Extended Abstract for the European Population Conference 2026

The Timing of Cancer Onset and its Labour-Market Consequences

Jana Ströbinger[*]
Yuliya Kulikova[†,‡]
Sonja Spitzer[*,†]

1 Introduction

Cancer survival has risen dramatically, yet surviving the disease often brings lasting social, health, and economic consequences. While prior research documents substantial labour-market penalties following cancer, less is known about how these effects differ across the life course. This study examines how the timing of a first cancer diagnosis shapes subsequent labour-market trajectories and survival, using comprehensive Austrian administrative data and an event-study difference-in-differences approach.

By linking the Austrian cancer and mortality registries to longitudinal social-security and income records, we construct a large, panel dataset following individuals before and after first diagnosis. Using matched control groups and event-study difference-in-differences designs, we quantify the dynamic effects of cancer on employment, hours worked, income, and mortality, thereby exploring its impact on healthy life years and working life years. Importantly, we examine heterogeneity by age at onset, but also tumour stage and cancer site.

Our analysis reveals that the timing of cancer over the life course critically shapes recovery patterns. Young survivors tend to re-enter employment but often reduce hours or shift into part-time work. Individuals diagnosed in mid-career, especially in their forties, experience the largest short-run employment and earnings losses. Late-career workers, by contrast, face persistent labour-force exit and early retirement. The age gradient in recovery seems partly driven by survival: younger and early-stage patients face markedly higher survival chances than older patients. These results underscore that identical health shocks have very different consequences for life-course trajectories depending on when they occur.

Conceptually, the paper bridges two research strands: (i) life-course and demographic analyses of morbidity and mortality with (ii) the economics of health and work capacity. We argue that the labour-market consequences of cancer are not only medical but institutional: the timing of onset interacts with age-specific labour-market attachment, human capital accumulation, and social insurance eligibility.

[*]Vienna Institute of Demography (VID), Austrian Academy of Sciences, Wittgenstein Centre for Demography and Global Human Capital (IIASA, OeAW, University of Vienna), Austria
[†]Science and Technology Group, Okinawa Institute of Science and Technology, Japan
[‡]Economic Frontiers Program, International Institute of Applied Systems Analysis (IIASA), Austria

2 Data

2.1 Data sources

We merge several administrative data sources: (1) the Austrian Cancer Registry, which provides exact diagnosis dates, tumour site, and clinical stage; (2) the Austrian mortality register, including time and cause of death; (3) Austrian social security data, covering daily information on employment, unemployment, retirement, and benefit receipt; and (4) tax records with annual gross and net earnings for the entire population. These linkages create a person-level panel spanning 2009–2020, with observation windows up to ten years around diagnosis.

The Cancer Registry allows us to distinguish between localised, regionalised, disseminated, and systemic stages. We restrict the sample to first primary cancers and exclude benign or in-situ diagnoses. Employment data capture both extensive (employment vs. non-employment) and intensive margins (days of full-time work). Income variables are deflated to 2015 euros.

2.2 Sample construction

We identify all individuals aged 20–64 with a first malignant diagnosis between 2009 and 2017 to ensure sufficient post-diagnosis follow-up. For each treated individual, we select matched controls without a cancer diagnosis, using coarsened exact matching on gender, five-year birth cohort, education, pre-diagnosis income quartile, region, and baseline labour-market status two years before diagnosis. Matching occurs without replacement and yields roughly five controls per treated person.

After matching, treated and control groups show balanced pre-trends in employment and income. We assign placebo diagnosis years to controls to align event time. The final dataset includes more than 150,000 treated individuals and over 700,000 matched controls.

2.3 Outcomes and descriptive patterns

In addition to mortality, we analyse seven key outcomes: (1) days employed, (2) days in full-time work, (3) unemployment days, (4) retirement days, (5) sick-pay days, (6) gross annual earnings excluding benefits, and (7) net annual income including benefits. Descriptive Figure 1 shows sharp employment declines around diagnosis and gradual recovery for those who survive, with wide heterogeneity by age and gender.

3 Empirical strategy

3.1 Event-study difference-in-differences

To estimate the dynamic effect of diagnosis on outcomes, we estimate an event-study specification:

$$\mathrm{y}_{it} = \sum_{k \neq -1} \delta_k \cdot \mathbf{1}\{\text{relative time}_{it} = k \wedge \text{treated}_i = 1\} + \alpha_i + \lambda_t + \gamma_a + \theta_s + \epsilon_{it}, \tag{1}$$

where α_i are individual fixed effects, λ_t year fixed effects, γ_a age fixed effects, and θ_s time-to-treatment fixed effects. The coefficients δ_k trace deviations from the year before diagnosis ($k = -1$). Standard errors are clustered at the individual level.

