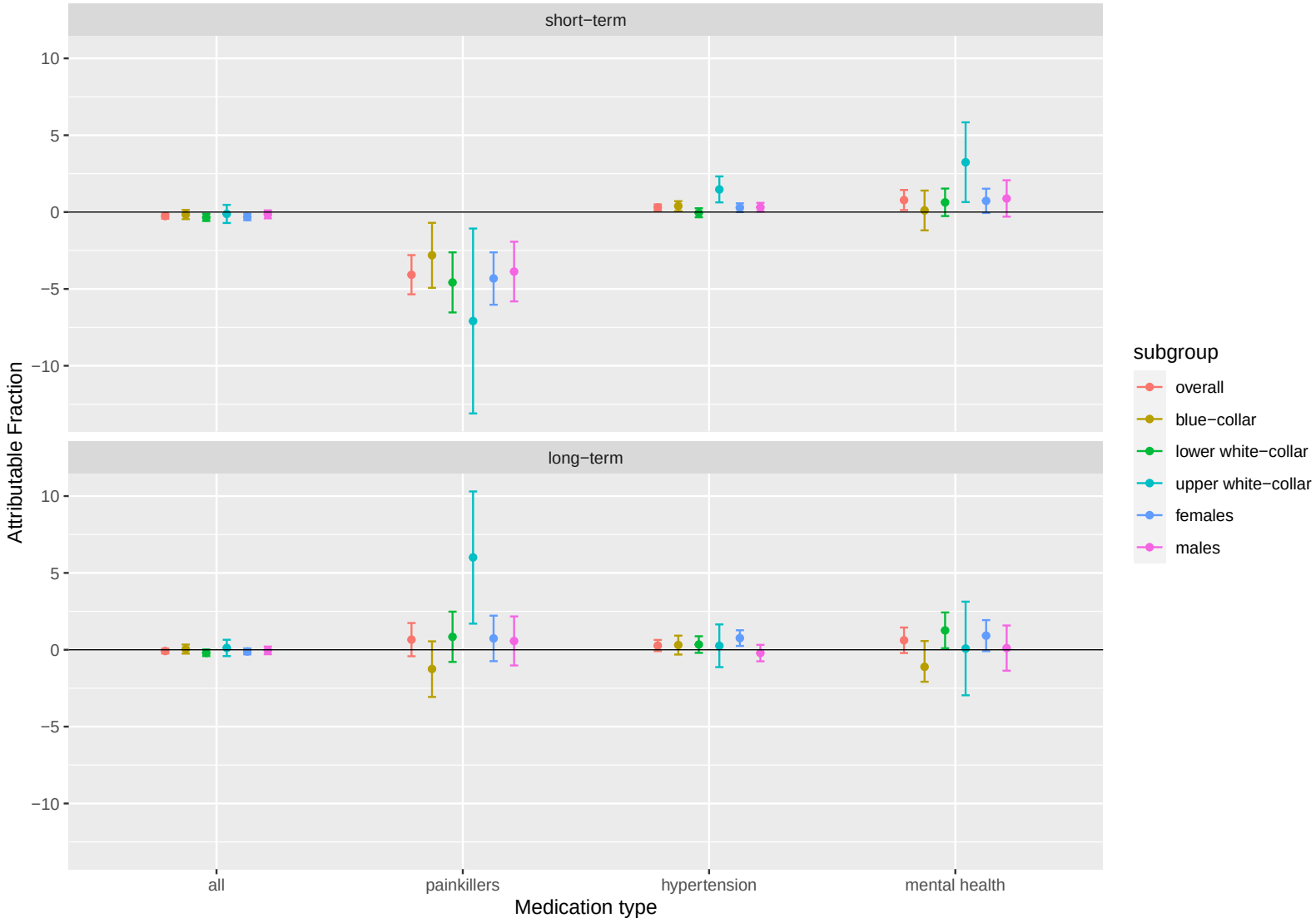
Approach:

- Recent data –> recent reform –> improved identifiability
- Monthly data
- Heterogeneity by occupation at age 45-55 & sex
- Improved IV technique for binary outcomes[4]

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

Results

Percentage point change in medication use if all would have retired

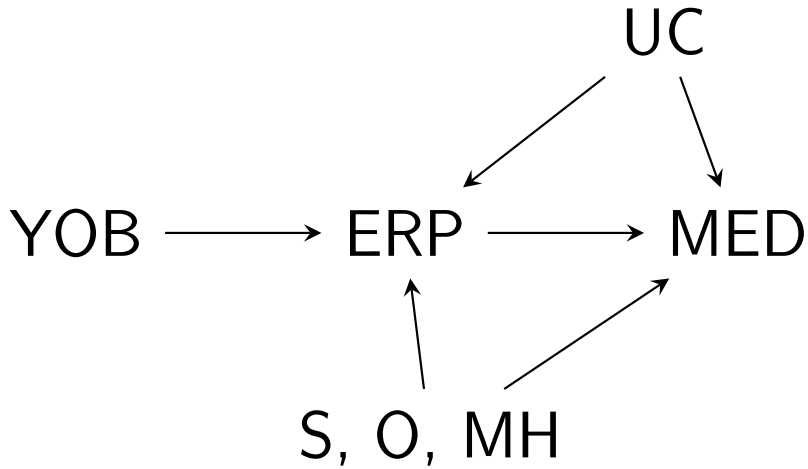


Design: reform

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

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

Design: IV model



$$P(\text{MED}_i = 1) = \mathit{logit}^{-1}(\beta_0 + \beta_1 \text{ERP}_i + \beta_2 \text{S}_i + \beta_3 \text{O}_i + \beta_4 \text{MH}_i + u_i)$$

