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ABSTRACT

Early Withdrawal of Retirement Savings After a Severe Health Shock: Evidence from Linked Administrative Data*

This paper examines how individuals respond financially to severe health shocks by analyzing early withdrawals from retirement savings following the initiation of cancer treatment (chemotherapy). Using comprehensive administrative data from Australia that link health, tax, and demographic records, we study behavior in a setting with universal health coverage and a mandatory retirement savings scheme that permits early access under hardship provisions. We find that early withdrawals increase significantly in the year of and the year after treatment, particularly among individuals who lose income or receive a terminal diagnosis. To interpret these patterns, we extend a dynamic Grossman-style model of health capital to account for survival probabilities and institutional features of the retirement system. Our findings show that health shocks prompt individuals to draw down retirement savings as a form of self-insurance, revealing how health risks interact with retirement policy. These results inform ongoing debates about the flexibility and adequacy of retirement savings systems.

JEL Classification: H55, I10, D14, D15, J32

Keywords: early retirement withdrawals, health shocks, income loss, administrative data, life-cycle savings

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1 Introduction

Pension plans and retirement savings are a cornerstone of financial security that are designed to provide income stability in retirement. However, the early withdrawal of retirement savings—particularly in the face of severe health shocks—has significant implications for individual financial wellbeing and the broader policy framework governing retirement savings. In this paper, we investigate the relationship between a severe and unexpected health shock, specifically the initiation of cancer treatment, and early retirement savings withdrawals using near-complete population data for Australia, a country with public health insurance and a mandatory retirement saving program.

Health shocks, such as a cancer diagnosis and associated chemotherapy treatment, impose substantial financial and psychological burdens (Jones et al., 2020; Mohanan, 2013; Smith, 1999; Trevisan and Zantomio, 2016). It is plausible that direct costs of treatment, lost income, an inability to work, and ancillary expenses can strain household budgets, leading individuals to access retirement savings prematurely. Despite the out-of-pocket costs for cancer patients being relatively low in Australia (Naghsh-Nejad et al., 2025), cancer and chemotherapy can be associated with a substantial loss of income, as we document in this paper. While pension and retirement savings systems in many countries include provisions for early withdrawals on compassionate or financial hardship grounds[1], little is known about how these mechanisms are utilized in practice. Understanding these dynamics is crucial for policymakers tasked with balancing the competing objectives of ensuring retirement income adequacy and providing immediate financial relief in times of crisis.

Using detailed administrative data from Australia, we exploit the unique features of the nation's retirement savings system, which allows for early access to retirement savings under compassionate grounds and specific financial hardship conditions. By linking health and financial records, we identify individuals initiating cancer treatment for the first time and track subsequent retirement savings withdrawal behaviour. Our focus on an unexpected and acute health shock, which in this case is cancer, means that we can better isolate the effects of a health event that is not primarily determined by prior behaviours or attitudes that might simultaneously influence both the likelihood of developing the condition[2] and the decision to withdraw retirement savings funds early. This approach reduces

[1] Early access to retirement savings for those with ill health or disability is allowed in a range of countries (Beshears et al., 2015). Out of 38 OECD countries, only 11 do not specifically allow early withdrawal of mandatory or voluntary retirement savings for a health-related factor (OECD, 2019). While the considerations differ, such as the type of fund and whether voluntary or employer contributions can be withdrawn, most countries (i.e. at least 27) do allow some limited use of retirement savings in response to poor health, disability, or high medical costs. Most of these cases are voluntary schemes where people can access their own contributions. But there are cases where mandatory schemes do allow people to access employer contributions, such as Australia, Mexico, Peru, Romania, and Switzerland. Peru even specifies cancer as an illness that could instigate an early withdrawal. Other countries, such as Korea and the United States, allow early withdrawal due to high medical costs. Specific details for each country are provided in the appendix, Table A1.

[2] Cancer is a disease that can be hereditary, related to lifestyle choices or exposure to contaminants, but tends to impact people at a random and unexpected time in someone's life. Studies have found that a substantial fraction of cancer driver gene mutations are due to random errors occurring during DNA replication in normal stem cells, which means that a "bad luck" component explains a far greater number of cancers than do hereditary and environmental factors (Nowak and Waclaw, 2017; Tomasetti and Vogelstein, 2015; Tomasetti et al., 2017).

potential confounding from traits such as a general risk-taking disposition and socio-economic factors, which could otherwise bias our results.

To further enhance the robustness of our analysis, we employ a later-treatment dynamic difference-in-differences model, similar to those used in studies by (Fadlon and Nielsen, 2019, 2021). This methodology enables us to account for unobserved differences across cohorts. Specifically, we compare the outcomes of individuals who first received cancer treatment between 2012 and 2017 to those treated for the first time between 2018 and 2023. By leveraging this staggered timing of treatment initiation, we can more precisely attribute differences in retirement savings withdrawal behavior to the onset of cancer, disentangling it from broader economic or policy changes during the study period. This empirical approach enables us to provide causal insights into the financial responses to health shocks, with broader relevance to other settings where early retirement savings access is permitted.

To understand the mechanisms and channels that influence the decision to make an early withdrawal from retirement savings we model the financial response to an unexpected severe health shock using a dynamic demand-for-health framework inspired by Grossman (2000) and Liljas (1998). In this framework, health is treated as a capital stock that depreciates over time, with uncertainty introduced through a random variable, δ, that accounts for unexpected health shocks. Following Grossman (2000), health depreciation is conceptualized as being determined by expected health declines and unforeseen events. Investments in health capital, such as medical care or exercise, and non-health goods are determined by household production functions, while overall wealth depends on assets, earnings, and time allocation. Unexpected health shocks lead to deviations in the expected health depreciation rate that impacts financial decisions, including early withdrawals from retirement savings. We extend the model by incorporating characteristics of the Australian 'Superannuation' system, which permits early retirement savings withdrawals in cases of severe health shocks, and link this to survival likelihoods (s) and terminal illness diagnoses, which influence consumption, savings, and bequests. To quantify the magnitude of health shocks, we use the number of prescriptions dispensed for an individual within one year of chemotherapy initiation and mortality data that allows us to capture a sub-sample of people who die a few years after cancer and chemotherapy. Our approach provides a comprehensive framework for understanding how severe health shocks alter lifetime savings behaviour, with specific relevance to policy settings that enable early access to retirement funds.

We find that severe health shocks significantly increase the likelihood and intensity of early retirement savings withdrawals, with important variation by income loss, illness severity, age, and survival expectations. Using administrative data and an event study design, we estimate that cancer diagnosis and chemotherapy lead to an 86% increase in the probability of withdrawal in the treatment year, rising to 95% in the following year, alongside persistent declines in annual earnings of over $8,800. The magnitude of response varies considerably with individual circumstances: those who suffer larger

income losses or experience more intensive treatment are significantly more likely to withdraw, as are renters and those without children. Withdrawals are especially concentrated among individuals in their 30s and 40s, who face both steep income losses and high household financial commitments. Importantly, individuals with limited survival prospects respond even more strongly, withdrawing up to 11% of their retirement savings in the year following treatment, consistent with updated beliefs about longevity and declining returns to future consumption. Taken together, the results highlight how early access to retirement savings serves as a de facto insurance mechanism in response to acute health and financial shocks, but also underscore the potential long-run costs for retirement security, particularly among midlife and economically vulnerable populations.

This paper contributes to several strands of the literature at the intersection of health and economic decision-making. First, we add to the body of research examining the interplay between health status and savings and pension decisions, e.g., Brown (2001); Capatina and Keane (2024); French and Jones (2011), by focusing on a previously understudied phenomenon—early withdrawals from retirement savings following severe health events.