3.2 Identification and robustness

Identification relies on parallel pre-trends between treated and control individuals. We verify this visually and formally, finding flat pre-diagnosis coefficients. As robustness, we estimate (i) the Sun–Abraham cohort-heterogeneous event-study estimator, (ii) two-period difference-in-differences with sequentially added fixed effects, and (iii) placebo treatments three years earlier or later. Results are consistent across specifications.

3.3 Heterogeneity analysis

We interact treatment effects with age-at-diagnosis groups (20–34, 35–44, 45–54, 55–64), clinical stage, and site categories (e.g., breast, digestive, genitourinary, hematologic). This allows us to identify heterogeneous recovery profiles and long-run scarring.

4 Preliminary results

4.1 Survival

Survival gradients are steep by both age and site: younger and early-stage patients face markedly lower mortality risks, while outcomes are poorest for digestive and respiratory cancers. These differences are important for interpreting subsequent results, since attrition from death mechanically affects observed employment and income patterns.

4.2 Aggregate effects

Cancer diagnosis leads to immediate and statistically significant drops in employment and earnings, while sick days increase (Figure 2). Employment rates fall by around 10 percentage points in the year after diagnosis, while full-time work days decline by 15–20%. Partial recovery begins after two years but remains incomplete even after eight years. Gross income falls by roughly 12% in the short run and stabilises at a 5–6% deficit after five years.

4.3 Life-course heterogeneity

Age at onset strongly conditions trajectories (Figure 2). Individuals diagnosed before 40 return to work quicker, but often in reduced hours. The 40-59 age group suffers the largest cumulative income loss, reflecting career interruption at peak earning ages. For workers above 50, employment recovery is limited and transitions to early retirement become dominant. Little changes for those age 60 and older, who are often already retired when cancer occurs. These results suggest that labour-market institutions amplify timing effects: older workers have stronger pension incentives; younger cohorts may face lower opportunity costs of retraining, if necessary.

4.4 Stage and site heterogeneity

If survived, advanced stages are associated with stronger and longer-lasting effects. Disseminated or systemic cancers reduce long-term employment by 25–30 percentage points compared to localised cases. Site heterogeneity aligns with treatment intensity: breast and thyroid cancer survivors recover faster, while digestive and hematologic cancers show larger declines. These patterns validate that observed economic impacts track underlying medical severity.

4.5 Gender and socioeconomic gradients

Women display more persistent earnings and employment gaps than men. Differences are partly explained by occupational segregation and higher prevalence of part-time work. Low-education and low-income groups experience slower recovery and larger permanent losses, consistent with lower job protection and weaker employer accommodation. The intersection of gender and socioeconomic status compounds disadvantage.

4.6 Earnings dynamics and benefits

Gross earnings excluding benefits decline more than net income, suggesting a strong cushioning effect from social transfers. Sick-pay and disability benefits offset around half of the short-run income loss, though replacement rates vary by diagnosis year and employment history. Still, cumulative lifetime earnings losses remain substantial, implying reduced pension entitlements and heightened long-run inequality.

5 Discussion

The results reveal that the same health shock can have sharply different economic implications depending on the career stage at which it occurs. Younger individuals face skill depreciation but seem to have time to rebuild careers; mid-career individuals experience strong disruptions, affecting long-term earnings growth; older individuals, often already close to retirement eligibility, may exit the labour force permanently.

