Retirement Age and Cardiovascular Health: Evidence from Italian Administrative Data

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Extended abstract

In recent years, there has been a significant increase in interest regarding how retirement impacts individuals' physical and mental health. This topic has gained attention not only within the medical and psychological communities, but also among labour and health economists (Filomena and Picchio, 2023). The global population is ageing rapidly, as a result of a long-term decline in fertility rates and an increase in life expectancy (WHO, 2017; Eurostat, 2020). Reductions in infant mortality, universalisation of health services, automation of strenuous jobs, and a generalised improvement in living conditions are among the factors that have led to the overall extension of life. In the European Union, at the beginning of 2020, there were approximately 100 million older people (aged more than 65), constituting one-fifth of the total population. Over the next three decades, the population over 65 is projected to increase to around 130 million inhabitants by 2050, representing about one-third of the total population, according to demographic forecasts (Eurostat, 2020).

From an economic perspective, the increase in the absolute number and share of elderly individuals in society imposes several challenges related to population health, primarily due to the rise in the old age dependency ratio (the proportion between the number of elderly and the working-age population) and its negative consequences for the productive system, and the sustainability of social welfare, and public finances. One of the most important challenges is the adjustment of the pension system to the current and future demographic structure. In response to demographic ageing and its consequences, European governments have tried to increase the labour market participation of older workers and have started to reinforce eligibility criteria for statutory pension, by increasing the state pension age beyond 65 (Wahrendorf et al., 2017). These measures have a double dividend: by raising the retirement age, older individuals can be kept in the workforce longer, which increases payroll taxes and reduces pension expenditure, thereby reducing the overall financial burden of state pensions (Eurostat, 2020).

Regarding Italy, the pension system belongs to the so called notional defined contribution (NDC) pension system (Palmer, 2006). Introduced in 1995 with the Dini reform with a godfather clause, it is financed by a public *pay as you go* system, where the benefit depends on the accrual of contributions made during working life and where pension benefits are paid with the contribution of current employees.[1] The Fornero reform, implemented in 2012, accelerated the transition to NDC system extending the contributory method to all for contributions after 2012, raised the age and seniority requirements for old-age and early retirement pensions for both employees (public and private) and the self-employed and eliminated the seniority pension (*pensione di anzianità*, i.e. the one with 40 years of contributions, with no minimum age).[2]

[1] In a *pay as you go* system, both workers and employers participate in the contribution, with mandatory monthly contributions financing old-age benefits, survivor benefits and disability insurance for most of the working population (excluding some professional categories). The pension is calculated by considering the expected longevity at retirement, i.e., the number of years for which the State expects to pay the pension check. The accumulated amount is conversed into the annuity through the "transformation coefficients", which are parameters, today updated every two years, based on the average life expectancy of residents relative to a certain age established by law. Nowadays, the calculation of average life expectancy does not consider individual heterogeneity in expected longevity, which several authors in Italy have shown to be related to gender, health status, and socioeconomic status (among others, Costa et al., 2014; Ardito et al., 2024; Vigezzi et al., 2021). By not taking this difference into account, with equal contributions made, different life expectancy translates into different wealth enjoyed (Lallo and Raitano, 2018).

[2] The contributory system, introduced in 1995, gradually replaced the retributive system, which calculated pensions on the basis of contribution years and earnings in the last period of working life. This change caused the decrease of the

The general welfare effects of retirement policy reforms, such as an increase in pension age, should consider not only the impact in financial terms but also the impact on health (Kuhn, 2018). Analysing the impact of retirement on health is therefore of primary importance, and several studies, in epidemiology, sociology and health economics have documented the possible undesirable consequences of delaying retirement.[3] However, the literature provides inconclusive findings on the effect of retirement on health. The positive consequences stem from the fact that retirement has a protective effect on overall health (Coe and Zamarro, 2011) and is associated with an improvement in self-rated health (Vigezzi et al., 2021, in Italy). The mediating factors between transition to retirement and health benefits are associated with the reduction of the risk of depression (Odone et al., 2021), and with the positive effect on physical and mental health particularly for workers employed in physically demanding roles (e.g. Fontana et al. 2024; Ardito et al. 2020; Eibich, 2015; Carrino et al., 2020), poorer health at baseline (Serrano-Alarcón et al. 2023), possibly through an improvement on health preserving habits, such as practicing sports, smoking cessation and BMI management (Freisling et al., 2020).

