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Economic Policy Analysis

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CPB Discussion Paper

Simon Rabaté, Maxime Tô, Julie Tréguier,
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February 2025

https://doi.org/10.34932/74do-f494

The Effect of Adverse Life-Events on Income Trajectories*

Simon Rabaté[1,2], Maxime Tô[3], Julie Tréguier[4], Wiljan van den Berge[1,5], and Willem van der Wal[1]

[1]Netherlands Bureau for Economic Policy Analysis (CPB)
[2]French Institute for Demographic Studies (Ined)
[4]German Institute for Economic Research (DIW)
[3]Institute of Public Policy (IPP)
[5]Utrecht University

February 2025

Abstract

This paper studies and compares the effect of different adverse life events – job loss, disability and health shocks, divorce and spousal death – on individuals' income trajectories. We use an harmonized design across events in terms of methodology and data: matching difference-in-difference with exhaustive Dutch administrative registers. We assess the effect of adverse events on different margins. We compare their effect on primary and disposable household income in order to measure the public insurance to the shocks provided by the tax and transfer system. Both between different events and within different groups for a given event, we find that the importance of government insurance increases with the severity of the shock on primary income. However, we find that certain groups of the population are relatively less protected against adverse life events, such as young people facing a large health shock or secondary earners facing a divorce.

JEL codes: H2, I1, J1, J2
Keywords: Life-events; family; health; labor; inequality; social insurance

*We thank Jonneke Bolhaar, Anne Gielen, Egbert Jongen, Maud Hofland, Janneke Pieters, Marianne Tenand, and Benedikt Vogt for their valuable comments and suggestions. Remaining errors are our own. This project received funding from the Dutch Ministry of Social Affairs and Employment, for which we are grateful. We finally thank Statistics Netherlands for providing access to the data.

1 Introduction

Life course trajectories can be profoundly affected by various adverse, disruptive events that can have significant and lasting effects on individuals' ability to earn. The impact of an adverse event depends not only on its nature and severity, but also on the resources available to cope with it. Replacement income to smooth consumption can be provided by private insurance, informally at the household or family level, or formally by the government through public insurance offered by the tax and transfer system as a whole. The latter, based on universal social insurance and redistributive transfers, can play an important role in limiting the impact of adverse events on income inequality. Indeed, adverse life events are not random. More vulnerable groups of the population are more likely to be affected by adverse events (Cammeraat et al. 2024), and the impact of these events on individual income trajectories can also be more important, as they are less likely to be protected by private or informal insurance. Public insurance is then essential to break or prevent the accumulation of disadvantage (DiPrete & Eirich 2006) that adverse life events can trigger.

In this paper, we analyse how individuals are affected by and insured against a broad set of adverse life events - job loss, disability and health shocks, divorce and spousal death. We use a research design that is harmonised across events in terms of methodology (difference-in-difference matching) and data (comprehensive Dutch administrative registers) to provide a comparative analysis of the effect of events on different outcomes. We distinguish between the effect of the event on household primary income - before all taxes and transfers - and its eventual effect on disposable income. We measure the insurance provided by the government as the difference between these two effects. By estimating the effect at different levels - individual, spouse, household - we can decompose the different margins of the effect on primary income. We first consider each event separately and then compare the effect on primary income and the insurance received across events. Finally, we estimate the impact of events on different subgroups to analyse the extent to which subpopulations are differentially affected by and insured against different life events.

We establish the following results. First, when considering each event separately we find qualitatively similar patterns: a large drop in primary income following the events, that is significantly reduced by the effect of taxes and benefits.

Second, when comparing different events, we find substantial variations in the direct effect of events on primary income before tax and benefits, ranging from a 20% (divorce) to a 60% (disability) drop relative to pre-event disposable income.

Third, we find that this gap is largely reduced when considering after-tax income: public insurance – through both taxes and benefits – plays a big role in protecting individuals from all adverse events, but the degree of insurance provided increases with the severity of the shock.

Fourth, the patterns we observe between events are also observed within events, between different categories of the population: we find large differences in direct effect of events, that are largely smoothed out in terms of disposable income. Combining our between events and between subgroups estimates, we overall exhibit a clear positive, linear relationship between the

initial severity of the event and the insurance provided by the tax and transfer system. Finally, we find that some categories of the population are relatively less protected against adverse life-events. This includes for example young people facing a large health shock or divorced individuals (mostly women) who earned less than their spouse.

Given the broad set of life events we consider, this paper relates to the different strands of the social sciences literature studying the causal effect of those events on income trajectories.[1] Numerous studies have shown that individuals' income trajectories can be significantly and durably affected by adverse life events such as job loss (Deelen et al. 2018, Bertheau et al. 2023, Andersen et al. 2023, Cammeraat et al. 2023), disability (Meyer & Mok 2019), health shocks (García-Gómez et al. 2013, Dobkin et al. 2018, Fadlon & Nielsen 2021), couple separation (Bonnet et al. 2021, Hogendoorn 2022) and widowhood (Fadlon & Nielsen 2021). In the case of employment or health shocks, which affect an individual, we typically observe a large drop in individual earnings, which is more or less compensated by public insurance depending on the institutional context. The impact of the event can also be compensated or amplified by spousal response to the shock. There is no clear consensus on the existence and magnitude of the so-called *added worker effect*, the increase in spousal labour supply when individual's own ability to earn income is negatively affected. Added-worker effects are of limited magnitude overall, and are more important when the ability to earn income of the directly impacted individuals is reduced (Bernasconi et al. 2024) and when access to formal insurance is limited (Autor et al. 2019). In some contexts, we can also observe negative spousal labour supply responses, if adverse events are correlated (e.g Hardoy & Schøne (2014) for job loss) or if one needs to reduce labour supply to care for the impacted spouse (García-Gómez et al. 2013). In the case of couple separation and spousal death, which affect the household directly, the loss of spousal income can be compensated by public insurance (e.g Fadlon & Nielsen (2021) for spousal death) or self-insurance through increased labour supply (e.g in Bonnet et al. (2021) for women) or re-partnering.