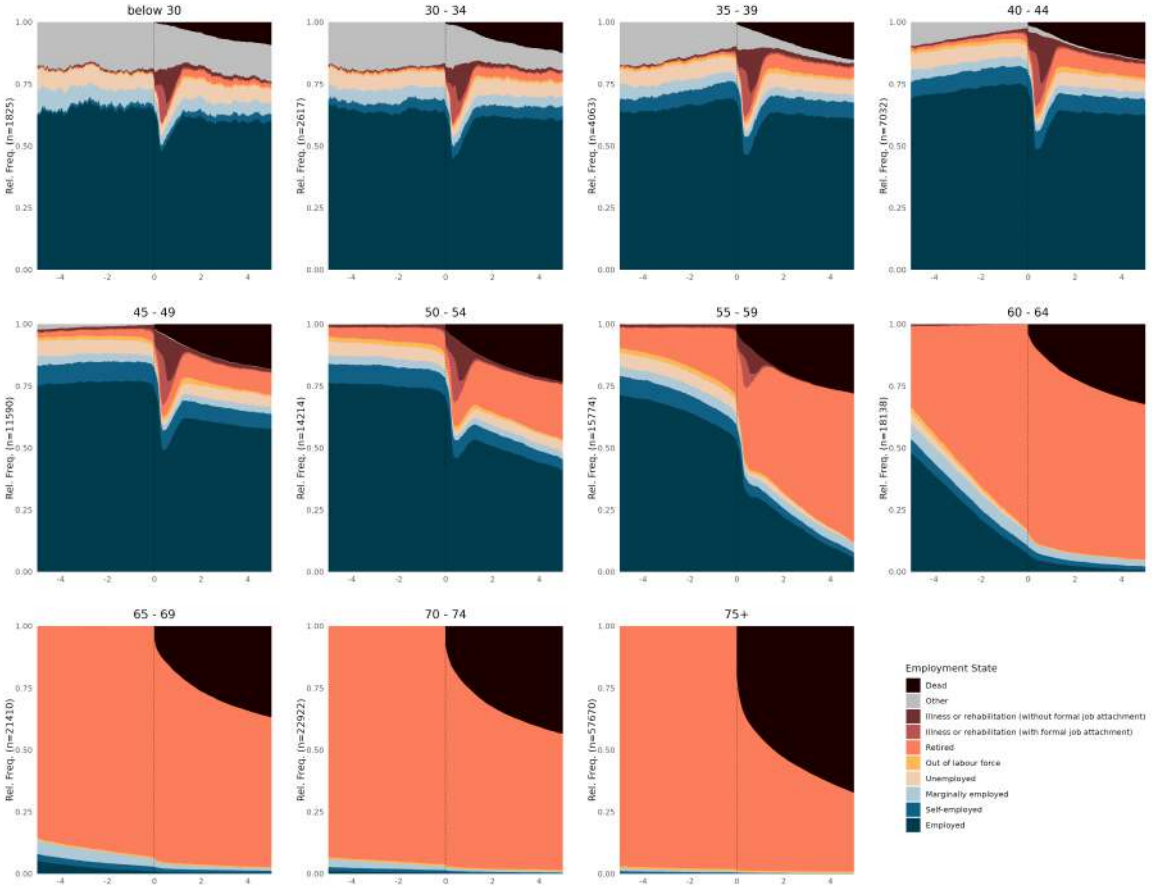
Survival patterns play an important role in shaping these life-course differences. Younger and early-stage patients have markedly higher chances of survival, whereas older individuals face substantially higher mortality after diagnosis. In addition to institutional context, this may partly explain why the estimated effects of cancer appear smaller at older ages – if the most vulnerable patients die, fewer remain to experience long-term labour-market consequences.

Improved cancer survival also implies that more individuals will live with the consequences. This Austrian case study provides lessons for other welfare states with strong employment protection and generous social insurance. The data show that institutional features, particularly the design of sickness and disability benefits, mediate recovery patterns and interact with age at onset. This has important implications for rehabilitation and return-to-work policies, which should be age-targeted: flexible schedules and partial work arrangements for younger survivors, re-skilling and employer incentives for mid-career workers, and pension adjustments for those near retirement.

6 Appendix

Figure 1: Employment status and survival of (a) female, (b) male cancer patients around diagnosis