On the contrary, other studies document a detrimental effect of retirement on health and cognitive functioning. Using data from the English Longitudinal Study of Aging, Behncke (2012) found a significant increase in CVD self-reported incidence associated with retirement. Using the SHARE survey, some authors find that retirement can lead to an acceleration of cognitive decline due to exiting the labour market and reducing efforts in cognitive activities (Mazzonna and Peracchi, 2012 and 2017). However, there is substantial heterogeneity in the effect of retirement on cognitive abilities across occupations and strata of workers, as shown in Mazzonna and Peracchi (2017) and Hale et al. (2021), who demonstrate that post retirement cognitive decline may accelerate more especially for workers exposed to better working conditions and with higher education, such as white collar and higher skilled workers.

In general terms, retirement may either improve or worsen retirees' health, depending on the relative importance of the different mechanisms (Kuhn, 2018). A common concern is that the heterogeneity in estimated retirement effects potentially stems from the identification strategy to detect causal effects (instrumental variable, regression discontinuity design or difference-in-differences), estimation method (linear, binomial, Cox proportional hazard), countries and periods under scrutiny, the health measure (mental or physical, objective or self-reported, mortality), or the type of pension transition in place (mandatory or voluntary, depending on the statutory retirement age legislation), and mediating factors, such as the previous job and voluntariness of retirement decision.

However, analysing the relationship between retirement (age) and health entails several methodological issues, detailed by Kuhn (2018), and related to reverse causality, country-specific

"replacement rate", i.e., the ratio of the retirement income to the employment income. Other important reforms, with elements still influential in today's system, include: (*i*) the Maroni reform of 2004, which raise the retirement age for old-age pensions (following the Amato reform in 1992) and set the criteria for complementary pension reform; and (*ii*) the Prodi reform of 2007, which introduces the system of "quotas" (determined by the sum of the statutory age plus years of contributions) to access to the pension check. As of January 1, 2019, the age requirement for retirement is 67, while a new reform of the pension system is under discussion for the upcoming 2025 budget law.

[3] According to the Grossman (1972) model, health can be viewed as a durable capital stock that produces an output of healthy time. It is assumed that individuals inherit an initial stock of health that depreciates with age and can be increased by investment. Individual activity affects one's stock of health and thus duration of life and the level of health of an individual is not exogenous but depends, at least in part, on the resources allocated to its production. Grossman model, however, concludes that health does not affect productivity. He assumes that human capital affects productivity and wage rate; health only affects the number of days a person can work (because they are not sick). Thus, in the Grossman's model, health affects one's annual salary but not one's hourly wage.

institutional settings (such as, statutory retirement age and healthcare expenditures financing) and outcome measures of health (self-assessment measures and objective measures). In particular, the bidirectional relationship between health and retirement is a well-known issue (Oksanen and Virtanen, 2012), particularly relevant for our analysis. On the one hand, retirement age and the type of retirement are influenced by health (voluntary retirement might be related to poor health or cognitive decline (Mazzonna and Peracchi, 2017); on the other hand, health is differentially influenced by retirement, depending on demographic, economic, and psychological factors (Schaap et al., 2018).

