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The Effect of Involuntary Retirement on Healthcare Use and Health Status

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ABSTRACT

We analyse the causal effect of involuntary retirement on detailed indicators of healthcare use and health status. Our identification strategy is based on a pension reform in Hungary which forced public sector workers above the statutory retirement age to full time retirement. Using rich administrative data, we find that on the three-year horizon, involuntary retirement decreases the number of primary care doctor visits, the consumption of antiinfectives for systemic use and drugs of the respiratory system, and the non-zero spending on antiinfectives, the drugs of the alimentary tract and metabolism and of the cardiovascular system. We also find that the impact on the latter two drug categories is driven by the drop in income due to involuntary retirement. The effects of involuntary retirement are comparable to the short-run effects of voluntary retirement, identified from a change in the statutory retirement age. We conclude that there is little evidence for health deteriorating effects of involuntary retirement and provide explanations for the possible mechanisms behind our results.

JEL codes: I10, J26

Keywords: healthcare use, involuntary retirement, voluntary retirement

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A kényszerű nyugdíjba vonulás hatása az egészségügyi ellátások igénybevételére és egészségi állapotra

BÍRÓ ANIKÓ – BRANYICZKI RÉKA – ELEK PÉTER

ÖSSZEFOGLALÓ

Tanulmányunkban a kényszerű nyugdíjba vonulás oksági hatását vizsgáljuk az egészségügyi ellátások igénybevételére és az egészségi állapotra, részletes egészségügyi mutatók alapján. Identifikációnk a közszektorban nyugdíj mellett dolgozók kényszerű teljes nyugdíjazását eredményező 2013. évi magyarországi nyugdíjreformot használja. Részletes adminisztratív adatok alapján azt találjuk, hogy három éves időtávon a kényszerű nyugdíjazás csökkenti a háziorvosi látogatások számát, a szisztémás fertőzés elleni szerek és a légzőrendszeri gyógyszerek fogyasztását, valamint csökkenti a fertőzések elleni gyógyszerekre, a tápcsatorna és anyagcsere, illetve a kardiovaszkuláris rendszer gyógyszereire fordított kiadás összegét. Megmutatjuk, hogy az utóbbi két gyógyszer-kategória esetében a kiadáscsökkenést a kényszerű nyugdíjazás okozta jövedelemcsökkenés hajtja. A kényszerű nyugdíjazás becsült hatásai hasonlók az önkéntes nyugdíjba vonulás rövid távú hatásaihoz, amit a nyugdíjkorhatár változását felhasználva becsülünk meg. Végül arra következtetünk, hogy kevés a bizonyíték arra, hogy a kényszerű nyugdíjazás rontja az egészségi állapotot, és bemutatjuk az eredményeket magyarázó lehetséges mechanizmusokat.

JEL: I10, J26

Kulcsszavak: egészségügyi ellátások igénybevétele, kényszerű nyugdíjba vonulás, önkéntes nyugdíjba vonulás

The Effect of Involuntary Retirement on Healthcare Use and Health Status*

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Abstract

We analyse the causal effect of involuntary retirement on detailed indicators of healthcare use and health status. Our identification strategy is based on a pension reform in Hungary which forced public sector workers above the statutory retirement age to full time retirement. Using rich administrative data, we find that on the three-year horizon, involuntary retirement decreases the number of primary care doctor visits, the consumption of antiinfectives for systemic use and drugs of the respiratory system, and the non-zero spending on antiinfectives, the drugs of the alimentary tract and metabolism and of the cardiovascular system. We also find that the impact on the latter two drug categories is driven by the drop in income due to involuntary retirement. The effects of involuntary retirement are comparable to the short-run effects of voluntary retirement, identified from a change in the statutory retirement age. We conclude that there is little evidence for health deteriorating effects of involuntary retirement and provide explanations for the possible mechanisms behind our results.

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1 Introduction

How does involuntary retirement affect healthcare use and health status? In most European countries, pension reforms are expected to remain high on the policy agenda to continuously respond to the challenges of ageing societies. Health effects of pension policy shifts are relevant for both the well-being of individuals and the balance of the fiscal budgets, which is often the trigger of pension reforms. Health and healthcare use implications of retirement may depend on the retirement process, whether it is voluntary or involuntary. Thus, assessing the role of granting control to individuals over the retirement decision is relevant. We investigate the impact of forced exit on healthcare use and drug consumption based on a pension reform in Hungary.

Studies about the health effects of retirement show mixed consequences, some find that retirement is detrimental to health (Rohwedder and Willis, 2010; Heller-Sahlgren, 2017; Celidoni et al., 2017), others report that retiring is health preserving or has no effect (Neuman, 2008; Coe and Zamarro, 2011). A common challenge is endogeneity, as poor health may trigger exit from the labour market in a reverse causal relationship. As a response, recent studies apply research designs that identify causality, and mostly find that retirement is rather beneficial for the health of the retirees. Apart from identification strategies, the variance in health-related outcome variables may also explain some of the contradicting results. For example, Rose (2020) matches several records from England and shows that retirement substantially improves well-being and reported health but does not affect cognitive ability, healthcare utilization, or mortality in the short run. Grøtting and Lillebø (2020) also report that based on the Norwegian registers, retirement has a positive effect on physical health, especially for individuals with low socioeconomic status and no impact on acute hospitalizations or mortality. Similarly, based on the Danish full population data, Nielsen (2019) arrives at no effect on health or healthcare utilization in case of statutory retirement (though there is a decrease in GP visits in case of early retirement). However, Zhang et al. (2018) finds that in contrast to developed countries, retirement increases healthcare utilization in

China.

Another potential reason behind conflicting findings is effect heterogeneity, as pointed out by Behncke (2012) and Eibich (2015). Effect heterogeneity across gender and education levels recevied some attention (Hessel, 2016; Grøtting and Lillebø, 2020), but we know little about the role of heterogeneity in the retirement process, in particular the role of control over the retirement decision. In a systematic review of longitudinal studies about the health implications of retirement, van der Heide et al. (2013) highlights the lack of studies that examine the differences between voluntary and involuntary retirement. There are some notable exceptions that analyse the impact of the mode of retirement on subjective health indicators. Dingemans and Henkens (2014) and Hershey and Henkens (2014) both use longitudinal data from the Netherlands, and find that compared with voluntary retirement, involuntary retirement is detrimental to life satisfaction. Dingemans and Henkens (2014) state that the impact of retirement on life satisfaction depends on how close the actual retirement path is to the preferred one, thus a bridge job can mitigate the negative shock. Bender (2012) (using data from the US) and Bonsang and Klein (2012) (using data from Germany) arrive at similar conclusions. Apart from abrupt and forced retirement, job loss at older ages also tends to have negative health effects (Gallo et al., 2000, 2006), especially among workers with limited wealth.

There are some examples of forced retirement in sectors where mandatory retirement at a certain age caps the duration of a career, for example in professional sport or academia. Ashenfelter and Card (2002); Clark and Ghent (2008); Warman and Worswick (2010) analyse the impact of elimination of (or lack of) mandatory retirement on retirement in the academic sector and all of them find that many choose to continue working once retirement is not forced, which indicates that mandatory retirement laws often impose involuntary retirement on employees, underlining the importance of studying its consequences.