As we are not focusing on one particular life event, our paper most closely relates to the few papers comparing the effect of different adverse events and the extent to which individuals are insured against the drop in consumption they imply. Stepner (2019) focuses on two life events (job loss and hospitalization) and analyses their effect on pre-tax and post-tax income in Canada. He finds that government insurance plays a significant role in reducing the effect of income shocks, and that progressive taxes and benefits are especially important – compared to social insurance – for reducing the risk of large income losses. He also shows that the insurance value of redistributive taxes and benefits is highly progressive: people who already have low incomes lose a disproportionate share of their income following a layoff or a hospitalization; but after taxes and benefits, the losses are more similar across the income distribution.

Our analyses also more broadly relate to the literature on earning dynamics, which has been boosted by the access to administrative registers in recent years. Guvenen et al. (2021)

[1] We do not aim at an exhaustive review of the literature and focus on most directly related papers. We provide a detailed description of the selected articles in Section 5.1 when we analyze the effect of each event separately.

decompose the changes in income dynamics between transitory and permanent shocks, analyze these changes over the life cycle and across the earnings distribution. De Nardi et al. (2021) study the specific role of household and government insurance in smoothing the dynamics of individual earnings.

Our paper brings additional evidence to each of the event-specific strands of the literature investigating the causal effect of adverse events on income trajectories. While the effects of job loss, disability and health shocks have been extensively studied, including analyses in the Dutch context, the literature on the effects of couple separation and spousal death is more scarce. We complement the existing literature on these life events by providing a comprehensive analysis of their effects, taking into account the relative importance of different margins (resource pooling, own labour supply, repartnering, state insurance) and the dynamics of the effects over time.

Rather than analysing each event separately, the novelty of this paper lies in the comparison across events made possible by the harmonised research design we implement. We apply to this broad set of events an in-depth analysis of their effects, combining the decomposition of the household response in terms of pre-tax income with the measurement of the insurance provided by the tax and transfer system. For comparison, Stepner (2019) considers only two life events and focuses on household level, while we also decompose between the individual and spousal response to the shock. The richness of our data in terms of sample size and available information also allows for a thorough heterogeneity analysis. From this unique setting, we produce original results describing how different life events affect individuals' trajectories. Our results also provide new insights into the role of public insurance in reducing income risks across different adverse events and different categories of the population.

The rest of the paper is structured as follows. Section 2 presents the institutional background and data. Section 3 presents the definition and measurement of life events. Section 4 presents the methodological and conceptual foundations of our empirical analyses, the results of which are presented in Section 5. Section 6 concludes.

2 Institutional setting

We first provide a brief presentation of the Dutch tax and transfer system, focusing on the elements that are directly under the scope of our analyses, namely taxes and contributions on labour income and in-cash benefits. We then provide specific additional institutional context that are relevant for the different life-events we study.

General presentation of the Dutch tax and transfer system The Netherlands is a high income, high tax country with an extensive welfare state. In 2016,[2] national income was equal to €592 billion, around €44,000 per adult on average. Tax revenue amounted to 45% of national income, mainly composed of income taxes (15%), payroll taxes and mandatory health insurance premiums (12% of national income), and indirect taxes (12%). The Dutch income tax

[2]This is the year covered by Bruil et al. (2022), from which the numbers presented here are taken.

treats labour and capital income differently. Labour income is taxed according to a progressive schedule with a 52% top rate. The taxation of (income from) capital differs for large shareholdings (at least 5% of a company) and all other forms of wealth (excluding owner-occupied housing and pension wealth). In the former case, capital income (dividends and realised capital gains) is taxed at a 25% rate. In the latter case, a 1.2% tax is levied on the stock of net wealth with no further taxation of the income derived from this wealth. Payroll taxes consist of contributions related to health care and long-term care, contributions for unemployment and disability insurance, as well as contributions for sickness benefits. In addition, basic health insurance is mandatory and paid for through premiums and social security contributions. Government spending reached 43% of national income in 2016 and can be decomposed into in-kind benefits (20%), in-cash benefits (13%) and collective expenditure (10%). Cash benefits are mostly made up of benefits paid by social security insurance (9%) or social assistance (4%).

Taxation of families. A number of rules in the tax and benefit system take account of household characteristics. This means that in some cases the separation of couples can lead to important changes in the taxes paid or benefits received by individuals. Income taxes on labour income are calculated at the individual level and are therefore not directly affected by household composition. On the other hand, the eligibility and amount of some specific tax credits depend on the income level and structure of the household (single vs. couple, main vs. secondary earner, with or without children).[3] Eligibility for social assistance is also based on household resources, which may mean that some people become eligible after separation. As a result, low-income individuals will receive more benefits or tax credits after a divorce or a spousal death, while the opposite may be true for high-income individuals.