Second, we contribute to the growing literature on the economic consequences of health shocks (Coile et al., 2022; Eriksen et al., 2023; Fadlon and Nielsen, 2019, 2021; García-Gómez et al., 2013). While prior work has explored impacts on labor supply, earnings, and broader household finances, to our knowledge, this is the first study to examine whether experiencing a severe and unexpected health shock increases the likelihood of making an early withdrawal from pension or retirement savings accounts. This provides new evidence on how households adjust long-term financial plans in response to short-term health-related income and liquidity constraints.

Third, we expand on recent research investigating the determinants and implications of early retirement savings withdrawals (Bateman et al., 2023; Hamilton et al., 2024) by introducing severe health shocks as a potential driver of these decisions. This highlights an important but previously overlooked link between health and retirement savings behavior that has implications for the design of pension and retirement saving systems and their flexibility during times of financial strain.

Finally, our findings contribute to ongoing debates about the adequacy of social insurance and welfare systems in buffering households against the economic fallout of health crises. In line with recent evidence (Coile et al., 2022; Fadlon and Nielsen, 2021) , our results suggest that existing support mechanisms may fall short in fully offsetting the financial burden of adverse health events, prompting individuals to draw down on long-term savings as a form of self-insurance (Bateman et al., 2023; Hamilton et al., 2024). The rest of this paper is structured as follows. Section 2 clarifies the institutional setting in Australia and section 3 provides a summary of the data. Section 4 details the theoretical foundation and section 5 explains the empirical estimation method. The results are presented in section 6 and section 7 concludes.

2 Institutional Setting

Australia has a universal public health insurance scheme known as Medicare, which provides free or subsidized access to most essential medical services for all Australian citizens and permanent residents. Medicare covers hospital treatment in public hospitals, general practitioner (GP) consultations, and a wide range of diagnostic and specialist services. Most prescription medicines are also subsidised under the Pharmaceutical Benefits Scheme (PBS). While out-of-pocket costs are relatively low by international standards, patients may still face expenses for private treatment, non-covered services, and co-payments. Previous research has shown that in case of cancer patients, while out-of-pocket costs are rising, they are relatively small (Naghsh-Nejad et al., 2025). However, there is no type of government support for individuals that are unable to maintain their work hours during their treatment and hence, they may lose income[3] and may face hardship maintaining their financial commitments.

Australias retirement income system is built around three pillars: a means-tested public age pension, compulsory retirement savings contributions, and voluntary private savings. Employers are legally required to contribute a proportion of an employee's earnings (currently a minimum of 11%) to a private 'Superannuation' fund where the funds are generally inaccessible until the preservation age, which is 65 years old. However, early access to these retirement savings is permitted under limited and tightly regulated circumstances. This includes compassionate grounds, which allow people to cover costs associated with medical treatment and medical transport, palliative care, home loan or council rate payments to avoid foreclosure, disability-related accommodations, and funeral or burial expenses for dependents (ATO, 2025a) [4]. Individuals can also contact their 'Superannuation' fund for financial hardship early withdrawals that are generally capped at $10,000. Generally, the average annual withdrawal is $24,000 per year, which depends on the amount of withdrawal granted on compassionate grounds by the Australian Taxation Office (ATO, 2025b).

3 Data

This study utilizes the Australian Bureau of Statistics' (ABS) Person-Level Integrated Data Asset (PLIDA), which is a comprehensive longitudinal dataset that links administrative records from mul-

[3]For individuals facing severe health shocks, such as cancer, the Australian welfare system provides limited direct support. Unlike many other countries, cancer patients in Australia are ineligible for disability support payments while undergoing treatment. This leaves unemployment benefits or the early withdrawal of retirement savings as the primary financial safety nets for those unable to work during extended treatment periods.

[4]Notably, early access to Superannuation was also granted as an emergency response during the COVID-19 pandemic. This policy served as a form of economic stimulus, allowing individuals to withdraw significant sums to mitigate financial stress. Approximately one in six working-age Australians took advantage of this provision, collectively withdrawing $38 billion, with the average participant withdrawing 51% of their Superannuation balance (Hamilton et al., 2023). This event highlighted the potential consequences of widespread early withdrawals, including reduced retirement savings and increased financial vulnerability in later life.

tiple government departments and national agencies. PLIDA provides near-complete coverage of the Australian resident population that enables detailed tracking of individuals' employment, income, healthcare utilisation, and demographic profiles over time. Its breadth and longitudinal structure make it a powerful resource for examining the impacts of major life events on economic and health outcomes (ABS, 2025).

We identify severe health shocks by focusing on when individuals commence chemotherapy, which typically follows soon after a cancer diagnosis and serves as a reliable, time-consistent indicator of serious illness. While this approach does not capture all cancer cases in Australia, it captures a clinically significant subgroup—those whose condition warrants intensive treatment that is likely to disrupt usual work and financial conditions. Importantly, both our treatment and comparison groups are defined based on the timing of chemotherapy initiation, which mitigates concerns that differences in treatment pathways (e.g., surgery-only or palliative care) could bias our estimates. The use of linked health service use and pharmaceutical data further enhances our design by providing information on individuals' healthcare use prior to diagnosis, which we use to proxy for baseline health status as well as providing indicators of treatment intensity post-diagnosis. This allows us to better account for heterogeneity in health needs and illness severity when examining behavioral and financial responses to cancer.

Administrative data from the Australian Taxation Office (ATO) provides comprehensive data on individuals' economic and retirement savings outcomes between 2009 and 2022. These records include detailed annual information on employment income, business earnings, investment returns, and other sources of taxable income during the Australian financial year (July 1 to June 30). Employment income—such as wages, salaries, commissions, and bonuses—is reported directly by employers as part of mandatory reporting requirements, which reduces concerns about measurement error or misreporting. In addition, the ATO provides annual information on Superannuation (retirement savings) withdrawals, enabling us to track retirement-related financial behaviour over time. We also accessed 'Superannuation' balances in 2019, which was also provided by the ATO, to calculate withdrawals as a percentage of aggregated retirement savings.

After combining all these data sets, we are left with 113,555 Australians under 60 who had one round of chemotherapy treatment. Those who underwent chemotherapy before June 2017 are the treatment group, and those who undergo chemo after July 2017 are the control group. Our main sample focuses on those who survive cancer at least 5 years post treatment initiation. We further re-estimate our results separately for a sample of 2509 individuals who survive 2 years after chemotherapy but do not survive 3-5 years post treatment initiation.

4 Impact of unexpected health shocks

As we focus on an unexpected health shock triggered by cancer, we adopt a Grossman-Liljas dynamic demand-for-health model where a random variable, δ, depreciates a person's stock of health. Liljas (1998) was influential by proposing that δ be used to introduce uncertainty about future health declines, which subsequently led Grossman to propose that the stock of health in period t will be impacted by this uncertainty in terms of a probability distribution of possible depreciation rates, δ, in each period (Grossman, 2000).

We follow the specification of Grossman where a person's utility function contains investments in health capital, I_t, and other commodities, Z_t. This is captured in two household production functions:

$$I_t = I_t\left(M_t, TH_t; E_t\right) \tag{1}$$

$$Z_t = Z_t\left(X_t, T_t; E_t\right) \tag{2}$$

where M_t is medicine and/or medical care, TH_t is time spent on health and/or exercise, X_t is the input of goods needed to produce other non-health commodities, which includes retirement savings assets, T_t is time spent producing these other non-health commodities, and E_t is the stock of educational capital, which contributes to the production of health and other non-health commodities.