Recent pension reforms from Hungary provide us with two quasi-experiments, so we can identify and compare the health-related consequences of both involuntary and voluntary retirement. First, since 2013, public sector workers (except for healthcare workers) cannot earn wages and receive pension benefits at the same time. As a consequence, the vast majority of public sector workers who received pension benefits before July 2013 were unexpectedly "forced" to retire. Second, in 2012, there was a sudden increase in the statutory old-age retirement age of males and since then it has further increased gradually. Therefore, voluntary retirement has been made possible only at later ages. Using a rich administrative data set from Hungary, we can evaluate the consequences of the two reforms on the same data, allowing us to compare the estimated effects of involuntary retirement on healthcare use to the effects of voluntary retirement.

We add to the recent studies that identify causal effects of retirement on health and healthcare use by testing a potential source of heterogeneity in the health implications of retirement: control over the retirement decision. To the best of our knowledge, we are first to establish casual effects of involuntary retirement above the statutory retirement age on objective indicators of healthcare. In addition, using the same data set and health indicators, we compare these effects to the causal effects of voluntary retirement. We have administrative measures on the use of outpatient and inpatient care and spending of prescription drug categories that are free from biases stemming from self-reporting, and which can also be considered as proxies for health status. We find evidence that involuntary retirement tends to reduce primary care use and the demand for prescription drugs and the decrease is comparable to the implications of voluntary retirement. These effects can be attributed both to changes in incentives to invest in health, direct health consequences and negative income impacts of retirement. We also find weak evidence that involuntary retirement has different effects on the consumption of psychoanaleptics (including antidepressants) among males than among females.

2 Pension reforms

Hungary has a mandatory, pay-as-you go pension system, where pension benefits are based on earnings before retirement, with a minimum pension. Eligibility is conditional on 20 years of service. The government sets the standard retirement age. However, under some mild conditions, earlier retirement was possible until December 2011. During our analysis period, two major reforms were implemented in the pension system. First, the joint possibility of receiving pension benefits and doing paid work in the public sector was abolished in 2013, leading to involuntary retirement among the majority of those who earned wages and received pension benefits at the same time. Second, early retirement was abolished and the standard retirement age has gradually increased, delaying the possibility for voluntary retirement. In the following, we provide further details of these reforms.

Since 2013, it is no longer possible to do paid work in the public sector and receive pension benefits at the same time. This legislation was announced in June 2012. If someone was working in the public sector on 1 January 2013 then the restriction applied only from 1 July 2013. If someone entered the public sector on or after 1 January 2013 then the restriction applied immediately. Generally, public sector workers to whom the restriction applied could choose between continued employment or old-age retirement (but not both). People working at a central budgetary institution were no longer allowed to work after reaching old-age retirement age, however, exceptions could be requested. In the following, we call the forced exit from the labour market "involuntary retirement", keeping in mind that the affected individuals received pension benefits even before the exit from the labour market.

Due to the shortage of workforce in the healthcare sector, the government offered that employers of healthcare workers above the old-age retirement age can request the sum of pension benefit as earnings supplement from the government. Because of this allowance, we exclude healthcare workers from the rest of the analysis.

Turning to the reform of the statutory retirement age, the early and the standard retirement ages have been increasing since 2008. Among males, the eligibility for pension benefits is solely based on age (conditional on 20 years of service). Until December 2011 (for cohorts born not later than 1951), males could retire at the (early) retirement age of 60. However, cohorts born in 1952 could retire only at the age of 62.5, then the standard retirement age has increased by 0.5 year for each year of birth, and will reach age 65 for the cohorts born in or after 1957. Our data covers the period when the male retirement age increased from age 60 to 63. If a man retired at age 60-62 before the reform, we consider it as voluntary retirement since continued work would have been possible by law. The increasing retirement age has made voluntary retirement at ages 60-62 (and later even up to age 65) impossible.

The female cohort of 1951 could go into (early) retirement already in 2008 (at age 57), while those born in 1952 could do it only in 2011 (at age 59). Since 2012, the standard retirement age for females has gradually increased from age 63. However, since 2012, females are also eligible for pension benefits after 40 years of service. As the increase of the retirement age from 57 to 59 is outside our observation period and we do not observe the total years of service (to check whether a female has at least 40 years of service), we exclude women from the analysis of the health impacts of voluntary retirement.

3 Theoretical background

Various channels have been discussed in the literature that can potentially explain the impact of retirement on health status and healthcare use. Some of these mechanisms depend on whether the retirement is voluntary or involuntary.

Following Behncke (2012), we divide the mechanisms into two categories: the changing incentives to invest in health and the direct health effects of retirement.

Incentives to invest in health change with retirement because there are no incentives any more to raise productivity and hence to achieve higher earnings. At the same time, health preferences might also change with retirement, although the direction of the change is ambiguous. Galama et al. (2013) and Kuhn et al. (2015) provide formal models of the relations between health and retirement when both are endogenous. In the model of Galama et al. (2013), people invest in health when their health falls below a health threshold (become "unhealthy"). In their framework, the health threshold drops at the age of retirement as a result of increased leisure time (leisure is either a substitute or a complement of health) and because health has no effect on income after retirement. In the model of Kuhn et al. (2015), before retirement, the incentives to invest in health are affected by the value of health-related increases in earnings and/or reductions in the disutility of labour and also by the disutility of providing labour. These effects are no longer present after retirement.

In principle, the changes in incentives to invest in health after retirement are not affected by the transition mode to retirement (voluntary or involuntary).

The second major channel through which retirement affects health directly and healthcare use indirectly is stress. Retirement might be a relief from stressful work, for example the health benefits of retirement are partly explained by substituting work time with sleep and leisure, i.e., more physical activities (Eibich, 2015; Rose, 2020). At the same time, retirement as a life event can also be stressful (Behncke, 2012). Stress, in turn, is related to health behaviours (Cooper et al., 1992; Torres and Nowson, 2007), physical health (Kivimäki and Steptoe, 2018) and mental health (Virtanen et al., 2007). Retirement is more likely to be a stressful event if it was involuntary, possibly leading to negative health consequences. Related to the stress-channel, retirement might also impact health due to the loss of social network and the loss of so-called latent functions, such as opportunities for social contact with other people or contributing to status and personal identity for the individual (for further details on these theories, see Janlert and Hammarström, 2009). Again, if retirement is involuntary, the loss of social support provided by fellow workers and of further benefits (latent functions) of working life are likely to be more significant, implying stronger negative health impacts of retirement. A forced and abrupt exit from the labour market may also hinder financial planning, which may lead to a negative income effect, again potentially contributing to ill health via increased stress and lower spending on health.

The stress induced by retirement and its potential impact on mental health call for an assessment of gender differences in coping with forced exit from the labour market. It is a common observation that women are more prone to internalizing disorders such as mood or anxiety disorders throughout the life-course (Seedat et al., 2009; Boyd et al., 2015). The underlying reasons are unclear (Riecher-Rössler, 2017), women may be more willing to report distress, though some studies suggest that the different societal roles explain much of the gender difference (Gove, 1984; Emslie et al., 2002), thus the stress of voluntary or forced retirement may also vary among men and women. There is some evidence that retirement in general is associated with increases in psychological anxiety for both genders (Richardson and Kilty, 1995). Isaksson and Johansson (2000) compared the impact of forced and voluntary early retirement following a downsizing of an insurance company in Sweden and found that both women and men report better psychological well-being in case of having a choice, however women reported lower values of work centrality and were more satisfied with retirement in general. An earlier study found that internally motivated retirement is especially influential on mental health among men (Quick and Moen, 1998). One of our contribution to the literature on gender differences in mental consequences of involuntary retirement is that we use an administrative data set, so we can rule out differential reporting of distress based on sex.