Couple separation Legal procedures regarding couple separation are similar for married couples and registered partnerships. We refer to Kabátek (2018) for a description of general rules and their evolution in recent years, and hereby focus on elements directly impacting ex spouses' standard of living, namely child and partner alimonies. In some cases, one of the spouses may have to pay child alimony, to compensate for the costs associated with raising children, and/or spousal alimony to maintain the standard of living after the divorce.

Unemployment insurance. The Netherlands has mandatory public unemployment insurance for all employees.[4] Both employers and employees contribute to the system. Unemployment benefits last up to two years, depending on employment history. For the full two years of eligibility, an individual has to have worked for at least 38 years. Benefits are 75% of the last earned wage in the first two months, and 70% thereafter, subject to a cap. The amount of benefits does not depend on a partner's income, or an individual's wealth. Like in most countries, eligibility to unemployment benefits in the Netherlands requires that individuals lost

[3] See de Boer & Jongen (2023) and de Boer et al. (2023) for a detailed presentation of these schemes.

[4] Here we present the current policy state. There have been substantial reforms, most notably in the maximum duration from five years in 2003 to two years (see de Groot & van der Klaauw (2019) for an evaluation).

their job beyond their own fault (this includes cases where the employer initiates the layoff and the employee agrees on receipt of a severance payment). Individuals also need to be available for work immediately and need to search actively.

Disability and sickness insurance. The Netherlands has mandatory public disability insurance (DI), supplemented by privately funded, mandatory sick pay.[5] When an employee gets sick, the employer is responsible for paying sick pay for two years and for reintegrating the individual into their own job or another job more suited to their current health. If the employment contract is shorter than two years, the remaining period is taken over by a public short-term DI scheme. Individuals who recently lost their job and receive unemployment benefits, have a mandatory waiting period of one year. Sick leave is then paid by the Public Employment Service (PES). Benefits for sick leave are at least 70 percent of the last earned wage. In many collective bargaining agreements, sick pay is increased to 100 percent in the first year of sickness and kept at 70 percent in the second year. After this two years period, individuals enter an independent assessment procedure by the PES to determine DI eligibility.

Eligibility and the amount of benefits for DI is based on two components: the previous wage and hours and the remaining earnings capacity (i.e. the wage an individual can still earn and the hours they can still work). The larger the gap between these two, the higher the degree of disability and hence the higher the benefit level.The remaining earnings capacity is determined through a medical examination by a physician appointed by the PES and an interview with an occupational assessor. Full DI is granted if the physician determines that the applicant has no durable capabilities for work. If the applicant is still deemed able to work, their level of functional capabilities is determined using a standardized instrument (Garcia-Gomez et al. 2023). The occupational assessor then uses this information and a database of jobs to determine which jobs the applicant is still able to do, and for how many hours a week. This determines the remaining earnings capacity. Final benefit levels depend on the degree of disability. If it is 80% or higher, then benefits are set at 75% of the last earned wage. If the degree of disability is less than 35%, no DI is granted. If the degree of disability is between 35 and 80%, then partial DI is granted. Partial DI entitles applicants to up to two years of benefits equal to 75 to 70% of their last earned wage. During this period, labor income can supplement benefits, creating an incentive to return to work. After this period, a strong work incentive is introduced. If applicants earn at least 50% of their remaining earnings capacity, they keep the same benefit level as in the previous period (i.e. 70% of their last earned wage). If they earn less than this, their benefit level drops to 70% of the minimum wage multiplied with their degree of disability (25 - 55% of the minimum wage).

Social assistance. Social assistance is a last resort benefit for people who are not eligible for any other benefits. It is administered by the municipality and has strict eligibility and work

[5]We present the current policy state. There have been several reforms over the past twenty years, most notably in 2006 when much of the current system was implemented. Koning & Lindeboom (2015) provide an overview of the history of the Dutch DI system and discuss the reforms.

requirements. The benefit amounts are 1,900 euros per month for multiple person households and 1,300 euros per month for 1-person households. Any other income is fully subtracted from the benefit amounts (including e.g. a gift, financial or otherwise, from a family member). Benefit amounts are scaled down the more adult people there are in the household to account for economies of scale. People who have household wealth of more than 15,000 euros in the case of a multiple person household or 7,500 euros in the case of a single household, are not eligible. Also, people who own a home are not eligible if the value of the house exceeds the mortgage by more than 63,000 euros.[6] Social assistance has strict work requirements. Individuals are required to accept any job within a three hour daily commute, and are required to be willing to move if they are not able to find a job in their area. Municipalities sometimes employ instruments to activate people, including sanctions, job search assistance or wage cost subsidies. Only single parents with kids younger than five years old or disabled people are exempt from search requirements.

Survivor insurance. Public insurance against the death of a spouse is provided by both the first (state) and second (occupational) pillars. The state insurance (*Algemene nabestaandenwet*, ANW) provides survival benefits, the eligibility and amount of which depend on the widow(er)'s income and characteristics (age, presence of children). The survivor receives a flat-rate benefit of 70% of the gross minimum wage, plus an additional 20% of the gross minimum wage if she or he is caring for a minor child (half-orphan benefit). Any income received by the survivor is partially or fully deducted from the survivor insurance, depending on the nature of the income and the type of benefit. There is no means test for the half-orphan's benefit, only for the flat-rate benefit of 70% of the minimum wage. Unemployment, sickness and disability benefits are fully deducted from public survivor insurance. Survivor benefits from other schemes (second and third pillar) are not deducted. Importantly, labour income is also partially deducted from public survivor benefits. For any labour income above 50% of full-time work at the minimum wage, benefits are deducted at a rate of 66%. As a result, individuals with incomes above 155% of the gross minimum wage do not receive any survivor benefits.[7] Second pillar pension benefits vary between pension funds and depend on the pension rights accumulated by the deceased spouse.