Following the specification of (Liljas, 1998), the rate of decline in health is a function of depreciation, δ, and health status, H_t, defined as:

$$\frac{dH_t}{d_t} = \dot{H}_t = I_t - \delta_t(H_t, Q_t)\, H_t \tag{3}$$

where the actual depreciation of health between time periods is δ_t. This implies that a health shock will be the case where δ is greater than expected based on previous experience or expectations. This means that the impact of a health shock can be redefined using an expected and unexpected health depreciation. In this case, the stock of health in period t will be a function of δ, which is separated into expected, $\bar{\delta}_{t-1}$, and unexpected, $\bar{\delta}_{t-1}$ - δ_{t-1}, health declines. Using these terms, the change in health status after a health shock was defined by (Grossman, 2000) as:

$$H_t = H_{t-1} - \bar{\delta}_{t-1} H_{t-1} + I_{t-1} + R_{t-1} \tag{4}$$

where $\bar{\delta}_{t-1}$ is a mean or expected depreciation rate for a usual year and the revealed health shock is $R_{t-1} = \left(\bar{\delta}_{t-1} - \delta_{t-1}\right) H_{t-1}$. In terms of the health shock literature, a key issue is that the magnitude of the health shock is the difference between $\bar{\delta}_{t-1}$ and δ_{t-1}, where the realisation of δ is worse than expected.

In addition to health shocks, other factors are likely to impact the depreciation of health. (Muurinen, 1982) modified the Grossman model by revising health depreciation to account for aging, education and wealth effects. Equation 5 shows how age-induced changes in the stock of health will influence the change in health status after a health shock:

$$H_t = H_{t-1} - \varepsilon \left(\bar{\delta}_{t-1} + q + (\rho - r) \right) H_{t-1} + I_{t-1} + R_{t-1} \tag{5}$$

where ε is the marginal efficiency of health capital in reducing sick time and q is the percentage increase in the marginal cost of health investment over a lifetime, which is caused by the decreasing productivity of medical care as people age. (Muurinen, 1982) also specified that there are time dependent consumption benefits of health, which are a function of the rate of time preference, ρ, and the interest rate, r. So, when the rate of time preference is higher than the rate of interest, the health stock deteriorates even more rapidly as individuals with higher preference for the present would choose to let their health decrease at a faster rate than those with less 'myopic' views of the future. However, decreasing discount rates as people age have been discussed as an explanation for households under-saving when young and over-saving after retirement (Kureishi et al., 2021).

Following from equation 5, the health shock will also be influenced by these factors, so that the revealed health shock is specified as:

$$R_{t-1} = \varepsilon \left(\bar{\delta}_{t-1} - \delta_{t-1} + q + (\rho - r) \right) H_{t-1} \tag{6}$$

where the unexpected health decline interacts with age related factors and previous health status.

Once someone's health is depreciated, they will re-evaluate their lifetime savings decision based on a revised likelihood of survival, s, which will be a function of the stock of health, H, expected health depreciation, δ, and the intensity of a recent health shock, R. Combining the asset accumulation specification from (French, 2005) with the life cycle saving model from (Nardi et al., 2016) provides a dynamic problem:

$$V_{t+1} = s_t \left([r A_t + Y_t + \alpha S_t, \tau] - C_t \right) + (1 - s_t) \left(b_{t+1} \right) \tag{7}$$

where s_t is a variable that captures the likelihood of survival and b is the expected bequest to beneficiaries, which is likely to be based on the total savings, i.e., $[A_t + Y_t + S_t, \tau] - C_t$. When s_t is closer to zero, i.e. death more likely, then the amount that would be bequest becomes more important. But a terminal illness can also be a trigger for allowing people to withdraw all of their retirement savings. In this formulation, we have specified asset accumulation as the sum of assets, A_t, income, Y_t, and retirement savings, S_t, after taking away consumption, C_t.

Two new parameters account for the ability to withdraw a proportion of employer-paid retirement savings early, α, and the tax treatment of these income sources, τ, which could differ across these assets. In the Australian case, 'Superannuation' is a different asset class where individuals will have a different α based on their health and financial circumstances.

To account for the magnitude of the health shock, we use number of prescriptions and the level of health service use in the year of chemotherapy. We also use the actual incidence of death after the cancer diagnosis, which will reveal cases where s becomes close to zero. In Australia, a terminal illness is an additional reason that allows early retirement savings withdrawals, which means that there is a threshold where α and s_t are related. This could decrease the bequest motive compared with other countries.

In summary, the likelihood of withdrawing retirement savings early will be a function of: - the ability to withdraw employer-paid retirement savings early, α, which in Australia will increase with a health shock, worse health, higher medical bills, and financial stress (especially when mortgage payments are involved), - the incidence of an unexpected health shock, R, which will differ in impact based on an assessment of the likelihood of survival, s, and - the possibility of bequeathing assets in the next period, $1 - s_t\left(b_{t+1}\right)$, and, the rate of time preference, ρ, which is associated with age.

5 Empirical Method

To identify the causal effect of a severe health shock on retirement savings withdrawals, we implement a dynamic difference-in-differences (DiD) framework using a later-treated comparison group, following the approach of (Fadlon and Nielsen, 2019, 2021). Specifically, we compare changes in the outcomes (i.e. probability of accessing retirement savings, withdrawal amounts, and income) across individuals recently diagnosed with cancer (treatment group) and those who will receive the diagnosis at a later date (control group). Although cancer risk can be influenced by genetics, lifestyle, or environmental exposure, the timing of onset is typically unpredictable as a 'bad luck' component dominates and a precursor gene mutation needs to occur (Nowak and Waclaw, 2017; Tomasetti and Vogelstein, 2015; Tomasetti et al., 2017). This makes cancer a suitable context for this identification strategy. By leveraging variation in the timing of diagnosis, this method helps isolate the effect of a severe health shock from other factors that may be correlated with both the onset of illness and financial behavior. In this DID design, those who underwent chemotherapy before June 2017 are the treatment group, and those who undergo chemotherapy after July 2017 are the control group.

To estimate the impact of the health shock on outcomes, we estimate the equation below:

$$W_{i,r,t} = \sum_{r=-2}^{5} \partial_r I_r + \sum_{r=-2}^{5} \varnothing_r I_{i,r} treat_i + X_i\beta + \gamma_t + \varepsilon_{i,r,t} \tag{8}$$

where, $W_{i,r,t}$, is the outcome of interest for individual i (likelihood of withdrawl, withdrawl amount, or income), in time period r relative to the year of treatment, and in year t. $treat_i$is a dummy variable for those who underwent chemotherapy before June 2017 (i.e. the treatment group), and , $X_{i,pre}$ are the control variables such as gender, state of residence, residence in a capital city, being on concessions, and being foreign born. Age at each year is included as dummies. $\gamma_t$captures the year fixed effects[5].

We estimate the model in two ways. First, we implement the model by including the time to treatment periods as indicated in specification 1, shown in equation 8. Second, we focus on the cumulative impact of all post periods relative to pre periods by using the interaction of key variables and a dummy variable that captures the period after chemotherapy, shown in equation 9.

This difference-in-differences approach relies on the assumption that, in the absence of the health shock, the treatment and control groups would have exhibited similar trends in outcomes over time. To strengthen the credibility of this assumption, we focus on a sudden and well-defined health event, i.e. cancer, which helps reduce concerns about endogenous timing. We assess the validity of this assumption in two ways. First, Table 1 shows summary statistics for both treatment and control groups and we observe similarities in socioeconomic characteristics across two groups. Second, in Section 4, we examine patterns of retirement savings withdrawals prior to diagnosis. Again, we find no evidence of systematic differences, providing further support for the parallel trends assumption., we find no evidence of systematic differences, providing further support for the parallel trends assumption.