Overall, the theoretical background suggests that both involuntary and voluntary retirement likely reduce the demand for healthcare services as a result of reduced incentives to invest in health, while involuntary retirement is more likely to have detrimental health effects than voluntary retirement due to higher levels of stress, possibly reflected in the consumption of prescription drugs. Also, we may see gender differences in mentally coping with forced retirement.

4 Data

4.1 Data source and variables

We use administrative data from Hungary, covering years 2003–2017 on a random 50% sample of the 2003 population.[1] The monthly labour force status, earnings and pension benefit indicators originate from the Central Administration of National Pension Insurance. Since pension status is imperfectly observed in year 2017, we exclude that year from the analysis. The demographic and health-related indicators originate from the National Health Insurance Fund Administration. The health-related indicators are available only since 2009, thus we restrict the main analysis to years 2009-2016. We have information on the monthly number of general practitioner visits, days spent in a hospital and on the monthly public plus private (out-of-pocket) expenditure on prescribed pharmaceuticals. We categorise drug spending by Anatomical Therapeutic Chemical (ATC) groups and focus on the six ATC groups with the highest consumption among working pensioners in the second quarter of 2013.

When analysing the impact of involuntary retirement, we collapse the data to half yearly level. When analysing the impact of voluntary retirement, we collapse the data to annual level by age (and not by calendar year).

4.2 Descriptive statistics: involuntary retirement

In the second quarter (Q2) of 2013, among public sector working pensioners (excluding the healthcare sector) for whom the industry classification is not missing (68% of the cases), 62% worked in the industry of "Public Administration and Defence; Compulsory Social Security" and 31% in the industry of "Education". Looking at occupations, 29% were

[1]The data is a property of National Health Insurance Fund Administration, Central Administration of National Pension Insurance, National Tax and Customs Administration, National Employment Service and Educational Authority. The data was processed by the Databank of the Centre for Economic and Regional Studies.

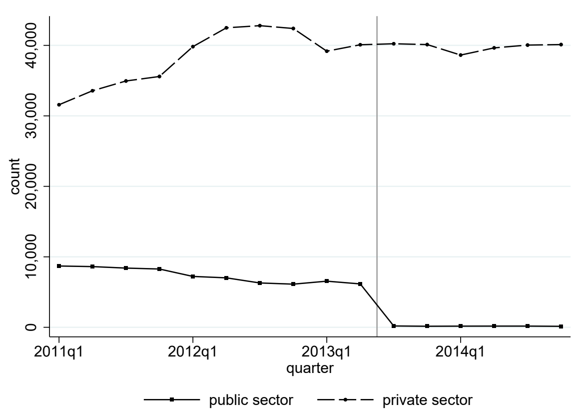
teaching professionals and 20% had elementary occupations. On average, labour earnings of the public sector working pensioners accounted for 63% of their total income (earnings plus pension benefits) – this source of income is lost after involuntary retirement.

Figure 1 shows that from 2013Q2 to 2013Q3, the number of public sector workers who received old-age pensions, and also the employment rate of pensioners in the public sector decreased to close to zero, without substantial gender differences. Specifically, in 2013Q2, we observe 6,160 individuals in our data who received pension benefits and earnings at the same time. This number drops to 193 at 2013Q3. We do not see such drops in the private sector.

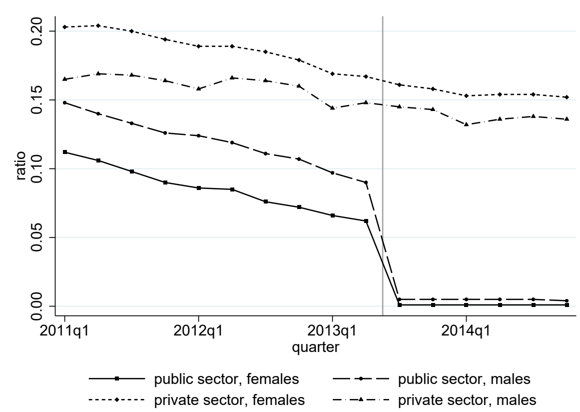
Further descriptive statistics by the sector of work and retirement are provided in Appendix Table A1.

Figure 1: Employment and old-age pension rates of males

(a) Number of working pensioners



(b) Employment rate among pensioners



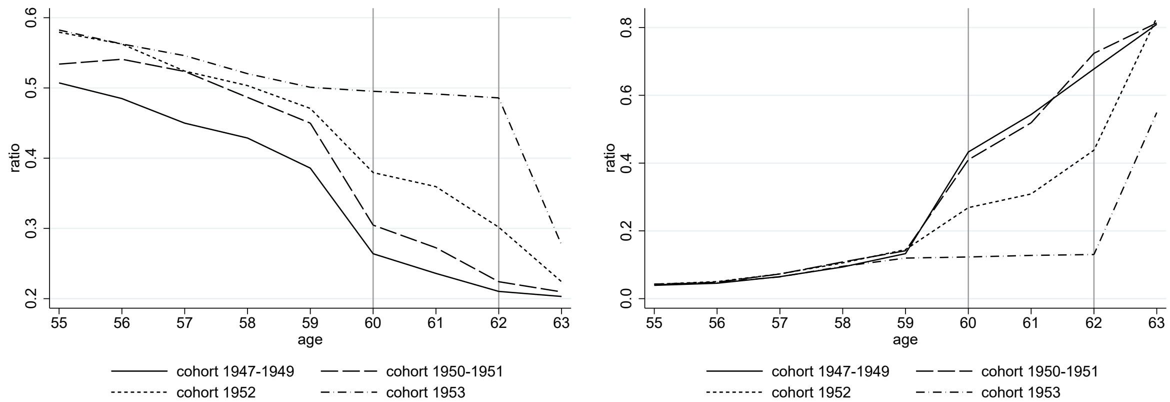
Note: An individual is classified to a sector based on the last observed job (missing if the last employment is not observed in the data). The vertical line indicates the date since the simultaneous receipt of pension benefits and earnings is not possible in the public sector.

4.3 Descriptive statistics: voluntary retirement

Figure 2 shows that at ages 60 to 62, the employment rate was much higher (and old-age pension rate was much lower) among cohorts born in 1952 and 1953 than among cohorts born earlier. This suggests that the increase in the statutory retirement age was effective.

Figure 2: Employment and old-age pension rates of males

(a) Employment (b) Old-age pensions



Note: The graphs show the ratio of males who are employed (including self-employment) and who receive old-age pensions (including early old-age pensions).