Non-take up. Recent research shows that the non-take-up of social insurance is substantial (Dubois & Ludwinek 2015). In the Netherlands, non-take-up rates range from around 10-15% for rent benefits and child support to around 30-40% for income top-ups for people on social insurance such as welfare or unemployment benefits (Berkhout et al. 2018, Arbeidsinspectie 2023). Evidence also shows that primarily individuals with lower human capital find it more difficult to access social insurance. We do not measure non-take-up in our data, since we do not know who is eligible for benefits, but does not use them.

Non-take-up can affect our results in two directions. On the one hand, since some individuals

[6] All amounts presented are nominal 2024 amounts. They are indexed twice a year.

[7] See Rabaté & Tréguier (2024) for a more detailed description of the scheme and its recent reforms, as well as an assessment of its effects on the labour supply of surviving spouses.

eligible for insurance are not using it, the insurance we measure is lower than the potential insurance following an adverse life event. It only affects the social insurance part, however, since tax rates are automatically adjusted to lower primary incomes. While there is currently no evidence of non-take-up of large benefits like DI and UB, non-take-up of these benefits could affect our results because we define some events (disability, job loss) by take-up. In this case, we may underestimate the incidence of events. Since this is more likely to be the case for people who are i) more disadvantaged and ii) less compensated (because they underuse insurance), we could overestimate the insurance provided – our average would be above the population average that would include events with non-take-up.

3 Data and life events definition

3.1 Data

Data sources. The data used in this study consist of individual- and household-level data provided by Statistics Netherlands (CBS). They are accessible via a secured remote access environment across multiple datasets. This data furnishes comprehensive individual and household histories, encompassing all Dutch residents. Each entry includes a distinct personal identifier enabling dataset merging. The information retrieved about individuals encompasses marital status and household history (from 1995), employment income, disability, unemployment, welfare benefits, and pension income (including survivor benefits) extracted from tax and social security records (from 1999). Our main explained variables (primary and disposable income at the individual and household levels) are obtained from administrative data on income tax declarations. Specific information regarding the name and versions of the datasets we used are presented in Appendix C.

Sample selection. Starting with the entire population living in the Netherlands between 1999 and 2023, we select our initial analysis sample as follows. We select individuals who are affected by at least one event during the observation period. We focus on the working-age population, i.e. individuals aged between 25 and 55 at the time of the event. Finally, since we want to observe income trajectories five years before and after the event and observe income from tax data between 2003 and 2021, we restrict our sample to individuals facing adverse life events between 2008 and 2016. Thus, we focus on individuals born between 1950 and 1989. From this initial population, we make the following three sample restrictions to construct our estimation sample.

For each type of event, we select only the first event recorded in the observation period. Thus, we estimate the effect of the first recorded event and all subsequent events. Other life events may occur in the years around a particular recorded life event. For example, a person may lose a job before or after a divorce. Because we want to include these ranges in our overall analysis, we do not impose a restriction on the simultaneous occurrence of different types of events. We do, however, impose a restriction by removing events that occur at the same time as

the birth of a child. Since childbirth is correlated with the occurrence of events (in particular, health shocks or disability) and can have important effects on women's income trajectories (Rabaté & Rellstab (2022)), we remove such common events from our pool of observations. Second, we use an exact matching approach (see section 4.2) and only retain individuals for whom we find a control in the matching procedure. Third and finally, we restrict our sample to individuals who are continuously observed in the five-year window around the event. Thus, we remove individuals who die or migrate out of the country during the observation window.

Table 1 shows the number of individuals in the sample before and after the sample restrictions. We start with an initial sample of 3.75 million individuals and end up with about 2.71 million in the estimation sample. Thus, we drop about 28% of our initial sample, mostly due to the matching restriction (14%) and the removal of the simultaneous child birth event (10%), while restricting to a balanced sample has a limited effect on the sample size (5% of the initial number of individuals).

3.2 Definition and incidence of life events

Couple separation We identify couple separation using the municipal registers. These record union creation and separation, for married and other registered partnership. We then define a separation event at the individual level when we observe the end of a legal union in a given year. This legal-based definition of couple separations has two main drawbacks. First, it ignores alternative forms of unions such as cohabitation without any legal form of (dis-)unions. Second, the timing of legal divorce may differ from the actual separation, which can occur before (or even after) couple actually legally separate. For this reason, we consider an alternative definition of couple separation as a sensitivity analysis presented in Appendix B.1. We identify a separation using the household type definition from tax data, and define the event if an individual switches from a couple situation to a single situation from one year to another. This approach circumvents the two issues mentioned above, but has two other drawbacks: it considers as couple cohabiting individuals that are not in couple, and does not identify as an event when individuals change partners within one year.

Widowhood There are no major issues regarding the definition or measurement of this adverse event. We simply define widowhood using municipal registers on unions, that identify death of one spouse as a type of union ending.