To examine heterogeneity by individual characteristics as developed in section 3, we use an interaction-based model. For clarity, we redefine the relative time variable into a binary 'post' indicator, capturing years 0–4 (post-treatment) relative to pre-treatment period of -4 to -2 (pre-treatment). This simplification allows for interactions with individual characteristics without introducing an overwhelming number of interaction terms. The heterogeneity model is as follows:

$$Y_{it} = \alpha Post_{it} + \delta Post_{it} * \ treat_{i\,i} \ + \tau Post_{it} * treat_i \ * I_{i,t} + X_{it}\beta + \ \gamma_t + \pi_i + \varepsilon_{it} \tag{9}$$

Here, $Post_{it}$ equals 0 for periods before diagnosis and 1 for years after. Here, $I_{i,t}$ represents individual characteristics of interest (e.g., high medical costs prior to cancer onset). In this regression, $\widehat{\delta}$ is the average estimated effect of cancer in years 0-4 for people without the specific individual characteristic, and $\widehat{\delta} + \widehat{\tau}$ is the corresponding estimate for people with the individual characteristic.

[5]Given that super withdrawals are a rare event, we use complementary log–log (cloglog) regressions for likelihood of withdrawal as an outcome (a binary variable). This specification provides estimates of a hazard ratio, which are the chance of an event occurring in the treatment group divided by the chance of the event occurring in the control group.

6 Results

6.1 Impact of health shock on early retirement savings withdrawals and earnings

Estimates of equation (8) are presented in Figure 2, which includes 3 event study graphs depicting the impact of the health shock on a) early retirement savings withdrawal rates (hazard ratios), b) withdrawal as a percent of total retirement savings, and c) annual income. Each graph covers nine time points, from three years before to four years after the shock, with chemotherapy treatment commencing in year t. The baseline comparison year is t-1.

Figure 2a shows that the health shock significantly increases the likelihood of early retirement savings withdrawals amounting to an 86% increase in withdrawals in the year of chemotherapy treatment. Heightened early withdrawals reach a peak at 95% in the year following the start of treatment and the estimate becomes insignificant at 4 years post start of chemotherapy. In figure 2b, the percentage of withdrawal amount (based on total savings in 2019) increases significantly in the year of chemotherapy treatment by 2.4% and reaches its peak in the year following treatment at 3.4%.

Figure 2c. shows the impact of the health shock on annual salary and wages (in real terms, corrected for annual CPI and pegged to 2012 dollars). On average, the decrease in salary was $6040.42 in the year of chemotherapy treatment and $8832.78 in the year following the start of treatment. In this case, the salary decline remains statistically significant 4 years after the initiation of chemotherapy treatment but is lower and estimated to be $4133.44. This decline could be due to working less hours and/or taking unpaid leave when sick leave entitlements run out, or in some cases exiting employment. These results highlight the financial strain on cancer patients beyond the costs for health care.

6.2 Variation in effects by health and financial circumstances

This section examines how individual health and financial circumstances shape the likelihood of early withdrawals. We focus on two broad sets of explanatory factors: (i) health-related variables, capturing both pre-existing health status and the severity of the health shock, and (ii) financial variables, reflecting exposure to economic stress and liquidity constraints. To do this, as explained in section 4, equation 9, we measure the cumulative impacts of post periods relative to pre periods prior to the health shock, interacting the health shock variable with factors of interest: health and financial factors.

6.2.1 Health-Related Drivers

Table 2, Panel A, presents the coefficient estimates for the interactions between the health shock and indicators of health status and illness severity. To proxy for baseline health status, we use two separate indicators measured in the year prior to chemotherapy initiation: (1) above-median use of healthcare services (e.g., GP and specialist visits, imaging, pathology), and (2) above-median pharmaceutical use (based on PBS records). Each of these indicators reflects greater health needs and is assumed to capture poorer underlying health. When examined independently, both indicators are associated with a higher likelihood of early retirement withdrawals—42% and 22% increases, respectively—relative to the baseline. However, when all health variables are included together (Table 1, Column 5), the predictive power of these pre-treatment health status indicators disappears. This suggests that baseline health status does not drive withdrawal behavior once other factors are accounted for.

In contrast, health shock severity, as proxied by above-median healthcare use and pharmaceutical prescriptions in the year following chemotherapy initiation, shows strong and consistent effects. Individuals with higher-than-median post-treatment pharmaceutical use are 46% more likely to withdraw, and those with higher-than-median post-treatment health service use are 39% more likely to do so. These results remain consistent when estimated together with prior health indicators in column 5. These results indicate that the intensity and burden of the illness, rather than prior health status, are more salient in prompting individuals to access their retirement savings prematurely.

This finding supports the behavioral predictions of our model in Section 4: when facing an unexpected and severe health shock, individuals whom their health depreciated more than expected, may re-evaluate their assessment of the probability of reaching retirement age, placing greater weight on immediate liquidity over long-term savings.

6.2.2 Financial Strain and Economic Constraints

Table 1, Panel B, turns to the role of financial stress in shaping withdrawal behavior. First, we examine the effect of income loss, measured as a reduction in salary in the year after treatment compared to the year prior. This variable has the largest effect among all financial indicators—a 164% increase in the likelihood of withdrawal—highlighting how the erosion of income due to illness substantially increases demand for liquid resources. This aligns with prior literature documenting that income shocks are a key driver of early access to savings, e.g., Amromin and Smith (2003).

Next, we consider the role of medical out-of-pocket (OOP) expenses. Although Australia's public health system provides a relatively generous coverage for cancer care, some patients still incur non-trivial OOP costs. We define financial strain from treatment as having above-median OOP costs in the year following treatment onset. The associated increase in withdrawal likelihood is a modest 10

percentage points and is only weakly significant. This result suggests that while medical costs do exert some pressure, they are less influential in terms of causing financial strain in the Australian context when compared with income losses.

We further investigate the impact of housing tenure—a key determinant of financial flexibility. Renters are 69% more likely to withdraw, underscoring how lack of housing security and regular rent obligations increase liquidity needs. In contrast, individuals with a mortgage do not differ significantly from the baseline. Interestingly, those who own their home outright are 31% less likely to withdraw, indicating that financial security and the absence of housing-related cash flow commitments buffer against the need to tap into retirement savings. However, this effect becomes statistically insignificant when all financial variables are included jointly (Table 1, Column 7), possibly due to correlation with other variables, such as income and rental status.

Another notable factor is having children, which may invoke a bequest motive as discussed in section 4. Individuals with children are 34% less likely to withdraw early, consistent with a preference to preserve long-term savings for intergenerational transfer. This finding supports the idea that family structure shapes financial decision-making under health-related uncertainty.

6.2.3 Joint Role of Health and Financial Strain

Finally, in Column 8 of Table 1, we jointly estimate the effects of both health and financial factors. The results reaffirm the importance of both sets of variables: individuals with more severe illness, income loss, and renter status face significantly higher likelihood of early withdrawals, while having children continues to have a lower higher likelihood of early withdrawals.

Taken together, these results demonstrate that early withdrawals from retirement savings are not a uniform response to a health shock. Instead, they are heavily influenced by the interaction of illness severity and economic vulnerability. For example, an individual who experiences a severe illness, faces a drop in income, rents rather than owns, and does not have children is estimated to be 247 percentage points more likely to make an early withdraw relative to someone without these characteristics. This underscores the compounded impact of simultaneous health and financial shocks and highlights the need for policies that better support vulnerable individuals during major life events.

6.3 Role of age

As outlined in section 4, economic theory and empirical evidence suggest that age plays a pivotal role in shaping saving behavior. Younger individuals are typically more present-biased, heavily discounting future consumption, and thus tend to under-save for retirement (Nkoutchou and Eiselen, 2012). In contrast, older individuals—particularly those approaching retirement—are more likely to preserve

retirement wealth, often exhibiting precautionary savings or over-saving behavior. In this section, we test whether the behavioral response to a serious health shock in terms of early withdrawals from retirement savings varies across age groups.