5 Methods and results

5.1 Involuntary retirement

5.1.1 Baseline analysis

When analysing the effects of involuntary retirement, we restrict the sample to those individuals who were employed in the public or private sector and also received pension benefits in 2013Q2. In our setting, the public sector working pensioners are the treated, the private sector working pensioners are the control individuals. Using two types of fixed-effects models, we estimate the average effect of involuntary retirement over 2013HY2 - 2016HY2 with equation (1) and half-year (HY) specific effects with equation (2). Since a small fraction of public sector working pensioners opted for continued work instead of full retirement, our approach is an intention-to-treat analysis.

$$y_{it} = public_{i,2013Q2} \times after_t \times \alpha + \beta age_{it}^2 + \delta_t + \eta_i + \epsilon_{it}, \qquad (1)$$

$$y_{it} = public_{i,2013Q2} \times \sum_{j=2009HY1}^{2016HY2} \tilde{\alpha}_j + \tilde{\beta} age_{it}^2 + \tilde{\delta}_t + \tilde{\eta}_i + \tilde{\epsilon}_{it}, \quad (2)$$

where i is the index of the individual and t denotes time (half-year), y_{it} is a health-related indicator of individual i at time t, δ_t and $\tilde{\delta}_t$ capture time fixed effects and η_i and $\tilde{\eta}_i$ capture individual fixed effects. The binary indicator of $public_{i,2013Q2}$ equals one for an individual who worked (and received pensions) in the public sector in 2013Q2, the indicator of $after_t$ equals one from 2013Q3 onward, and $\tilde{alpha}_j$ ($j = 2009HY1, \ldots, 2016HY2$) denote half-year (HY) specific time effects. The parameters of interest are α for the average effect and the $\tilde{\alpha}_j$-s for the half-year specific effects. (Note that one parameter, here $\tilde{\alpha}_{2012HY1}$, should be set to zero.)

The FE results of equation (2) (Appendix B) show that some of the estimated pre-treatment effects are statistically significant. Due to this problem, we estimate propensity-score weighted fixed-effects models (following Stuart et al., 2014; Austin and Stuart, 2015). Specifically, we estimate a logit model of working in the public sector and also receiving pensions in 2013Q2, using the following regressors: age dummies, one-digit occupation code dummies and health measures (primary care and inpatient care use, amount of drug spending and binary drug spending indicators) between 2009HY2 - 2012HY1, i.e., in the three years before the announcement of the policy. In the FE regression we weight the control individuals with the predicted probability and the treatment individuals with one, so as to estimate the average treatment effect on the treated (ATT).

When looking at the demand for prescription drugs, we use the binary indicator of positive spending (extensive margin) and the logarithm of positive spending (intensive margin) as dependent variables, hence we estimate two-part (hurdle) models. For general practitioner (GP) visits we use linear models (no need to distinguish the two margins as the ratio of zero GP visits is very small) and for hospital stays we only use the binary indicator as outcome variable.

Table 1 shows that involuntary retirement has a statistically significant negative effect on

Table 1: Effect of involuntary retirement on half-year indicators of healthcare use and drug spending

Number of GP visits and logarithm of (positive) drug spending	GP visits	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Treatment effect	-0.170***	-0.053**	-0.044***	-0.030*	0.034	-0.017	-0.027
	[0.036]	[0.025]	[0.014]	[0.015]	[0.022]	[0.039]	[0.041]
Mean outcome (no logs, drug spending in HUF)	3.816	16,735	19,890	3,591	6,048	11,293	16,107

Binary indicators of use	Hospital stay	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Treatment effect	0.004	0.005	-0.008*	-0.024***	-0.008	-0.001	-0.016***
	[0.003]	[0.005]	[0.005]	[0.004]	[0.005]	[0.004]	[0.003]
Mean outcome	0.091	0.368	0.680	0.252	0.261	0.130	0.139

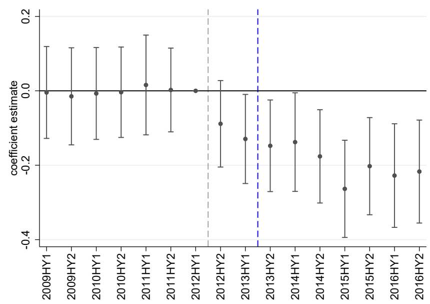
Note: Weighted fixed effects results of equation (1), average effect over 2013HY2-2016HY2. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Total sample size: 411,425 observations of 25,895 individuals. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R. 1 EUR ≈ 300 HUF in the analysed period.

primary care use and on the logarithmic spending on cardiovascular drugs and antiinfectives for systemic use. Also, it decreases the probability of the consumption of antiinfectives for systemic use and of respiratory drugs. Appendix Table A3 shows that the impacts on antihypertensive drugs (part of cardiovascular drugs), on antibacterials (part of antiinfectives for systemic use) and on drugs for obstructive airway diseases (part of respiratory drugs) are similar to the total impacts on the respective larger categories.

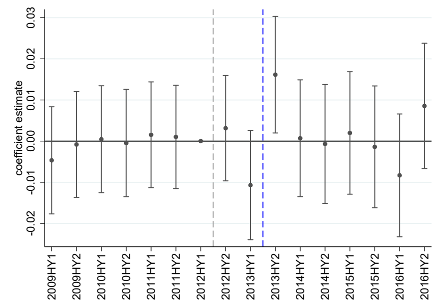
The results of Figure 3 suggest that involuntary retirement decreases the demand for health-preserving care already around the time of the announcement of the reform, as indicated by the estimated year-specific effect on primary care use. The demand for prescription drugs starts to decrease after the implementation of the policy (i.e., from 2013HY2).

Figure 3: Half-year specific effect of involuntary retirement on healthcare use and binary indicators of drug spending