$$P(\text{ERP}_i = 1) = \mathit{logit}^{-1}(\gamma_0 + \gamma_1 \text{YOB}_i + \gamma_2 \text{S}_i + \gamma_3 \text{O}_i + \gamma_4 \text{MH}_i + \nu_i)$$

Design: variables

- ERP: Early retirement pension, indicator of retirement between age 60-60.5
- YOB: year of birth, either pre-1954 (unaffected cohorts) or $\geq$ 1954 (affected cohorts)
- MED: medication use, indicator of medication use between age 60-60.5 (short-term) or 60-63 (long-term)
- MH: medication history, categorical medication use between age 59.5-60, 0, $\leq$7, $\leq$31 or $>$31 daily defined doses a month
- S: sex (male/female)
- O: longest held occupation type between age 45-55.

Design: medication types

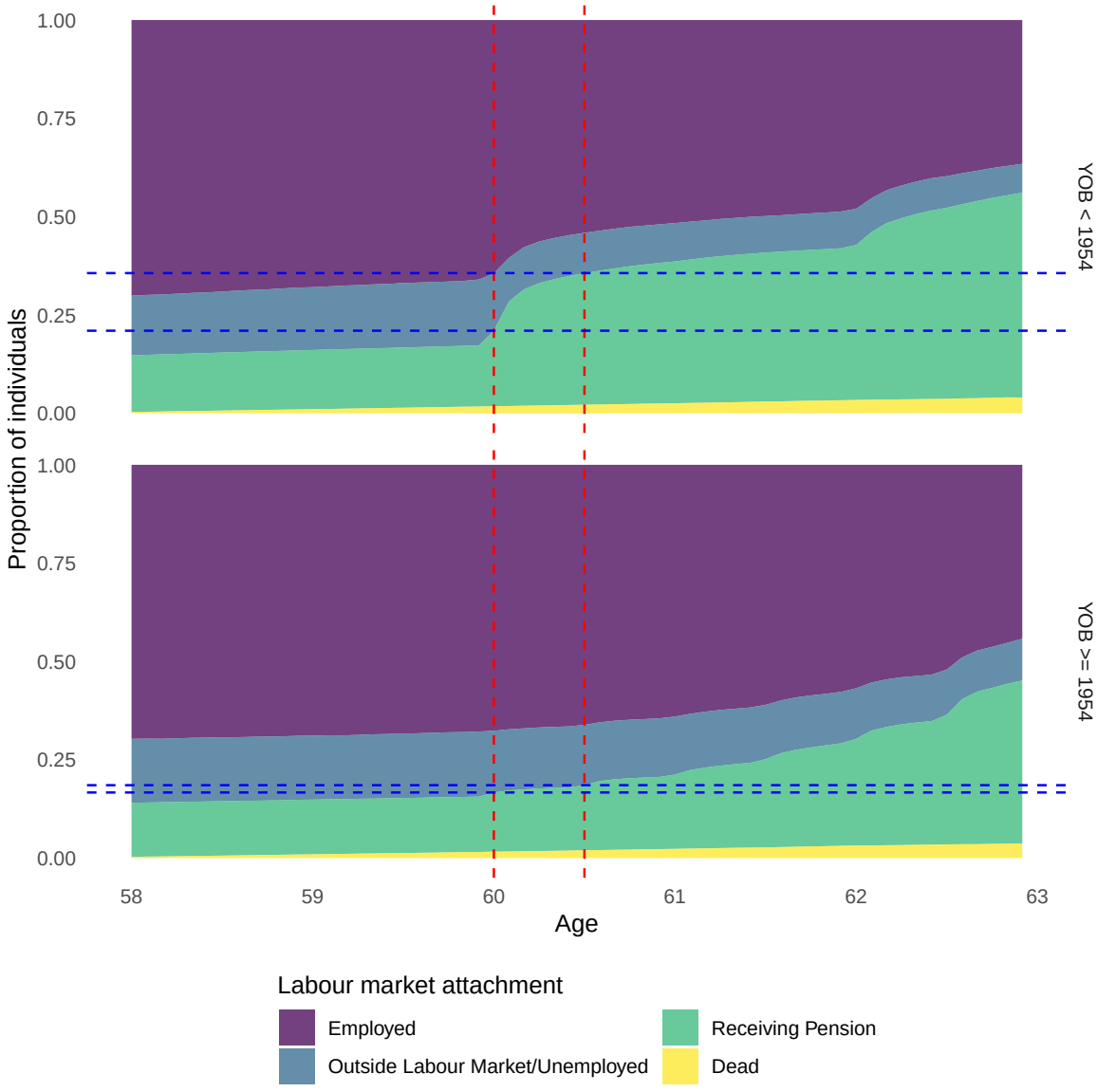
Painkillers: M02AA, N02A, N02B (antiinflammatory preparations, non-steroids for topical use, opioids, other analgesics and antipyretics)[5]