Job loss Identifying job loss as an adverse event using administrative records is challenging. Conceptually, we would like to focus on individuals losing their job against their will. However we cannot directly observe this in the data. In the main specification, we identify job loss when an individual receives unemployment benefits in a given year and not the preceding year. With this approach, we fail to capture two types of job loss we would like to capture (false-negative): individuals who loose their jobs and find another job without transiting through unemployment insurance and employment situations that are not under the scope of unemployment insurance

(e.g self-employed). One other issue is that we are potentially capturing job loss in very unstable employment trajectories, that may not be *per se* the disruptive adverse life events we aim at studying. For this reason we consider in Appendix B.1 an alternative definition of job loss following Andersen et al. (2023): the termination of a long lasting employment relationship (two years) followed by an important drop in labor earnings. We thus aim at capturing more significant life-events.

Disability As for job loss, we identify disability from the take-up of sickness leave or disability insurance. One conceptual issue is that we miss situations where individuals have long-term physical or mental limitations in their earnings ability that do no trigger disability benefits eligibility. This includes individuals who not are insured in the public DI scheme (e.g self-employed) or who fail to have their limitation acknowledged by the DI system. One practical issue is that individuals enter DI only after a two years period of sickness leave. In most cases, sickness leave is paid by the employer and cannot be observed in the data. We therefore detect disability with a lag, ranging from zero to two years depending on (un)employment situations.

Health shock We define health shocks as large increase in health care expenditure from one year to the other. We use data on yearly expenses for healthcare that are reimbursed according to the mandatory basic healthcare insurance according to Dutch law (Zvw). We have information between 2009 and 2022. This insurance is mandatory for all Dutch residents, regardless of their nationality. It includes many different healthcare types including general practice care, hospital care, drug therapy, physical therapy, etc. We have selected expenses on total healthcare costs, from which we have deducted the costs for obstetrics and maternity care. We define health shock as an increase of 10k euros in total healthcare expenditure. We choose this threshold as it roughly corresponds to the 95th percentile of yearly change in healthcare expenditure. Given the arbitrariness of this choice, we consider alternative definitions of health shocks based on smaller (5k euros) or larger thresholds (up to 100k euros).

Incidence of events We present the number of individuals for which we record an event in Table 1. As might be expected given our focus on the working age population, job loss is the most common event (1.14 million events) and widowhood the less common (72k events). Divorce, disability and health shocks have a similar incidence, around half a million observations. Appendix Figure A.1 shows the composition of each population according to the following socio-economic characteristics measured four years before the event: sex, age, household type, migration background and household and individual income group (quartiles by gender and age). Event incidence is overall balanced in terms of gender, except for widowhood, which is more common among women, who are on average younger within couples and live longer. Older people are also over-represented for widowhood and for health shocks. With regard to income, we do not observe any clear difference between events, except for health shocks, which are more frequent among the lower income groups. Neither do we observe any difference between events in the incidence of events by migration background.

Table 1: Sample selection and sample size

		Job loss	Disability	Health	Divorce	Widowhood	Total
Inital sample	Number of id	1571785	755780	790688	553101	83823	3755177
	% removed						
Removing joint events	Number of id	1425267	598970	739099	533430	82791	3379557
	% removed	9	21	7	4	1	10
Matching with control ids	Number of id	1163824	487908	670986	452413	74456	2849587
	% removed	17	15	9	15	10	14
Balancing sample	Number of id	1138459	463226	597124	441898	72044	2712751
	% removed	2	3	9	2	3	4

NOTE: This Table presents the number of individuals in our sample, for different steps of the sample selection. Initial sample includes all individuals with facing an events, who are born between 1950 and 1989, and aged between 25 and 55 at the time of the event and with an event occurring in years 2008-2016. We then remove individuals with a joint birth event, individuals we cannot match to a control individual and individuals we continuously observe in the data five years before and after the event. For each step, we present the number of remaining observations and the share of individuals from the initial population that is removed.

4 Concepts and methods

The goal of our empirical analysis is to identify the dynamic causal effects of several life events on individual and household income. We first detail our conceptual framework and the parameters of interest, and then detail how we identify and estimate these parameters from the data.

4.1 Conceptual framework

Income concepts We estimate the effect of life events on different income variables, corresponding to different income concepts.

We first consider primary income, which comprises gross labour and capital income earned by households or individuals, before taxes and benefits. Since capital gains are recorded at the household level, we distinguish three primary income components for a given individual i, τ periods after the life event happens: primary household income ($Y_{i\tau}^{hh,prim}$), primary individual income ($Y_{i\tau}^{prim}$) representing individual labour income, and primary other income ($Y_{i\tau}^{oth,prim}$) encompassing both labour income of other household members and capital income.

By adding all monetary benefits to household primary income, we define household total income ($Y_{i\tau}^{hh,gross}$). Benefits include social security benefits, welfare benefits, child support, and spousal alimony. Finally, removing all taxes and contributions levied on $Y_{i\tau}^{hh,gross}$ (including social security contributions and income tax) yields household disposable income ($Y_{i\tau}^{hh,disp}$). The relationships between these income concepts are formalized as follows:

$$\begin{aligned} Y_{i\tau}^{hh,disp} =& Y_{i\tau}^{hh,gross} - \text{taxes}_{i\tau} \\ =& Y_{i\tau}^{hh,prim} + \text{benefits}_{i\tau} - \text{taxes}_{i\tau} \\ =& Y_{i\tau}^{prim} + Y_{i\tau}^{prim,oth} + \text{benefits}_{i\tau} - \text{taxes}_{i\tau} \end{aligned}$$

Some of the life events we consider – in particular couple separation and widowhood – also affects the composition of the household. We account for these changes by normalizing all income variables by a measure of household size in our main specification.[8] Doing so, we make the implicit assumption that all resources are shared equally by all members of the households.