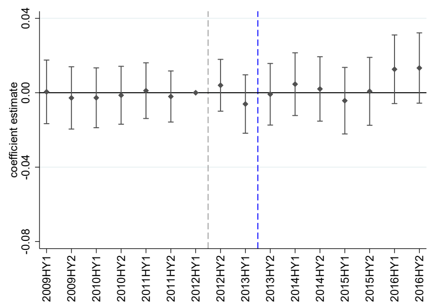
(a) GP visits



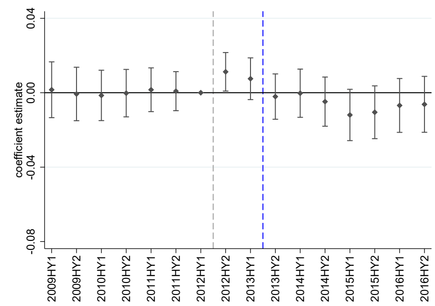
(b) Hospital stay



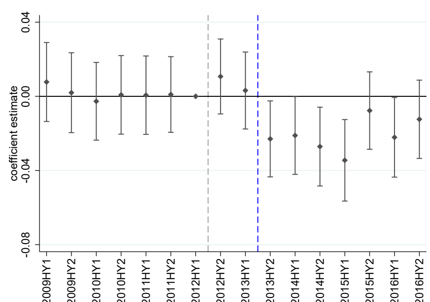
(c) Alimentary tract & metabolism



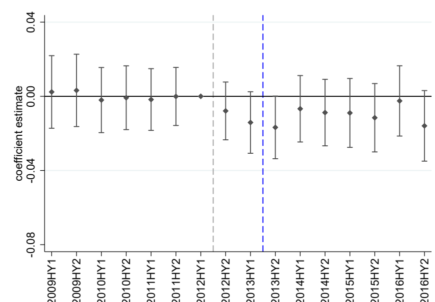
(d) Cardiovascular



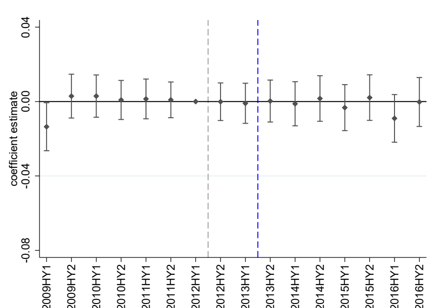
(e) Antiinfectives



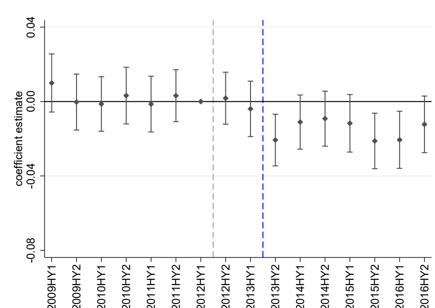
(f) Musculo-skeletal



(g) Nervous system

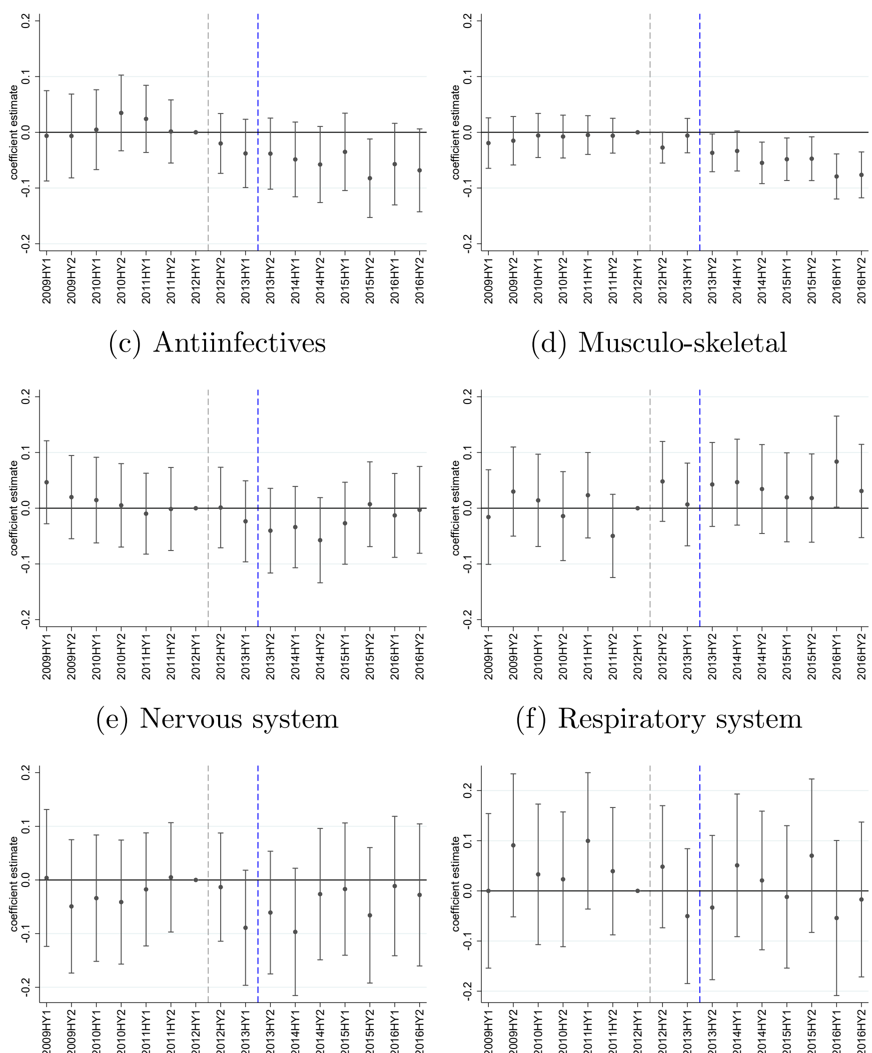


(h) Respiratory system



Note: Weighted fixed effects results of equation (2). Point estimates with 95% CI. Total sample size: 411,425 observations of 25,895 individuals. The grey vertical line indicates the announcement of the policy, the blue vertical line indicates the date since the simultaneous receipt of pension benefits and earnings is not possible in the public sector. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R.

Figure 4: Half-year specific effect of involuntary retirement on logarithmic drug spending



(a) Alimentary tract & metabolism

(b) Cardiovascular

(c) Antiinfectives

(d) Musculo-skeletal

(e) Nervous system

(f) Respiratory system

Note: Weighted fixed effects results of equation (2). Point estimates with 95% CI. The grey vertical line indicates the announcement of the policy, the blue vertical line indicates the date since the simultaneous receipt of pension benefits and earnings is not possible in the public sector. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R.

Based on our findings, the demand for drugs that are typically used to treat infections (antiinfectives for systemic use and drugs of the respiratory system) decreases. There is weaker evidence for involuntary retirement affecting the magnitude of non-zero spending on drugs (Figure 4). Spending decreases significantly by about 8% on antiinfectives for systemic use. We also see that after involuntary retirement, individuals opt for cheaper cardiovascular drugs, most likely due to income effects, which we will test in section 5.1.3.

We also estimate the impact of involuntary retirement on three-year mortality between 2013HY2 and 2016HY1 with a linear probability model. We include the following regressors in the model: gender, age dummies, one-digit occupation code dummies and health measures (primary care and inpatient care use, amount of drug spending and binary drug spending indicators) between 2011HY2 - 2012HY1, i.e., in the year before the announcement of the policy. This regression indicates that involuntary retirement decreases the three-year mortality by a statistically insignificant -0.25 percentage point (p-value: 0.381).

5.1.2 Mental health

The theoretical considerations of section 3 suggest that involuntary retirement might have a negative – and possibly gender specific – impact on mental health. We capture mental health with the consumption of psychoanaleptics (ATC N06), which primarily include antidepressants.