The aim of this paper is to analyse the relationship between retirement age and cardiovascular disease (CVD), a group of disorders that are among the top causes of death and hospitalization globally (WHO, 2020), and a major contributor to global health loss (Vos et al., 2020), CVD is a critical consideration in the context of retirement and pension reforms, particularly given the established link between demanding work conditions and CVD risk (Marmot et al., 1997; Perk et al., 2012; Holtermann et al., 2021). To this end we conduct the empirical analysis on a representative sample composed of Italian retirees, extracted from the Work History Italian Panel (WHIP-Health) database, a longitudinal administrative source of work and health histories data, managed by the University of Torino on behalf of the Ministry of health.[4] The database integrates different sources of data, such as administrative social security archives from INPS, the Italian Institute of Social Security, hospitalizations records from Ministry of Health, injury records from the INAIL, the National Institute for Insurance against Accidents at Work, and ISTAT mortality data. The database is the result of a deterministic linkage procedure, through a unique individual identifier, of different administrative archives (Bena et al., 2012). For the purpose of this analysis, we are interested in the labour and health section of this database.

The labour section of WHIP-Health is a database of individual work histories, built from the INPS management archives, comprising the population of private sector workers, who have carried out at least part of their working career in Italy, while public employment, predominant in education and health sectors, is not covered. The section on health is constructed by linking the individual information extracted from the INPS archives to the hospital discharge forms (*schede di dimissioni ospedaliere*, SDO), available from the Ministry of Health and collecting information relating to all hospitalization episodes, both ordinary and day-hospital, provided in both public and private hospital facilities throughout the national territory. Concerning the period covered by the database, the latest data update made it possible to reconstruct the health follow-up over the period 2001 – 2019. This information is useful for the construction of a follow-up of health status covering three years after retirement. Additionally, the advantage of using hospital discharge forms in place of a self-assessment measure of health is mainly due to the virtual elimination of measurement errors (Ardito et al., 2020).

Our empirical analysis is conducted on a representative sample of more than 107,000 Italian retirees, over the period 1990 – 2015 and adopting an instrumental variable approach to address issues related the endogeneity of retirement timing, our treatment variable. The outcome is observed at ages 68 – 70 for all the cohorts (i.e. the follow-up period). Our contribution to the literature is threefold. From a methodological point of view, since the relationship of interest between retirement age and health is affected by endogeneity, due both to reverse causality and omitted variables, we adopt an

[4] For more details, see https://www.salute.gov.it/portale/temi/p2_6.jsp?lingua=italiano&id=4792&area=Sicurezza%20lavoro&menu=vuoto and Bena et al. (2012).

instrumental variable approach, following closely the strategy adopted in Ardito et al. (2020) and coherently with the international literature on the health consequences of retirement, e.g. Mazzonna and Peracchi (2017). Reverse causality might depend on the correlation between poor prior health and both current health outcomes and retirement decision (Kuhn, 2018). In other terms, the relationship of interest might be affected by self-selection of poor-health individuals into retirement. On the other hand, omitted variables induce differences in individual characteristics, such as financial constraints or individual life expectancy, that might be correlated with both current health and retirement decision. Both issues determine a correlation between the error term and the treatment variable, i.e. retirement age, entailing biased estimates.

The first contribution of our paper is related to the fact that most previous studies, with few exceptions (e.g. Ardito et al., 2020), focus on retirement, rather than on retirement age. Studying the relationship between *retirement age* and post-retirement health is important for some papers, such as Eibich (2015), show that there is heterogeneity in the effects of retirement on health depending on the age at retirement. Moreover, understanding this relationship can help identify the best strategies to promote well-being among retirees and diseases prevention. Findings on this relationship can address policy decisions regarding the retirement age. If evidence shows that retiring later improves health and reduces healthcare costs, this could justify raising the retirement age. If it is found that retiring later has positive effects on health, it might be possible to delay the onset of age-related chronic diseases, such as cardiovascular conditions, thereby improving the quality of life for the elderly. Conversely, if retiring later negatively impacts health, because it prolongs exposure to stressing factors, pension policies might need to be revised. From a policy perspective, in the current economic and demographic context, understanding the effects of retirement age on health is therefore crucial for providing policymakers with credible estimates for designing pension systems, preserving the sustainability of pension systems, labour market reforms, designed to keep older people at work, and directing investments in the healthcare system to enhance individual and collective well-being (Filomena and Picchio, 2023; Kuhn, 2018). This is even more so considering the current pension reforms, aiming at increasing the retirement age and since Italy is involved in such reforms, it is an interesting case study.