Figure 3 illustrates the age-gradient in the effect of cancer diagnosis on the likelihood of withdrawing from superannuation accounts. Our findings, presented in Figure 3a, reveal a non-linear pattern: while the probability of early withdrawal is elevated among younger adults, it peaks for individuals in their 40s (specifically, those aged 40–49). This pattern is consistent with more than just myopic financial behavior. Individuals in their 40s are often in their peak earning and career-building years but may also face the heaviest financial commitments—including mortgage repayments, dependent children, and other family-related expenses. The dual burden of rising household obligations and a sudden health shock can severely constrain liquidity, making early access to retirement savings a necessary coping strategy rather than a purely myopic choice.

When examining withdrawals as a proportion of retirement account balances, Figure 3b, individuals in their 30s and 40s again stand out. Among those aged 30–39, withdrawals amount to an average of 5.5% of their total retirement savings—more than double the proportion withdrawn by individuals in their 50s, where the equivalent range is 2.1% to 2.8%.

Moreover, we observe that the greatest income loss following the health shock occurs for individuals aged 30–39, with average annual earnings declining by nearly $15,000 in the year after chemotherapy initiation (figure 3c). For those aged 40-49, the decline is $11,000. Those aged 50-59 have lower salary losses with a decline of $6,600. These differences suggest that midlife individuals are more exposed to both income shocks and liquidity constraints and may be withdrawing not only more frequently but also more deeply into their retirement reserves.

In contrast, individuals in their 50s—despite being closer to retirement and potentially less concerned about preserving long-term savings—appear to exercise greater restraint. Their lower withdrawal rates may reflect higher accumulated balances, better access to alternative safety nets (e.g., long-term leave entitlements or accumulated savings), or stronger incentives to preserve retirement saving balances as retirement becomes more imminent.

Overall, the age pattern in withdrawal behavior suggests that financial vulnerability following a health shock is highest among those in midlife, who are squeezed between rising family costs, housing commitments, and income disruption.

6.4 Impact of survival expectations

To further examine the role of perceived longevity in shaping withdrawal behavior, we estimate Equation 8 for a distinct group of individuals who survive at least two years following the onset

of chemotherapy but do not survive beyond the five-year window (as opposed to our main sample, where all individuals survive at least 5 years post diagnosis). This allows us to focus on a sample of 2,509 individuals who likely received clearer signals about the severity and limited duration of their remaining life expectancy during the early stages of treatment. To ensure comparability and the availability of outcomes, we restrict analysis to the first two years post-treatment initiation (t+1 and t+2).

Figure 4 presents the results for this group and shows a markedly stronger response to the health shock compared to the baseline sample. This is consistent with predictions from our theoretical model in section 4, which suggests that individuals revise their intertemporal preferences when faced with new information about reduced survival prospects. Here, there is an unexpected health depreciation that substantially impacts the likelihood of survival. In particular, the expected utility from future consumption—especially in retirement—declines substantially, leading to a rational increase in early consumption financed through retirement saving withdrawals[6].

Figure 4a illustrates that for individuals in this reduced-survival group, the probability of withdrawing from retirement savings increases dramatically: by 164% in the year of chemotherapy treatment, and by 194% and 165% in the first and second years after treatment, respectively. These effects are not only larger in magnitude than in the broader population, but also more persistent over time, suggesting that the behavioral response is closely tied to the recognition of limited remaining lifespan.

Consistent with this financial stress and altered survival expectations, we find that the intensity of withdrawals from retirement accounts also increases substantially, refer to Figure 4b. Withdrawals as a percentage of retirement savings rise to 11% in year t+1 and 6% in year t+2, compared to 2–5% in the general sample. These are sizeable drawdowns that may have limited long-term consequences for individuals who do not expect to live into traditional retirement ages but highlight the extent of financial need and re-optimization under severe health conditions.

In Figure 4c, we document the corresponding decline in earnings for this group. Their annual salary falls by nearly $8,000 in the treatment year, followed by even more substantial declines of $11,000 to $13,000 in the two years following chemotherapy. These losses likely reflect both the inability to continue working due to deteriorating health, early retirement when there is a terminal diagnosis, and, possibly, reduced employer demand due to the uncertainty surrounding long-term availability for work.

[6] A terminal condition is also part of the reasons that allows early retirement savings withdrawals.

7 Conclusions

This paper provides novel evidence on how individuals respond to severe and unexpected health shocks—specifically, a new cancer diagnosis—by drawing down on their retirement savings through early withdrawals. Using linked administrative data from Australia, which integrates health, taxation, and demographic information for almost the entire population, we quantify the incidence and magnitude of early retirement savings withdrawals before and after the onset of cancer treatment. Our empirical strategy, based on a dynamic difference-in-differences framework, allows us to estimate the causal impact of health shocks on early retirement savings access in a setting where such access is tightly regulated and contingent upon demonstrable financial hardship or terminal illness.

We find that there are significant increases in early withdrawals in the year of and the year following chemotherapy initiation. These effects are exacerbated for individuals who experience substantial income losses following their diagnosis, consistent with liquidity constraints being a primary determinant of withdrawal behavior. Furthermore, withdrawals are particularly large among those diagnosed with a terminal illness, suggesting that expectations around survival—and thus the future value of retirement savings—play a central role in shaping financial responses. Our dynamic health capital model, adapted from Grossman and Liljas, provides a theoretical foundation for interpreting these behaviors as rational responses to revised expectations for future health status, longevity, and income potential in the presence of uncertain depreciation of the health stock.

Our findings contribute to multiple literatures. First, we add a new dimension to the extensive body of work on the economic consequences of health shocks, showing that one important channel of adjustment is the early liquidation of long-term savings. Second, we bridge the health and retirement economics literatures by showing that pension and retirement savings systems, while primarily designed to ensure income security in old age, are increasingly used as de facto insurance mechanisms during working life in the absence of more responsive social insurance. Third, we provide empirical evidence to inform the ongoing policy debate around the design of pension and retirement savings systems with early access provisions. While such flexibility may provide necessary short-term relief, it may come at the cost of diminished retirement readiness, especially for individuals with lower lifetime earnings and limited alternative assets.

Importantly, our results highlight a tension in public policy: the need to support individuals during acute health and income shocks without undermining the long-term objective of retirement income adequacy. The use of retirement savings as financial support in the face of a health shock is likely to occur elsewhere, as at least 27 countries allow early access to retirement savings for those with ill health, high medical bills, or disability. Although Australia's retirement savings (Superannuation) system includes compassionate access provisions, the data suggest that these may be serving as

substitutes for more direct income replacement mechanisms. This raises broader questions about the sufficiency of Australias—and by extension, other countries'—social safety nets in cushioning economic vulnerability during periods of poor health.