To make progress on the analysis of life events on the different concept, we introduce potential outcomes variables $Y_{i\tau}(0)$ and $Y_{i\tau}(1)$ describing counterfactual situations where the individual or the household experiences a life event ($Y_{i\tau}(1)$) or not ($Y_{i\tau}(0)$). Thus the effect of a life event τ for an individual i periods after it happens is defined as:

$$\delta_{i\tau}^{Y} = Y_{i\tau}(1) - Y_{i\tau}(0)$$

This effect can be defined for all income concepts, taxes and benefits previously defined. Moreover, insurance to life events provided by the household and the tax and transfer system can be obtained by combining these effects. We first distinguish between the direct effect of the event on household primary income (before any tax and transfer), and its eventual effect of disposable income. We measure the insurance provided by the government as the difference between the two effects.

Direct effect on primary income We define the *direct effect* of a given event life event as its effect on primary income at the household level ($Y_{i\tau}^{hh,prim}$). We therefore measure the aggregated effect of the event on the different margins of household income, before all taxes and benefits. In that regard, there is a fundamental difference between events that primarily affect individuals (job loss, health or disability shocks in our setting) and household events that directly affect its structure (divorce and widowhood). We therefore consider them successively.

For individual events, the direct impact of an event on household primary income is mainly determined by the impact on the individual affected by the event in question ($Y_{i\tau}^{prim}$). As we consider mostly adverse events, we expect a negative effect on income, which measures the extent to which the event reduces the ability to earn income. Second, there may be an effect of the shock on the income trajectories of other household members ($Y_{i\tau}^{oth,prim}$) - which we call spousal effects for simplicity. The effect on the spouse's primary income can be positive if the spouse increases his or her labour supply to compensate for the loss of income, commonly referred to as the *added-worker effect*. There may also be a negative effect if the spouse is also affected by a shock at the same time, or if he or she reduces his or her labour supply to care for the affected spouse (*correlated effect*). Finally, there may be simultaneous events affecting the structure of the household (*correlated events*) and the income of the spouse (e.g. divorce following a job loss). In practice, we cannot fully decompose between these three different margins of the spouse's primary income. However, we provide suggestive evidence of their relative importance.

For household events (divorce and widowhood), the direct effect is determined by the relative effect on individual and spousal income. First-order effects are driven by the end of resource

[8] We use the scale computed by Statistics Netherlands. See Appendix B.2 for the details on the scale used and the sensitivity of the results to alternative ones.

pooling within the couple: a loss of previously shared spousal income and a gain of previously shared own income. The overall effect depends mainly on the relative share of own income in the household before the event. Two other post-event margins can enter into the effect on primary household income: the formation of a new union (increase in spousal income) and the adjustment of individual labour supply to the change in living standards after the event. The latter can be positive or negative depending on the effect of the event on the post-union standard of living. As with individual events, we cannot provide a formal decomposition of these different components and only provide qualitative evidence of their relative magnitude.

Public insurance to adverse events The most direct form of insurance against negative income shocks is the one provided by the tax and transfer system.[9] Two mechanisms are at work (Stepner 2019). First, in the Netherlands as in many countries, various insurance schemes compensate for the income drop through additional public benefits. Benefits may be directly related to the realized income risk (e.g unemployment benefits in case of job loss) or part of global anti-poverty policies (e.g welfare benefits for low-income). This implies that, on average, the drop in total income will be of smaller magnitude than the drop in pretax income. A second insurance component is generated by the tax system: as individuals receive less income, they will also pay less taxes. Due to this mechanism, whose magnitude increases with the overall progressivity of the tax schedule, the drop in post-tax income is to be smaller than the drop in the tax base (or total income).

We use and compute two different definitions of insurance. The first one is a relative measure of insurance $I_{i\tau}^{rel}$ that measures how much of the initial drop in primary income due to the direct effect of the event is compensated by the tax and benefits system. In order to ensure the comparability between events and the additivity of the decomposition of the effect, we follow Andersen et al. (2023) and normalize all income measures by the pre-event level of disposable income, $Y_{ref}^{hh,disp}$, measured as the sample average in period τ = -5 to τ = -1.

$$\begin{aligned} I_{i\tau}^{rel} &= \frac{\delta_{i\tau}^{prim}/Y_{ref}^{hh,disp} - \delta_{i\tau}^{hh,disp}/Y_{ref}^{hh,disp}}{\delta_{i\tau}^{prim}/Y_{ref}^{hh,disp}} \\ &= 1 - \frac{\delta_{i\tau}^{hh,disp}/Y_{ref}^{hh,disp}}{\delta_{i\tau}^{prim}/Y_{ref}^{hh,disp}} \\ &= 1 - \frac{\delta_{i\tau}^{hh,disp}}{\delta_{i\tau}^{prim}} = \frac{\delta_{i\tau}^{ben} + \delta_{i\tau}^{tax}}{\delta_{i\tau}^{prim}} \end{aligned}$$

When the shock is perfectly compensated, $\delta_{i\tau}^{hh,disp}$ is null, and $I_{i\tau}^{rel} = 1$. When the shock is not compensated at all, $\delta_{i\tau}^{hh,disp} = \delta_{i\tau}^{prim}$, and $I_{i\tau}^{rel} = 0$.