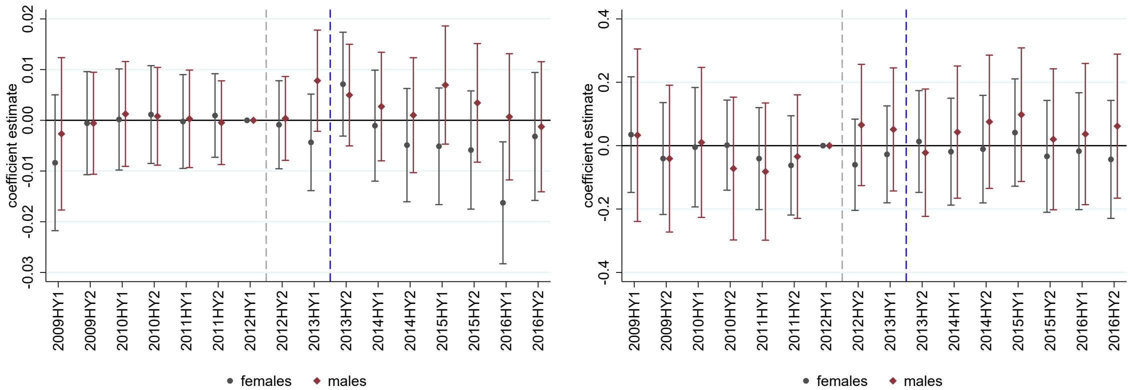
We estimate the half-year specific effect of involuntary retirement separately for females and males (equation (2)) and report the results in panels (a) and (b) of Figure 5.[2] These results do not indicate an overall increase in the consumption of psychoanaleptics – if anything, the probability of the use of psychoanaleptics among females seems to decrease, however it reaches statistical significance only by the end of the observation period. We see weak evidence that the probability of the usage of psychoanaleptics increases by close to one percentage point among males in 2013, that is in the year when the involuntary retirement policy came into force. Although statistically insignificant, the magnitude of this effect is substantial, compared to the 5.1% average of psychoanaleptic consumption rate among males (and 6.7% among females).

[2] Appendix Table A2 shows that there is no evidence for gender specific effect of involuntary retirement on other indicators of healthcare use.

Figure 5: Gender specific effect of involuntary retirement on the use of psychoanaleptics

(a) Probability of any spending

(b) Logarithm of (positive) spending



Note: Weighted fixed effects results of equation (2). Point estimates with 95% CI. Total sample size: 411,425 observations of 25,895 individuals. The grey vertical line indicates the announcement of the policy, the blue vertical line indicates the date since the simultaneous receipt of pension benefits and earnings is not possible in the public sector. The outcome variables refer to ATC group N06.

5.1.3 Heterogeneity by occupation and the impact of income

We investigate whether the impact of involuntary retirement on healthcare use varies with the amount of lost income and with the type of the last occupation.[3] A major drop in income might reduce the demand for costlier prescription drugs (which require higher out-of-pocket payments). To test this hypothesis, we interact the treatment indicator with a binary indicator of "large income drop". To generate this indicator, we first calculate the ratio of the mean earnings plus pension income after and before 2013Q2 for each individual in the treatment group. We then calculate its first quartile (which is 0.49). If the ratio in the treatment group is below the first quartile then the binary indicator of income drop is set to one, and zero otherwise.

We also investigate whether the impact of involuntary retirement differs by type of the occupation in 2013Q2. ISCO codes 1-4 are classified as white-collar occupations, ISCO codes 5-9 as blue-collar occupations.

[3]Further heterogeneity analyses (not reported here) indicate that the impact of involuntary retirement does not vary with baseline health, as captured by total drug spending before the announcement of the policy.

The results reported in Table 2 provide some evidence for heterogeneities by occupation and by the drop in income. The negative effects of involuntary retirement on non-zero spending on the drugs of alimentary tract and metabolism and the cardiovascular system are mostly driven by individuals who suffer a major loss of income. Also, for them, involuntary retirement decreases the probability of buying any cardiovascular drugs. Finally, the negative effect on the number of primary care visits is more pronounced for the blue-collar than for the white-collar workers.

Having worked in a blue-collar job and experiencing a large income drop are both estimated to increase the probability of three-year mortality (by 0.83 and 0.34 percentage points, respectively) but these increasing effects are statistically insignificant even at the 10% significance level. When estimating the impact on mortality, we follow the same approach as explained at the end of section 5.1.1.

5.2 Voluntary retirement

We turn to voluntary retirement to put our results into context. To analyse the impacts of voluntary retirement, we estimate fixed effects instrumental variable (FE IV) regressions on the sample of males. In each specification, the dependent variable is an annual health-related indicator (annualised by age and not by calendar year) and the key explanatory variable is the binary indicator of old-age retirement. The explanatory variable is instrumented with being above the statutory retirement age. Further regressors are quarterly date dummies (indicating the start of each interval) and age dummies. The sample is restricted to individuals aged 59-63 of cohorts 1950-1954 who worked at age 58.

Formally, we estimate the following model:

$$y_{it} = \gamma_r \times R_{it} + \gamma_a \times D_{it}^{age} + \kappa_t + \lambda_i + \nu_{it}, \tag{3}$$

where y_{it} is a health-related indicator of individual i at time t, R_{it} is the binary indicator of

Table 2: Heterogeneity by occupation and income change: effect of involuntary retirement on half-year indicators of healthcare use and drug spending

Number of GP visits and logarithm of (positive) drug spending	GP visits	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Treatment effect	-0.100**	-0.021	-0.025	-0.035*	0.033	-0.017	-0.061
	[0.047]	[0.032]	[0.018]	[0.019]	[0.029]	[0.052]	[0.052]
Treat eff × blue-collar job	-0.141*	-0.041	-0.010	0.054	-0.040	0.017	-0.009
	[0.083]	[0.052]	[0.029]	[0.034]	[0.047]	[0.079]	[0.093]
Treat eff × large income drop	-0.067	-0.077*	-0.044*	-0.027	0.051	-0.028	0.006
	[0.065]	[0.044]	[0.026]	[0.027]	[0.042]	[0.078]	[0.064]
Mean outcome (no logs, drug spending in HUF)	3.816	16,735	19,890	3,591	6,048	11,293	16,107

Binary indicators of use	Hospital stay	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Treatment effect	0.000	0.001	0.001	-0.015***	-0.007	-0.000	-0.013***
	[0.004]	[0.007]	[0.006]	[0.006]	[0.006]	[0.005]	[0.005]
Treat eff × blue-collar job	0.005	0.012	-0.013	-0.012	-0.008	-0.004	-0.008
	[0.007]	[0.012]	[0.010]	[0.009]	[0.011]	[0.008]	[0.008]
Treat eff × large income drop	0.010*	0.000	-0.017*	-0.018	0.006	0.004	0.000
	[0.006]	[0.010]	[0.009]	[0.008]	[0.009]	[0.007]	[0.006]
Mean outcome	0.091	0.368	0.680	0.252	0.261	0.130	0.139

Note: Weighted fixed effects results, average effect over 2013HY2-2016HY2. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Total sample size: 411,425 observations of 25,895 individuals. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R. ISCO codes 5-9 are classified as blue-collar occupations. The binary indicator of "large income drop" is set to one if the ratio of the mean earnings plus pension income after and before 2013Q2 is below the first quartile of this ratio in the treatment group. 1 EUR ≈ 300 HUF in the analysed period.

old-age pensioner status, D_{it}^{age} is the age dummy, while κ_t and λ_i denote time fixed effects and individual fixed effects, respectively. Thus, the equation captures the impact of being retired on health-related outcomes (γ_r being the parameter of interest), holding age and calendar year fixed. Since R_{it} is endogenous due to two-way causalities, we instrument it with the binary indicator of being above the statutory retirement age. A similar identification strategy is applied by Bíró and Elek (2018).