The second contribution of our work is that we can control for both education and income in our regression analysis. Several studies (for instance, see Cutler and Lleras-Muney, 2006) document that there is a strong association between education and health. The obvious economic explanation is that education is related to income or occupational choice and therefore to health. Education and income are closely related, but it is unlikely that income and healthcare can entirely account for the association between education and health. Education does not fully capture the effect of income on health because of differences in health behaviours and unobserved factors. In sum, while education improves health in part through increased income and access to resources, it also affects health through other channels that are not fully captured by income. Although the topic has been variously addressed, to our knowledge there is no solid literature controlling in the same model for both education and income. Some studies consider education along with employment status (Van Zon et al., 2016; Hale et al., 2021), which can be considered proxies for income levels. However, there is a lack of studies that includes both education and income level in the same regression. The aim of this paper is to fill this gap.

Additionally, this paper contributes to the previous literature by going beyond the mean and considering the heterogeneity of the association between pension age and health in terms of individual education and income. While some studies find evidence of heterogeneous effects by gender, health,

and type of occupation, there are still relatively few studies on this aspect and the issue remains an open matter, as suggested by recent meta analyses on retirement and health (Filomena and Picchio, 2023; Garrouste and Perdrix, 2022).

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References

Afshar S., Roderick P. J., Kowal P., Dimitrov B. D., Hill A. G. (2015). Multimorbidity and the inequalities of global ageing: a cross-sectional study of 28 countries using the World Health Surveys. *BMC Public Health*, 15.

Ardito C., Leombruni R., Blane D., D'Errico A. (2020). To work or not to work? The effect of higher pension age on cardiovascular health. *Industrial Relations*, 59: 399-434.

Ardito, C., Zengarini, N., Leombruni, R., Costa, G., & d'Errico, A. (2024). Increasing inequalities in longevity among Italian workers. *Oxford Economic Papers*, gpae007.

Behncke, S. (2012). Does retirement trigger ill health?. *Health economics*, 21(3), 282-300.

Bena, A., Leombruni, R., Giraudo, M., & Costa, G. (2012). A new Italian surveillance system for occupational injuries: characteristics and initial results. *American journal of industrial medicine*, 55(7): 584-92.

Blake H., Garrouste C. (2019). Collateral effects of a pension reform in France. *Annals of Economics and Statistics*, 133: 57-86.

Carrino, L., Glaser, K., & Avendano, M. (2020). Later retirement, job strain, and health: Evidence from the new State Pension age in the United Kingdom. *Health economics*, *29*(8), 891-912.

Coe N. B., Zamarro G. (2011). Retirement effects on health in Europe. *Journal of Health Economics*, 30: 77-86.

Costa G., Bassi M., Gensini G., Marra M., Nicelli A., Zengarini N. 2014. *L'equità nella salute in Italia. Secondo rapporto sulle disuguaglianze sociali in sanità*. Milano: Franco Angeli.

Cutler D. M., Lleras-Muney A. (2006). Education and health: evaluating theories and evidence. *NBER working paper n. 12352*.

Eibich, P. (2015). Understanding the effect of retirement on health: Mechanisms and heterogeneity. *Journal of health economics*, 43, 1-12.

Eurostat (2020). *Ageing Europe. Looking at the lives of older people in the EU*.

Filomena M., Picchio M. (2023). Retirement and health outcomes in a meta-analytical framework. *Journal of Economic Surveys*, 3: 1120-55.

Fontana, D., Ardito, C., Leombruni, R., Strippoli, E., & d'Errico, A. (2024). Does the time spent in retirement improve health? An IV-Poisson assessment on the incidence of cardiovascular diseases. *Social Science & Medicine*, 354, 117084.

Freisling H., Viallon V., Lennon H. et al. (2020). Lifestyle factors and risk of multimorbidity of cancer and cardiometabolic diseases: a multinational cohort study. *BMC Medicine*, 18.