Medication to reduce blood pressure: C02, C03, C07, C08, C09 (antihypertensives, diuretics, beta blocking agents, calcium channel blockers, agents acting on the renin-angiotensin system)

Antidepressants and medications for anxiety and sleep disorders: N05B N05C, N06A, N06C (anxiolytics, hypnotics and sedatives, antidepressants, psycholeptics and psychoanaleptics in combination)

[5] N02BE01, N02BE05, N02BA01, N02BA51, N02BB51 and 200 mg M01AE01 are not included

Design: labour market attachment

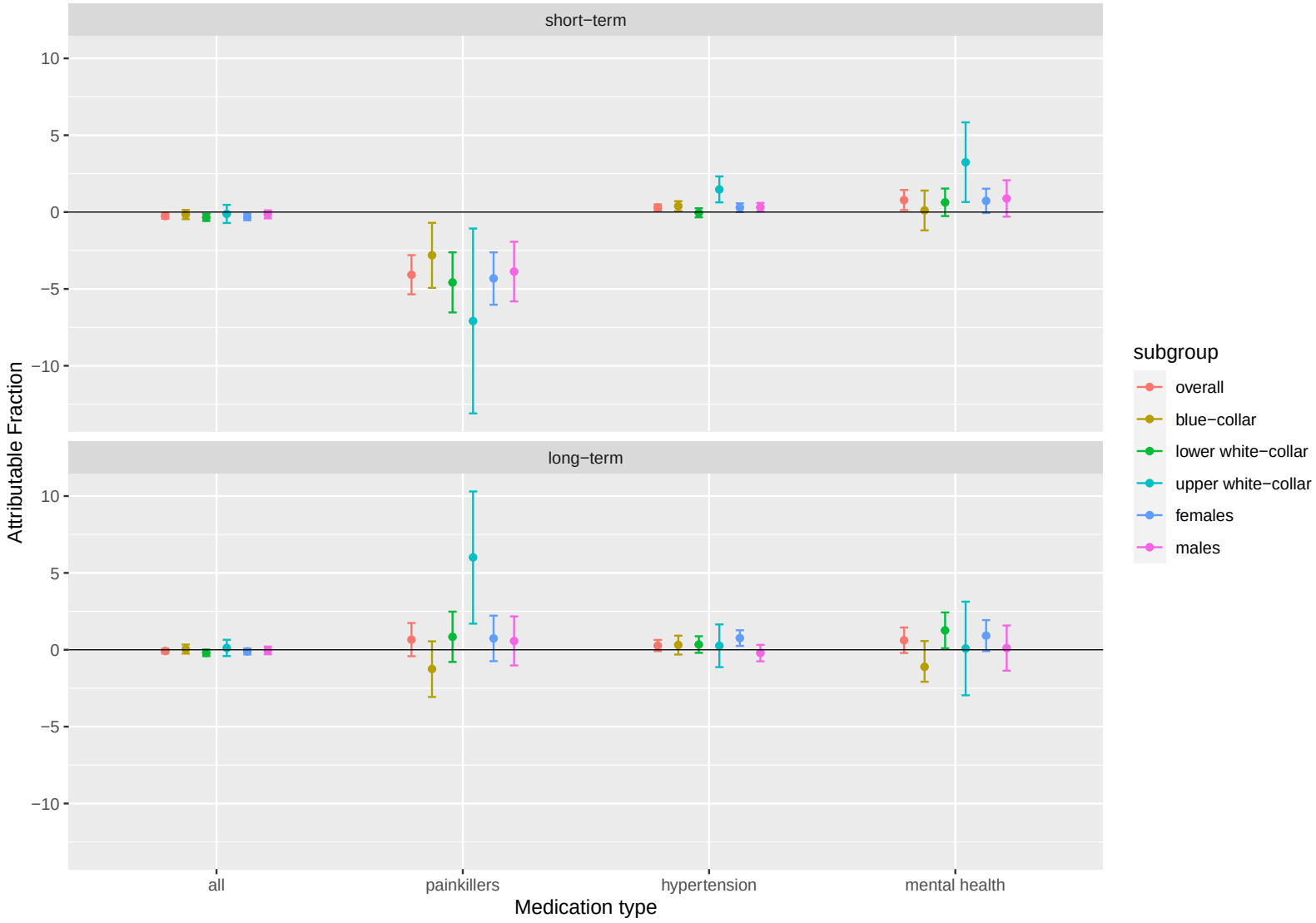


IV assumptions

- IV associated with exposure
- Exclusion restriction
- Randomization assumption

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