According to the estimation results of Table 3, voluntary retirement reduces the number of primary care physician visits as well as the probability of consumption of antiinfectives for systemic use and of drugs of the musculo-skeletal and the respiratory system. Also, the estimated effects on the amount of non-zero spending are mainly negative, but statistically significant only for the drugs of the musculo-skeletal system. These results might be due both to improved health and to reduced incentives for healthcare use after retirement. We estimated zero effect of voluntary retirement on three-year mortality. Appendix Table A4 shows that the negative impact of voluntary retirement on the consumption of respiratory drugs and antiinfectives for systemic use is even stronger for the public sector than for the private sector workers. In the public sector, the effect of voluntary retirement is significantly negative on cardiovascular drugs, which is in line with the negative effect of involuntary retirement (that was also estimated for the public sector).

Table 3: Effect of voluntary retirement

Number of GP visits and logarithm of (positive) drug spending	GP visits	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Retirement	-2.489***	-0.011	0.032	-0.072	-0.182***	-0.075	-0.155
	[0.178]	[0.060]	[0.029]	[0.068]	[0.059]	[0.141]	[0.132]
Mean outcome (no logs, drug spending in HUF)	7.751	34,039	21,649	4,112	5,305	18,458	27,326

Binary indicators of use	Hospital stay	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Retirement	0.016	-0.006	-0.007	-0.051***	-0.070***	-0.013	-0.032***
	[0.013]	[0.012]	[0.010]	[0.016]	[0.014]	[0.009]	[0.011]
Mean outcome	0.152	0.357	0.635	0.294	0.295	0.131	0.152

Note: FE IV estimation results of equation (3). Standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Total sample size: 354,079 observations of 75,201 individuals. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R. 1 EUR ≈ 300 HUF in the analysed period.

6 Discussion and conclusions

Based on a pension reform in Hungary, we estimated the causal effect of involuntary retirement on primary care use, inpatient care use and spending on prescription drug categories. Our results show that involuntary retirement decreases primary care doctoral visits, the probability of taking antiinfectives for systemic use and drugs for the respiratory system. Also, involuntary retirement decreases the amount of non-zero spending on alimentary tract and metabolism drugs, antiinfectives and drugs of the cardiovascular system, mostly driven by those who suffer a major loss of income as a result of forced retirement.

The impacts of involuntary retirement on healthcare use are broadly in line with the estimated impacts of voluntary retirement, thus we do not find evidence that the short to medium-run effects of retirement on health-related outcomes would vastly differ by the reason of retirement. However, we have no information about the perceived control over retirement, which may partly explain the only moderate differences.

Our focus is on objective measures of healthcare utilization and drug prescriptions instead of self-reported health outcomes. While we eliminate some of the bias inherent in self-reported measures, our inference of health status from physician visits and drug prescription has some limitations. Interpreting the various potential mechanisms behind our findings sheds light on the health impact. First, retirement reduced the demand for healthcare services already around the time when the reform was announced, in line with the theory of decreased incentives to maintain good health as a pensioner not depending on labour income. The number of primary care visits decreased especially among the blue-collar workers holding physically more demanding jobs compared to white-collar workers. Also, after retirement, the option of claiming sick leave benefits no longer works as an incentive for healthcare utilisation.

Second, the reduced demand for antibiotics or respiratory drugs possibly indicates improved health, as retirement might decrease the risk of infections due to the lower number of contacts with other people. Nevertheless, as retirement, especially involuntary retirement in our setting, implies a decline in income, the demand for prescription drugs might also decrease because of the presence of cost sharing. We find that individuals with a large drop in income due to involuntary retirement are less likely to buy any cardiovascular drugs and in case they do, they tend to opt for cheaper ones, indicating budget constraints. We find similar evidence for reduced amounts of non-zero spending on drugs of the alimentary tract and metabolism. Less investment in health, including lower spending may have negative health impacts. The negative income effect of unexpected and forced retirement is a notable health risk compared to voluntary retirement. However, when looking at three-year mortality, we do not find evidence that involuntary retirement would increase the risk of mortality.

The consumption of psychoanaleptics, including antidepressants did not change significantly after involuntary retirement, it rather decreased slightly among women, and the increase among men is hardly significant, though its magnitude is substantial in the year of forcing retirement. Overall, we find weak evidence of (gender specific) mental health impacts, bearing in mind that mental well-being may be affected but not reflected in drug consumption in the short run.

We conclude that in the short run, mental and physical health (based on hospitalizations and mortality) are rather unaffected, moreover, health may improve after retirement based on reduced drug consumption, though the negative income effect of involuntary retirement seems to drive some of the decrease.

Analyzing healthcare utilization indicators allows us to directly observe the implications of retirement for the healthcare system. Our results point to a trade-off lying in inducing retirement, as the budgetary gains from decreased healthcare use are curtailed by the higher government spending on pensions. In other words, it seems that in the short run, both involuntary and voluntary retirement alleviate the burden on the healthcare system but they increase expenditure on pensions. Further studies are needed to assess the long-run impacts of involuntary (and voluntary) retirement on healthcare use and health status.

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Appendix

A Descriptive statistics by employment status

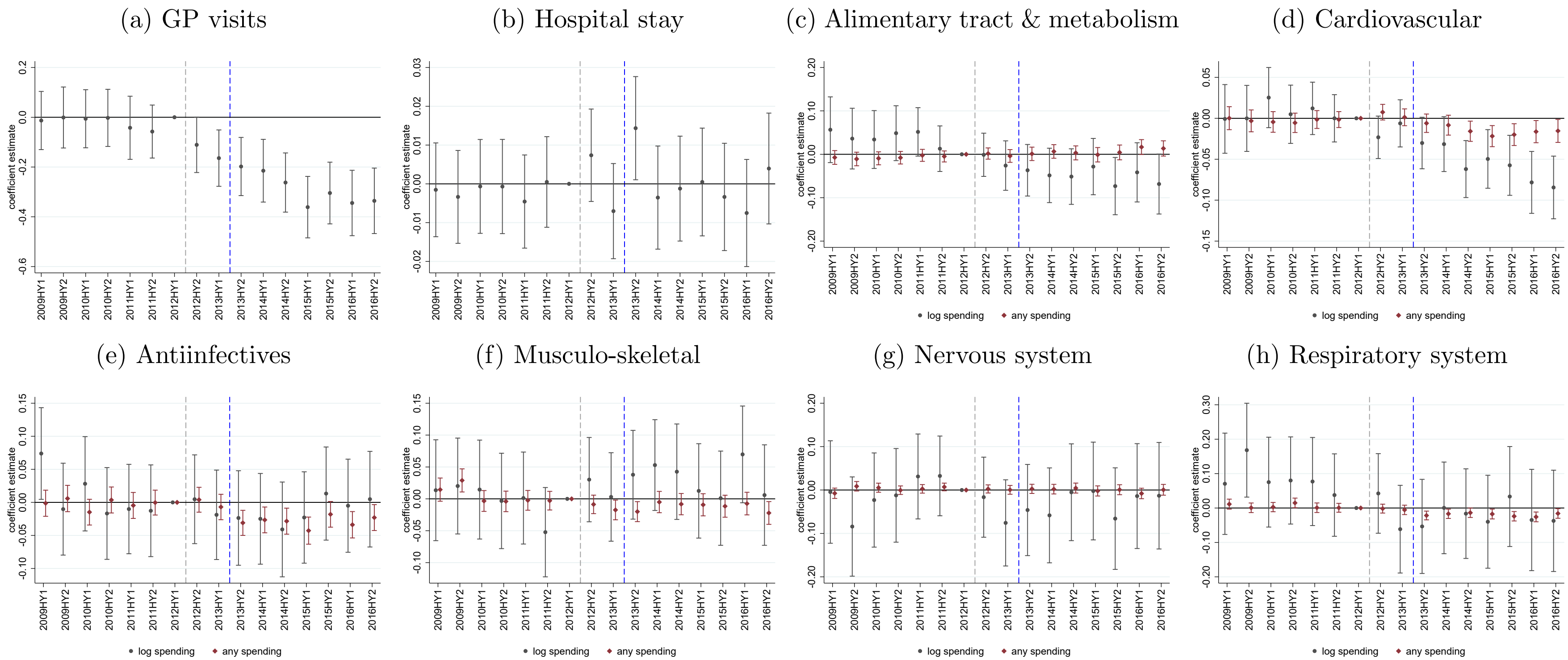
Appendix Table A1: Descriptive statistics