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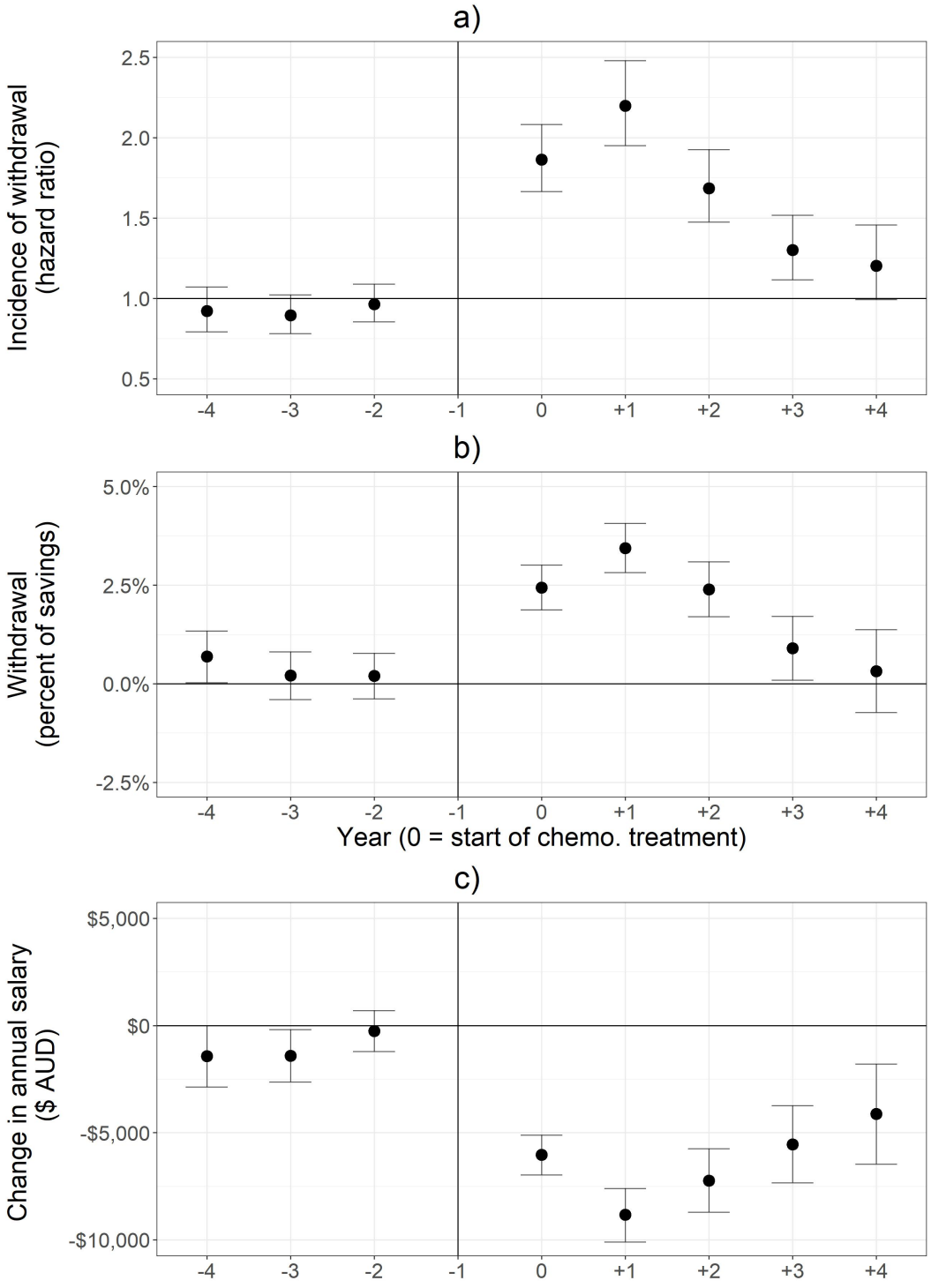
Main tables and figures:

Table 1 – Summary statistics for the whole sample, the treatment group and the control group

Variable	**All sample**		**Treatment group**		**Control group**	
	Mean	N	Mean	N	Mean	N
Annual salary	52,929.44	672,275	51,379.90	217,261	53,669.32	455,014
Aged in 30s	0.17	672,275	0.17	217,261	0.17	455,014
Aged in 40s	0.34	672,275	0.35	217,261	0.33	455,014
Aged in 50s	0.44	672,275	0.43	217,261	0.45	455,014
Female	0.62	672,275	0.67	217,261	0.60	455,014
Married	0.73	672,275	0.73	217,261	0.73	455,014
Has children	0.86	672,275	0.86	217,261	0.87	455,014
Single parent	0.08	672,275	0.08	217,261	0.08	455,014
Born outside Australia	0.27	672,275	0.27	217,261	0.28	455,014
Owns home outright	0.23	672,275	0.24	217,261	0.23	455,014
Has a mortgage	0.53	672,275	0.54	217,261	0.53	455,014
Renter	0.20	672,275	0.18	217,261	0.20	455,014

Notes: All monetary values are in Australian dollars. Means are reported separately for the full sample, the treatment group, and the control group. All characteristics are pre-cancer characteristics. Annual salary is reported for the base year (year -1).

Figure 1 - Estimated effects on withdrawal and salary



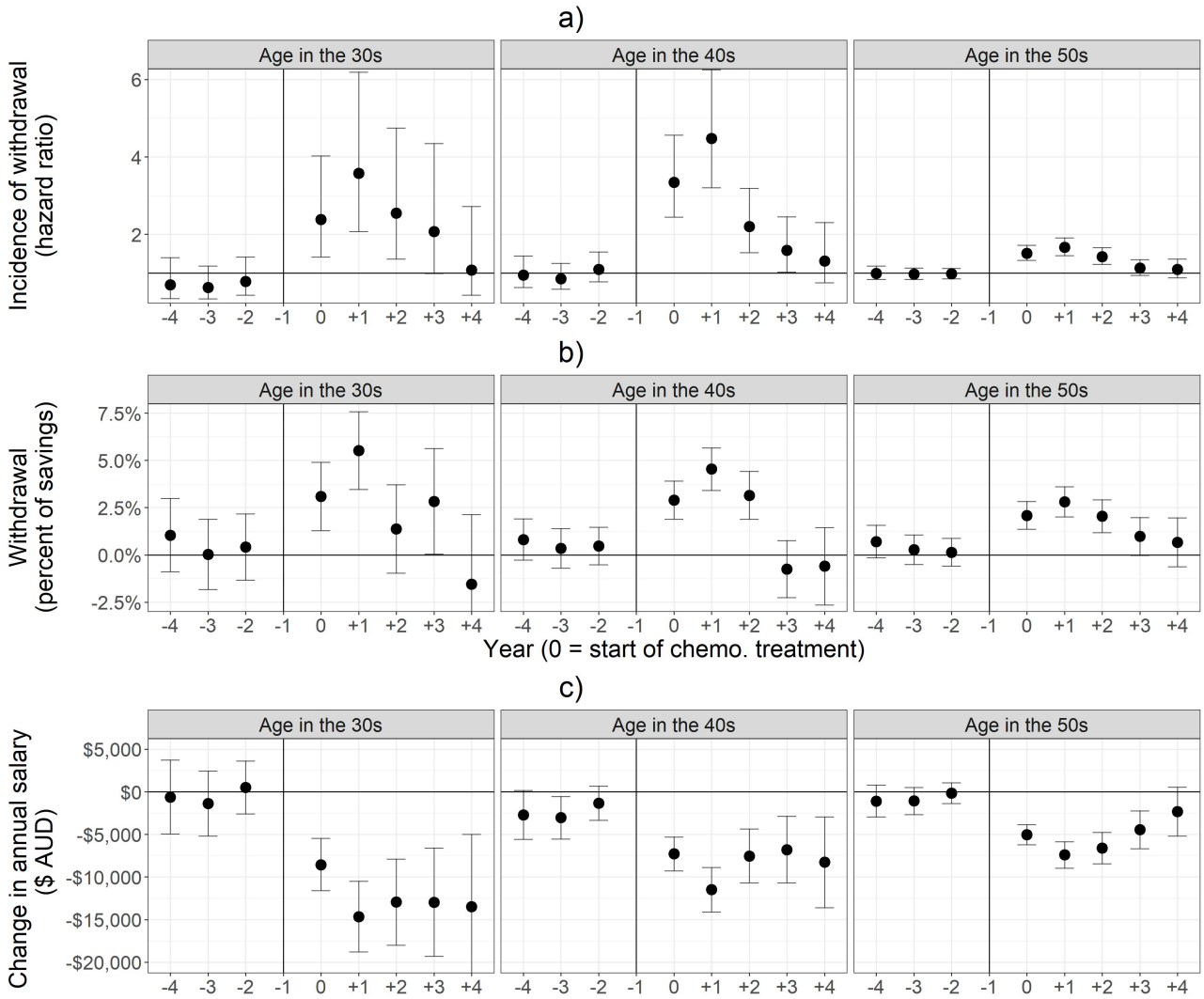
Notes. Horizontal access shows time (year) relative to year of initiation of cancer treatment. Baseline is at year -1. Vertical access is income in dollars. Figure (a) indicates the impact of initiation of cancer treatment on likelihood of withdrawal from retirement savings . Figure (b) indicates the impact of initiation of cancer treatment on percent of the withdrawal from total saving. Figure (c) shows the impact of initiation of cancer treatment on salary.