This relative measure of insurance is conceptually closer to the main goal of insurance: ensuring consumption smoothing between different states of the world. However, it disregards the absolute value of public insurance, which can be relevant from a public finance point of

[9] See section 2 for a more detailed description of the main features of the Dutch tax and transfer system.

view. We also compute an absolute value of insurance, measured as the difference between the effect on primary and disposable in percentage points.

$$\begin{aligned} I_{i\tau}^{abs} &= -(\delta_{i\tau}^{prim}/Y_{ref}^{hh,disp} - \delta_{i\tau}^{hh,disp}/Y_{ref}^{hh,disp}) \\ &= -(\delta_{i\tau}^{ben} + \delta_{i\tau}^{tax})/Y_{ref}^{hh,disp} \end{aligned}$$

Our definition of insurance based on the comparison between the effect of adverse events on primary and disposable income calls for two important remarks. First, insurance to shock is most commonly defined in the literature (e.g Chetty (2006)) by the degree of consumption-smoothing provided in case of negative earning shock. By measuring insurance to adverse shocks in terms of disposable income, we make the implicit assumption that consumption can be proxied by disposable income. Put differently, we assume that individuals consume hand-to-mouth and do not save nor borrow. This may not be true in practice: Andersen et al. (2023) indeed show that, in the case of job loss, individuals largely use their private saving to smooth consumption. Second, our decomposition between direct and insurance effects does not explicitly account for behavioral effects of public insurance on individual labour supply. In practice, moral hazard associated to the access to public insurance can affect the labour supply response to adverse events, by providing incentives to reduce (individual or spousal) labour supply (see e.g Autor et al. (2019) for disability benefits or Rabaté & Tréguier (2024) for survival benefits). The direct and insurance effects we estimate are therefore jointly determined by the structure of the tax and transfer system.

4.2 Identification strategy

We now describe the empirical strategy we use to identify the causal impact of life events. Since we do not observe the income dynamics of individuals had they not experienced an event, we need to use a control group to build a counterfactual income. Our approach is comparable to the one used by Stepner (2019).

As raised by the recent literature focusing on event-studies (Sun & Abraham 2020, Borusyak et al. 2021, De Chaisemartin & d'Haultfoeuille 2020), the estimation of such models with staggered design requires particular caution when choosing the control group. In our case, we build on stacked difference-in-differences (Cengiz et al. 2019) by building for each cohort of life event, a clean control group of individuals who do not experience similar life events. For each treated individual we draw a control individual from the set of individuals who have identical household type, gender, migration status, year of birth and income deciles 4 and 5 years before the event happens.

From that sample, we estimate the following equation:

$$Y_{itc} = \alpha_{ic} + \lambda_t + \sum_{\tau \neq -4} \gamma_\tau \mathbb{1}\{t - E_{ic} = \tau\} + \sum_{\tau \neq -4} \delta_\tau T_{ic} \times \mathbb{1}\{t - E_{ic} = \tau\} + \varepsilon_{itc}, \tag{1}$$

where y_{itc} is the outcome variable for individual i from cohort c, T_{ic} equals 1 if the individual

actually experiences a life event, and E_c denotes the time period of the event of cohort c. As mentioned before, a cohort c gathers both treated and matched control individuals. Thus, there are as many cohorts as unique combinations of time of event, year of birth, gender, household type (we distinguish single, first or second earner in couples), migration status (natives, first or second generation immigrants), individual and household income quartile 4 and 5 years before the event. When constructing the matched comparison group for job loss, we also restrict our control group to individuals employed one year before the age of job loss.

As individuals may belong to several cohorts, we control for individual $\times$ cohort fixed effects. Our design also allows us to control for both time fixed effects (λ_t) and a fictitious time to event event effect γ_τ. Indeed the variable E_{ic} is defined for both treated and matched control individuals. As the match is exact on year of birth, one can interpret γ_τ parameters as a control for age effects around the event. Finally, the δ_τ parameters capture the dynamics of the treatment effect before and after the life event, and correspond to the parameters used to compute relative and absolute insurance.

The use of our estimator is motivated by several reasons. First, as this is the case for stacked difference-in-differences, it allows for the selection of a clean control group which prevents from forbidden comparisons (Borusyak et al. 2021, De Chaisemartin & d'Haultfoeuille 2023). Second, matching on the year of birth allows to control for age effects in a simple way: our analysis always compares outcomes of individuals at the same age and the same time period.[10] Third, one may still be concerned that treated or control individuals may be selected into treatment based on unobserved characteristics that may also drive the evolution of potential outcomes. To limit this possibility, we control for past lagged income. We use past periods that are sufficiently back in time (4 and 5 years before the life event) to prevent mean reversion pattern that would result from correlation between lagged income shocks and life event occurrence. Such correlation can be verified from the significance of δ_{-3}, δ_{-2} and δ_{-1} parameters.

Finally, one should note that we only use one randomly chosen matched individual in the building of our cohorts. One could easily use more control individuals to increase efficiency, but this would be at the expense of larger computational cost.[11] Given that our estimates are already precise enough given our large sample sizes, we only used one control individual.