Garrouste, C., & Perdrix, E. (2022). Is there a consensus on the health consequences of retirement? A literature review. *Journal of Economic Surveys*, *36*(4), 841-879.

Grossman, M. (1972). Front matter, the demand for health: a theoretical and empirical investigation. In *The demand for health: a theoretical and empirical investigation* (pp. 20-0). NBER. Accessible at: https://www.nber.org/system/files/chapters/c3484/c3484.pdf

Hale J. M., Bijlsma M. J., Lorenti A. (2021). Does postponing retirement affect cognitive function? A counterfactual experiment to disentangle life course risk factors. *SSM - Population Health*, 15: 1-12.

Holtermann, A., Schnohr, P., Nordestgaard, B. G., & Marott, J. L. (2021). The physical activity paradox in cardiovascular disease and all-cause mortality: the contemporary Copenhagen General Population Study with 104 046 adults. *European heart journal*, *42*(15), 1499-1511.

Kuhn, A. (2018). The complex effects of retirement on health. IZA World of Labor. Accessible at: https://wol.iza.org/articles/the-complex-effects-of-retirement-on-health/long

Lallo C., Raitano M. (2018). Life expectancy inequalities in the elderly by socioeconomic status: evidence from Italy. *Population Health Metrics*, 16: 1-21.

Marmot, M. G., Bosma, H., Hemingway, H., Brunner, E., & Stansfeld, S. (1997). Contribution of job control and other risk factors to social variations in coronary heart disease incidence. *The lancet*, 350(9073), 235-239.

Mazzonna F., Peracchi F. (2012). Ageing, cognitive abilities and retirement. *European Economic Review*, 56: 691-710.

Mazzonna F., Peracchi F. (2017). Unhealthy retirement?. *Journal of Human Resources*, 52: 128-51.

Odone A., Gianfredi V., Vigezzi G. P. et al. (2021). Does retirement trigger depressive symptoms? A systematic review and meta-analysis. *Epidemiology and Psychiatric Sciences*, 30: 1-24.

OECD (2023). *Pensions at a glance 2023: OECD and G20 indicators*. Paris: OECD Publishing.

Oksanen T., Virtanen M. (2012). Health and retirement: a complex relationship. *European Journal og Ageing*, 9: 221-5.

Palmer E. 2006. *What is NDC?*. In Holzmann R., Palmer E. (eds.). *Pension reform: issues and prospects for NDC schemes*. Washington: World Bank Publishing.

Schaap R., de Wind A., Coenen P., Proper K., Boot C. (2018). The effects of exit from work on health across different socioeconomic groups: a systematic literature review. *Social Science & Medicine*, 198: 36-45.

Serrano-Alarcón M., Ardito C., Leombruni L. et al. (2023). Health and labor market effects of an unanticipated rise in retirement age. Evidence from the 2012 Italian pension reform. *Health Economics*, 32: 2745-67.

Van Zon S. K. R., Bültmann U., Reijneveld S. A., Mendes de Leon C. F. (2016). Functional health decline before and after retirement: A longitudinal analysis of the Health and Retirement Study. *Social Science & Medicine*, 170: 26-34.

Vigezzi G. P., Gaetti G., Gianfredi V. et al. (2021). Transition to retirement impact on health and lifestyle habits: analysis from a nationwide Italian cohort. *BMC Public Health*, 21.

Vos, T., Lim, S. S., Abbafati, C., Abbas, K. M., Abbasi, M., Abbasifard, M., ... & Bhutta, Z. A. (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a

systematic analysis for the Global Burden of Disease Study 2019. *The lancet*, *396*(10258), 1204-1222.

Wahrendorf M., Akinwale B., Landy R. Matthews K., Blane D. (2017). Who in Europe works beyond the state pension age and under which conditions? Results from SHARE. *Population Ageing*, 10: 269-85.

WHO (2017). *World population ageing*. Accessible at: https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Report.pdf

World Health Organization. (2020). Global Health Estimates 2020: Deaths by Cause. *Age, Sex, by Country and by Region*, 2000.