Table 2 - Estimated effects of health and financial factors

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Panel A. Health effects								
Main effect	1.55***	1.97***	1.65***	1.79***	1.423***			1.43*
	(0.15)	(0.10)	(0.11)	(0.10)	(0.14)			(0.28)
Interaction effects								
Health pre cancer (services)	1.42***				1.078			1.014
	(0.13)				(0.13)			(0.12)
Health pre cancer (pharma)		1.22***			1.086			1.103
		(0.08)			(0.07)			(0.07)
Severity (services)			1.39***		1.24***			1.21***
			(0.09)		(0.10)			(0.10)
Severity (pharma)				1.46***	1.363***			1.31***
				(0.09)	(0.09)			(0.09)
# of observations	457899	457899	457899	457899	457899			
Panel B. Financial effects								
Main effect	1.30***	1.98***	2.12***	1.93***	2.37***	3.17***	1.75***	
	(0.07)	(0.12)	(0.12)	(0.09)	(0.12)	(0.29)	(0.32)	
Interaction effects								
Salary loss	2.63***						2.55***	2.51***
	(0.16)						(0.15)	(0.15)
High medical costs		1.1*					1.13*	0.99
		(0.07)					(0.07)	(0.07)
Housing tenure								
Mortgage			0.10				1.02	1.01
			(0.06)				(0.16)	(0.16)
Renter				1.69***			1.50**	1.44**
				(0.13)			(0.25)	(0.24)
Home owner					0.69***		0.80	0.80
					(0.04)		(0.13)	(0.13)
Children (bequest motive)						0.63***	0.66***	0.66***
						(0.06)	(0.06)	(0.06)
# of observations	457899	457899	457899	457899	457899	457899	457899	457899

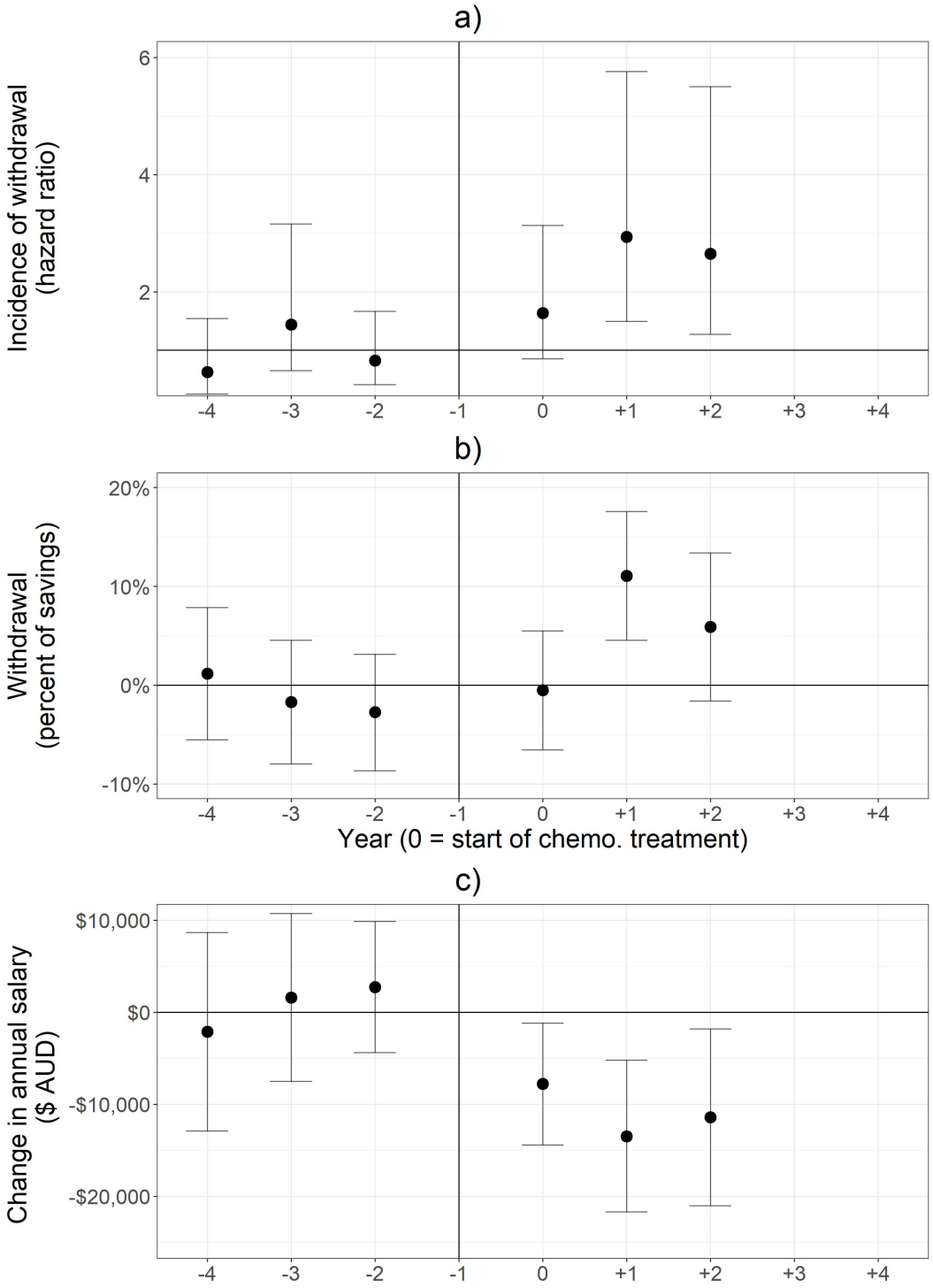
Notes. Statistical sig, *** p<.01, ** p<.05, * p<.1, observation numbers in all columns 457899. Cloglog regressions ? no R-Squared reported. The columns in each panel depicts separate estimations using interaction variables on likelihood of early withdrawal from retirement saving, except for column 8 where the estimations includes interactions from both panels. Panel A refers to impacts of health. Health pre cancer is interactions between treatment indicator and indicators of above-mean pre cancer health care use (either services or pharma) in the base year (t=-1). Panel B refers to impact of financial factors. The salary loss row represent estimated interactions between treatment indicator and indicators of an individual had a loss in income in the year of treatment relative to the base year. The High medical costs row shows estimated interactions between treatment indicator and indicators of an individual had above mean out of pocket costs in the year following the start of cancer treatment. The housing tenure variables show the interaction between treatment variable and the housing tenure of an individual as indicated in census 2011 (prior to onset of cancer). The children row indicates the interaction between having children and treatment. The estimates are based on equation 9.