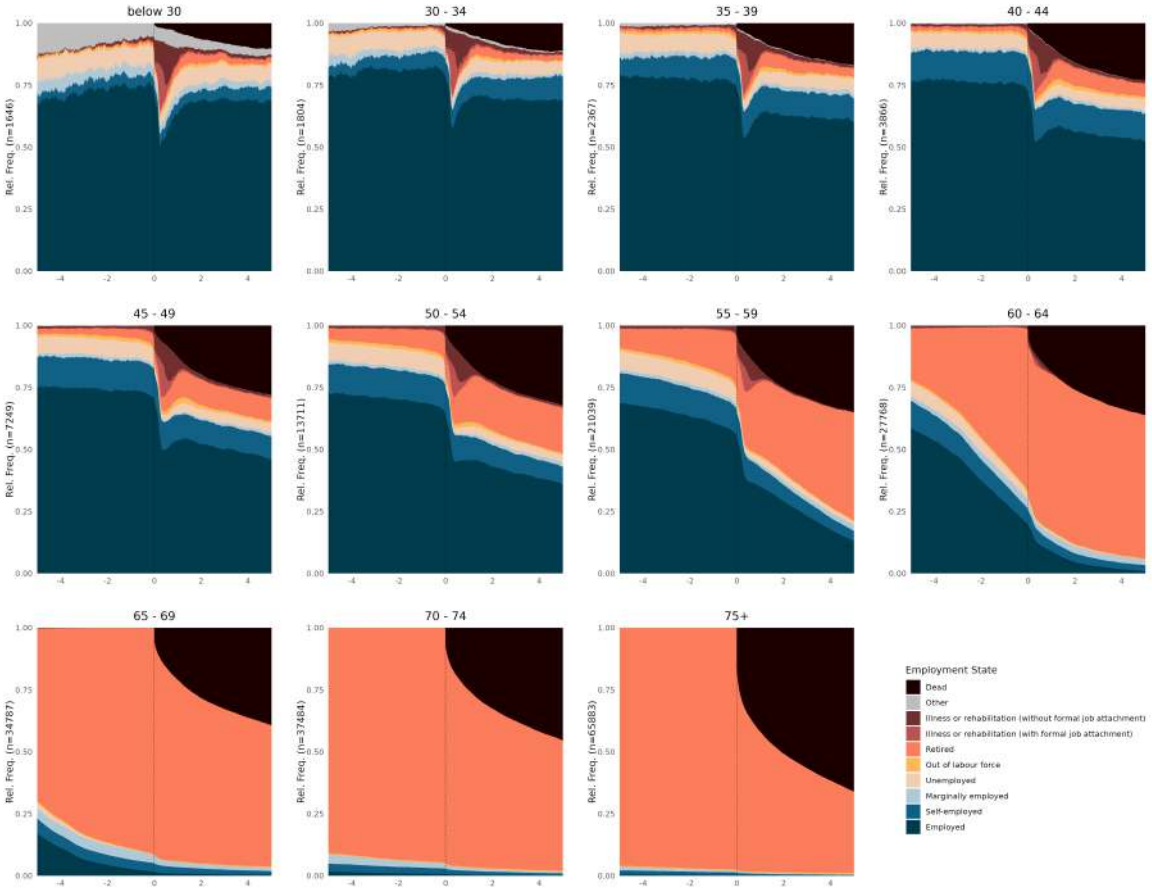
(a) Female



Note: These graphs show the employment status of (a) female and (b) male cancer patients five years around their first diagnosis, grouped into five year age at diagnosis groups with open ended outer intervals (below 30 and 75+ years at diagnosis). We observe the full unmatched cancer statistics from 2009 to 2020. Blue hues indicate employment types (employed, self-employed, marginally employed), red hues indicate absences from the labour market (unemployed, out of labour force, retired, illness or rehabilitation with and without formal job attachment), grey are other categories (such as parental leaves and military service), and black indicates death.

Figure 1: Employment status and survival of (a) female, (b) male cancer patients around diagnosis