	public sector, working retired	public sector, not retired	private sector, working retired	private sector, not retired
age	63.659	57.125	63.357	57.195
male	0.362	0.301	0.460	0.590
monthly earnings (HUF)	275,142	267,168	124,403	205,202
working hours	33.827	39.451	26.946	37.212
monthly pensions (if not missing, HUF)	165,141	86,667	126,582	68,388
armed forces	0.005	0.001	0.000	0.000
managers	0.086	0.118	0.102	0.096
professionals	0.408	0.398	0.092	0.069
associate professionals	0.152	0.200	0.149	0.122
clerical support workers	0.057	0.043	0.087	0.065
services and sales	0.046	0.055	0.162	0.104
skilled agricultural	0.003	0.002	0.010	0.013
craft and related trades	0.021	0.026	0.078	0.175
machine operators	0.016	0.019	0.081	0.165
elementary occupations	0.206	0.138	0.239	0.192

Note: The table shows descriptive statistics at the second quarter of 2013, that is in the last quarter when the simultaneous receipt of pension benefits and earnings was possible in the public sector.

B Fixed effects estimation results without weighting

Appendix Figure A1: Effect of involuntary retirement on half-year indicators of healthcare use and drug spending



Note: Fixed effects estimation results of equation (2) without weighting. Point estimates with 95% CI. Sample size: 411,425 observations of 25,899 individuals. For drugs, both the effects on logarithmic positive spending and on the probability of any spending are shown. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R.

C Gender specific impact of involuntary retirement

Appendix Table A2: Heterogeneity by gender: effect of involuntary retirement on half-year indicators of healthcare use and drug spending

Number of GP visits and logarithm of (positive) drug spending	GP visits	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Treatment effect	-0.209***	-0.048	-0.052***	-0.020	0.047	-0.031	-0.050
	[0.049]	[0.031]	[0.019]	[0.019]	[0.033]	[0.049]	[0.050]
Treatment effect × male	0.095	-0.013	0.018	-0.025	-0.029	0.033	0.059
	[0.072]	[0.051]	[0.028]	[0.032]	[0.043]	[0.081]	[0.085]
Mean outcome (no logs, drug spending in HUF)	3.816	16,735	19,890	3,591	6,048	11,293	16,107

Binary indicators of use	Hospital stay	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Treatment effect	0.005	-0.004	-0.011*	-0.029***	-0.009	-0.004	-0.024***
	[0.004]	[0.007]	[0.007]	[0.006]	[0.007]	[0.005]	[0.005]
Treatment effect × male	-0.003	0.019*	0.007	0.014*	0.004	0.008	0.018**
	[0.007]	[0.011]	[0.010]	[0.009]	[0.010]	[0.007]	[0.007]
Mean outcome	0.091	0.368	0.680	0.252	0.261	0.130	0.139

Note: Weighted fixed effects results (equation (1)), average effect over 2013HY2-2016HY2. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Total sample size: 411,425 observations of 25,895 individuals. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R. 1 EUR ≈ 300 HUF in the analysed period.

D Impact of involuntary retirement on detailed categories of pharmaceuticals

Appendix Table A3: Effect of involuntary retirement on half-year indicators of drug spending

Logarithm of (positive) drug spending	ATC A10	ATC C02-09	ATC J01	ATC N05	ATC N06	ATC R03
Treatment effect	-0.019	-0.026*	-0.033**	-0.024	0.026	-0.055
	[0.042]	[0.014]	[0.015]	[0.053]	[0.040]	[0.061]
Mean outcome (no logs, HUF)	33,386	13,763	3,039	3,874	8,533	32,430

Binary indicators of use	ATC A10	ATC C02-09	ATC J01	ATC N05	ATC N06	ATC R03
Treatment effect	-0.001	-0.011**	-0.022***	0.000	-0.001	-0.007***
	[0.002]	[0.005]	[0.004]	[0.002]	[0.003]	[0.002]
Mean outcome	0.109	0.631	0.235	0.022	0.060	0.058

Note: Weighted fixed effects results (equation (1)), average effect over 2013HY2-2016HY2. Robust standard errors, *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Total sample size: 411,425 observations of 25,895 individuals. ATC group definitions: A10 – drugs used in diabetes; C02-09 – drugs mostly used in hypertension; J01 – antibacterials for systemic use; N05 - psycholeptics; N06 - psychoanaleptics; R03 – drugs for obstructive airway diseases. 1 EUR $\approx$ 300 HUF in the analysed period.

E Effect of voluntary retirement by sector of work at age 58

Appendix Table A4: Effect of voluntary retirement by sector of work

Number of GP visits and logarithm of (positive) drug spending	GP visits	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Retirement	-2.490***	-0.006	0.039	-0.064	-0.186***	-0.073	-0.135
	[0.176]	[0.059]	[0.028]	[0.067]	[0.059]	[0.140]	[0.129]
Retirement × public sector	0.020	-0.045	-0.059***	-0.062	0.034	-0.022	-0.138
	[0.131]	[0.041]	[0.021]	[0.045]	[0.042]	[0.094]	[0.088]
Mean outcome (no logs, drug spending in HUF)	7.751	34,039	21,649	4,112	5,305	18,458	27,326

Binary indicators of use	Hospital stay	Alimentary tract & metabolism	Cardio-vascular	Anti-infectives	Musculo-skeletal	Nervous system	Respiratory system
Retirement	0.016	-0.006	-0.006	-0.048***	-0.072***	-0.012	-0.028***
	[0.012]	[0.012]	[0.010]	[0.016]	[0.014]	[0.009]	[0.011]
Retirement × public sector	-0.001	0.001	-0.016**	-0.028**	0.014	-0.010	-0.032***
	[0.009]	[0.009]	[0.007]	[0.012]	[0.010]	[0.007]	[0.008]
Mean outcome	0.152	0.357	0.635	0.294	0.295	0.131	0.152

Note: FE IV estimation results of equation (3). The sector of work is recorded at age 58. Standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Total sample size: 354,079 observations of 75,201 individuals. Drug categories: alimentary tract and metabolism – ATC A; cardiovascular system – ATC C; antiinfectives for systemic use – ATC J; musculo-skeletal system – ATC M; nervous system – ATC N; respiratory system – ATC R. 1 EUR ≈ 300 HUF in the analysed period.