Figure 2 - Estimated effects on withdrawal and salary by age groups



Notes. Horizontal access shows time (year) relative to year of initiation of cancer treatment. Baseline is at year -1. Vertical access is income in dollars. Figure (a) indicates the impact of initiation of cancer treatment on likelihood of withdrawal from retirement savings . Figure (b) indicates the impact of initiation of cancer treatment on percent of the withdrawal from total saving. Figure (c) shows the impact of initiation of cancer treatment on salary.

Figure 3 -Estimated effects on withdrawal and salary for non-survivors



Notes. Horizontal access shows time (year) relative to year of initiation of cancer treatment. Baseline is at year -1. Vertical access is income in dollars. Figure (a) indicates the impact of initiation of cancer treatment on likelihood of withdrawal from retirement savings . Figure (b) indicates the impact of initiation of cancer treatment on percent of the withdrawal from total saving. Figure (c) shows the impact of initiation of cancer treatment on salary.

Appendix 1 – Review of countries that allow early pension or retirement savings withdrawals for illness, disability, or to cover medical costs

Table A1 - Countries that allow early access to mandatory and voluntary retirement savings plans

Country	Early access allowed – mandatory scheme	Early access allowed – voluntary scheme	Granted for disability and/or illness	Granted for severe financial hardship	Granted for financing real estate	Other reason
Australia	Yes	Yes	Becoming disabled or terminally ill; Compassionate grounds (e.g., medical treatment or transport, mortgage assistance, expenses associated with a death of a dependent)	Severe financial hardship	First home buyers can apply to release their voluntary contributions (up to AUD 15,000 per year or AUD 30,000 in total), along with associated earnings, to help purchase their first home	Low balance; Temporary residents permanently leaving Australia
Austria	N/A	No				

Belgium	N/A	Yes		If stipulated in the plan rules, it is possible to use occupational pensions to finance real estate (buying, building, or renovating).	
Canada	N/A	Yes	Shortened life expectancy due to physical or mental disability	Some registered retirement savings plans allow to buy or build a qualifying home for themselves (first-time home buyers) or for a related person with a disability	
Chile	No	Yes			
China	No	Yes	Employees may be entitled to the enterprise annuity if they no longer have the capability to work		
Colombia	Yes	Yes	Allowed for voluntary personal plans	Allowed for voluntary personal plans	Low or high balance
Costa Rica	No	Yes	Being in a state of disability or terminal illness		

Denmark	No	Yes	Allowed for voluntary personal plans			
Estonia	No	Yes	Allowed for voluntary personal plans - fully and permanently disabled			
Finland	No	Yes – for some cases	Voluntary personal funds may allow in the case of long-term disability or the death of a spouse	Voluntary personal funds may allow in the case of unemployment		Voluntary personal funds may allow in the case of divorce
France	N/A	Yes – for some cases	Invalidity; Death of partner	End of unemployment benefits after involuntary unemployment	Purchase of the principal home (for voluntary contributions only)	
Germany	N/A	Yes – for some cases			Purchase of owner-occupied housing	
Greece	N/A	Yes				Low balance
Hungary	N/A	Yes – for some cases				
Iceland	No	Yes	In the case of serious accidents or illnesses resulting in a reduction in work capacity		Can be used to pay down residential housing debt	

Ireland	N/A	Yes	In the event of serious ill-health			
Israel	Yes					Low balance; retirement or closing their business
Italy	N/A	Yes	In the event of permanent disability and for health expenses (including for the spouse and children)	Unemployment exceeding 48 months, resignation, or dismissal	Buying/repairing the first house for themselves or their children	
Japan	N/A	Yes – for some cases				
Korea	Yes	Yes	Medical care costs incurred for minimum 6-month convalescence from illness or injury	Declared bankrupt	Purchase a house; Responsibility for the tenancy deposit or a security deposit for residential purposes	College tuitions, wedding expenses, or funeral expenses; Damage inflicted by a natural disaster
Latvia	No	Yes	Severe disability; Death of heirs			If a participant works in a profession that has an earlier retirement age
Lithuania	N/A	Yes – for some cases				
Luxembourg	N/A	Yes – for some cases	Lower tax in case of severe illness or invalidity			

Mexico	Yes	Yes	Long-term voluntary contributions can be withdrawn for disability or incapacity for remunerated work	Unemployment		
Netherlands	No	No				
New Zealand	N/A	Yes	Illness, injury or disability that either permanently affects the ability to work or poses a risk of death	Significant financial hardship	Purchasing or building a first home (after 3 years of membership	Permanent emigration to countries other than Australia
Norway	No	No				
Peru	Yes	Yes	Early retirement can also be taken if the individual diagnosed with a terminal illness or cancer that reduces their life expectancy (validated by a medical commission) and are unable to access a disability Pension may opt to retire early			

Poland	N/A	Yes – for some cases	Savings can be withdrawn in case of severe illness (of participant, spouse, or children)		Savings can be temporarily withdrawn to buy a real estate. They must be repaid within 15 years	
Portugal	N/A	Yes	Refund of own contributions in case of serious illness or permanent disability	Refund of own contributions in case of long-term unemployment	For the payment of instalments of mortgage-backed credit on the participants permanent residence	
Romania	Yes	Yes	If a participant becomes incapacitated to work due to invalidity			
Spain	N/A	Yes	In the event of serious illness	In the event of long-term unemployment		
Sweden	N/A	Yes	Exceptional reasons (e.g. serious physical or mental illness)	Insolvency		Low balance
Switzerland	Yes	Yes	Certain cases of disability			Low balance; they leave Switzerland definitively (in principle, to a country outside the EU)

Turkey	N/A	Yes	Disability or death		
United States	N/A	Yes	Unreimbursed medical expenses exceeding 10% of adjusted gross income; permanent and total disability	Plans may allow participants facing a hardship to take a withdrawal on account of an immediate and heavy financial need	Costs directly relating to the purchase of a principal residence; payments necessary to prevent eviction from, or foreclosure on, a principal residence

Note: Adapted from OECD (2019) Formal access to retirement savings plans of workers in non-standard forms of work.

Appendix 2 – Regression results

Table B1 – Estimates corresponding with Figure 1a, 2a, and 3a

	Main results	Aged 30s	Aged 40s	Aged 50s	Non survivors
Year -4	0.921	0.696	0.953	0.996	0.626
	(0.071)	(0.248)	(0.201)	(0.088)	(0.288)
Year -3	0.894	0.629	0.856	0.972	1.436
	(0.061)	(0.202)	(0.166)	(0.076)	(0.577)
Year - 2	0.965	0.782	1.092	0.982	0.828
	(0.060)	(0.237)	(0.193)	(0.068)	(0.295)
Year 0	1.863***	2.388***	3.342***	1.511***	1.636
	(0.106)	(0.638)	(0.531)	(0.097)	(0.541)
Year 1	2.199***	3.578***	4.476***	1.666***	2.935***
	(0.135)	(1.000)	(0.761)	(0.117)	(1.009)
Year 2	1.686***	2.547***	2.205***	1.425***	2.645***
	(0.115)	(0.809)	(0.414)	(0.112)	(0.989)
Year 3	1.300***	2.075*	1.586**	1.126	3.096***
	(0.102)	(0.783)	(0.354)	(0.102)	(1.300)
Year 4	1.203*	1.082	1.315	1.096	3.432**
	(0.118)	(0.509)	(0.377)	(0.123)	(1.789)
Number of observations	672,275	112,475	227,391	299,119	13,946
Number of groups	113,555	27,910	52,904	67,488	2,509

Note: Statistical sig, *** p<.01, ** p<.05, * p<.1, observation numbers shown above. The table above corresponds to the likelihood of withdrawl results shown in figures 1a, 2a, and 3a.