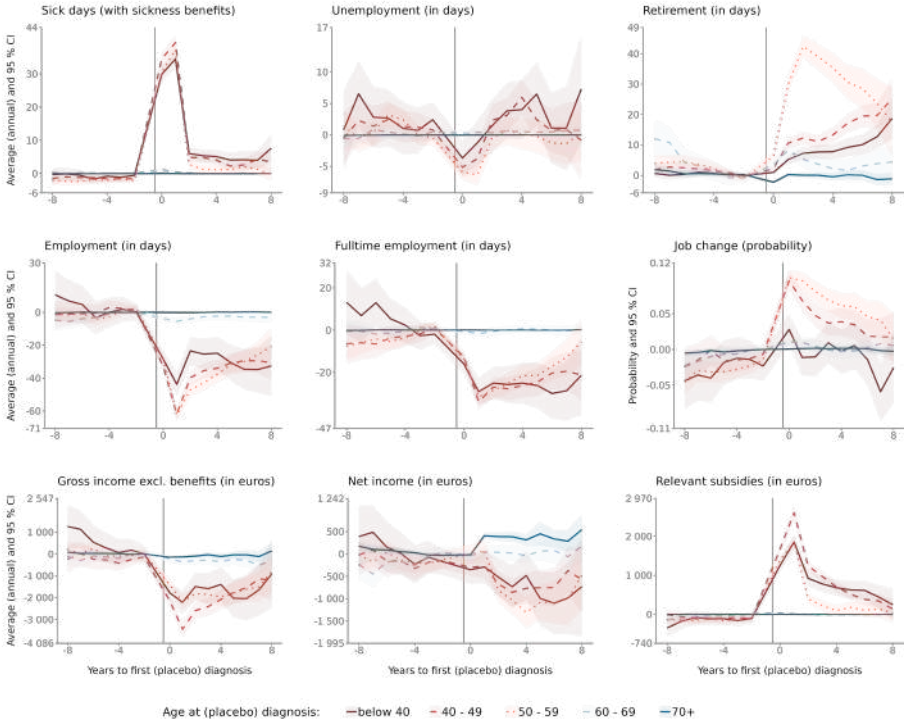
(b) Male



Note: These graphs show the employment status of (a) female and (b) male cancer patients five years around their first diagnosis, grouped into five year age at diagnosis groups with open ended outer intervals (below 30 and 75+ years at diagnosis). We observe the full unmatched cancer statistics from 2009 to 2020. Blue hues indicate employment types (employed, self-employed, marginally employed), red hues indicate absences from the labour market (unemployed, out of labour force, retired, illness or rehabilitation with and without formal job attachment), grey are other categories (such as parental leaves and military service), and black indicates death.

Figure 2: Estimated effects of cancer on labour market outcomes for (a) women and (b) men by age group

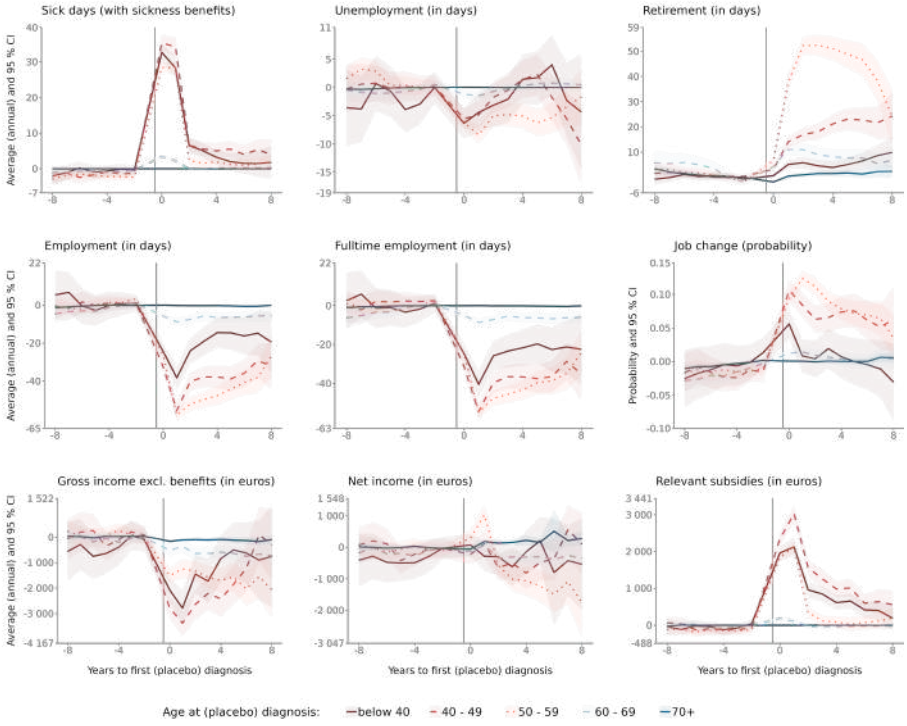
(a) Women



Note: This figure shows the effect of a cancer diagnosis on our selected outcomes for (a) women and (b) men, grouped by age at (placebo) diagnosis. The red hues indicate working-aged cohorts below 60 years of age at (placebo) diagnosis, the blue hues indicate age groups above 60 years of age at (placebo) diagnosis. Our estimates are based on equation 1. Each line displays the estimated outcome difference between the treated sample and the control group over relative time to (placebo) diagnosis, grouped by age at (placebo) diagnosis. The semi-transparent areas represent 95 percent confidence intervals based on individual-level clustered standard errors.

Figure 2: Estimated effects of cancer on labour market outcomes for (a) women and (b) men by age group

(b) Men



Note: This figure shows the effect of a cancer diagnosis on our selected outcomes for (a) women and (b) men, grouped by age at (placebo) diagnosis. The red hues indicate working-aged cohorts below 60 years of age at (placebo) diagnosis, the blue hues indicate age groups above 60 years of age at (placebo) diagnosis. Our estimates are based on equation 1. Each line displays the estimated outcome difference between the treated sample and the control group over relative time to (placebo) diagnosis, grouped by age at (placebo) diagnosis. The semi-transparent areas represent 95 percent confidence intervals based on individual-level clustered standard errors.