Estimation samples We construct event-specific estimation samples as follows. We start from a list of individuals facing an event over the period of observation (cf. section 3 for details on sample selection and event definition). For each treated individual, we attribute a control individual following the method described above. For each control and treated individual, we construct a panel with demographic and income variables five years before and after the date of the event. We use a balanced estimation sample in which in restrict to individuals observed all eleven years around the event. Appendix Table A.1 presents some pre-event descriptive

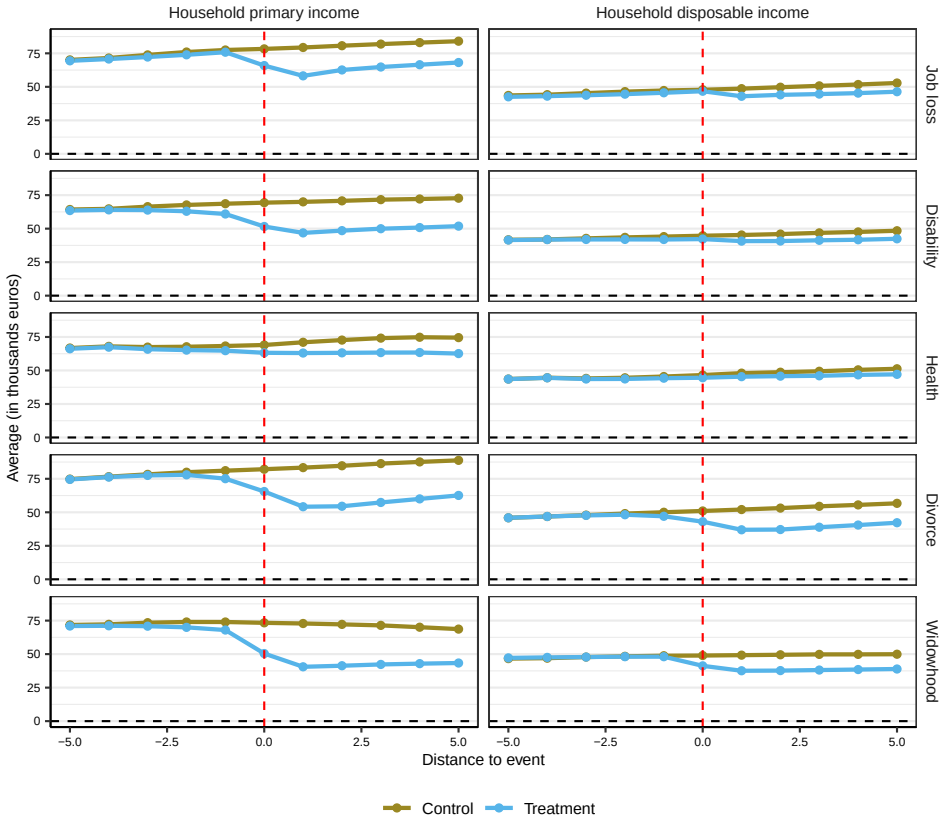
[10] Note that we can still control for time fixed effects as we stack several cohort for the estimation, in particular cohorts treated at the same age, but at different time periods, and cohorts treated at the same time period but at different ages.

[11] We performed different tests using a maximum of 10 and 100 control individuals per treated ones, which do not affect our results.

statistics for the treatment and control groups composing the estimation samples, for each life events we study. Between events, estimation samples differ substantially in terms of size and characteristics, reflecting the fact the incidence of life events is not random across the population. Within events, treatment and control groups exhibit similar characteristics, which is consistent with the matching approach we follow.

Parallel trends Identification relies on a typical parallel trend assumption of the potential outcome when non treated: in the absence of the life event, outcomes of the treated and controlled individuals would have evolved in the same way. Figure 1 provides evidence to support this assumption. Overall, income in the control and treatment groups evolve in parallel in the pre-event period for all shocks. However, for most shocks we see a slight decline in income one or two periods before the shock, which we attribute to anticipation effects. Anticipation effects reflect the fact that the events we are looking at are not exogenously defined. In the literature, job loss is typically studied through mass layoffs, and health shocks are analyzed through the lens of specific, less predictable events, such as hospitalization for an acute health event. Because we are interested in a broad range of life events, want a framework that allows comparison between them, and are interested in the interaction between events, we use less restrictive event definitions and sample selections. In any case, the observed anticipation effects are not massive compared to the effect of the events and do not pose a major threat to the interpretation of our results.

Figure 1: Average household primary income by event time, for control and treatment groups



NOTE: This Figure presents the raw average for household primary income, before and after the event, separately for the control and treatment groups constructed for each life-events. For the treatment groups, the distance to event is equal to zero at the year of the event. The event dates of individuals of the control groups are based on their matched individuals from the treated groups.

5 Results

5.1 Results by event

We first describe the estimates we obtain for each type of event separately. For each event, we present two main results. We first show the effect on primary household income and its two main components, namely individual and spousal primary income. Second, we present the insurance effect provided by benefits (gross income) and taxes (disposable income). Finally, we compare those results to what has been previously found in the literature. In Figures 2 to 6, we present the estimated effect of life events on different income concepts that are all normalized by household size and by the pre-event average disposable income. Appendix Figures A.5 and A.6 present the estimated effect on income absolute and relative levels without household size normalization.

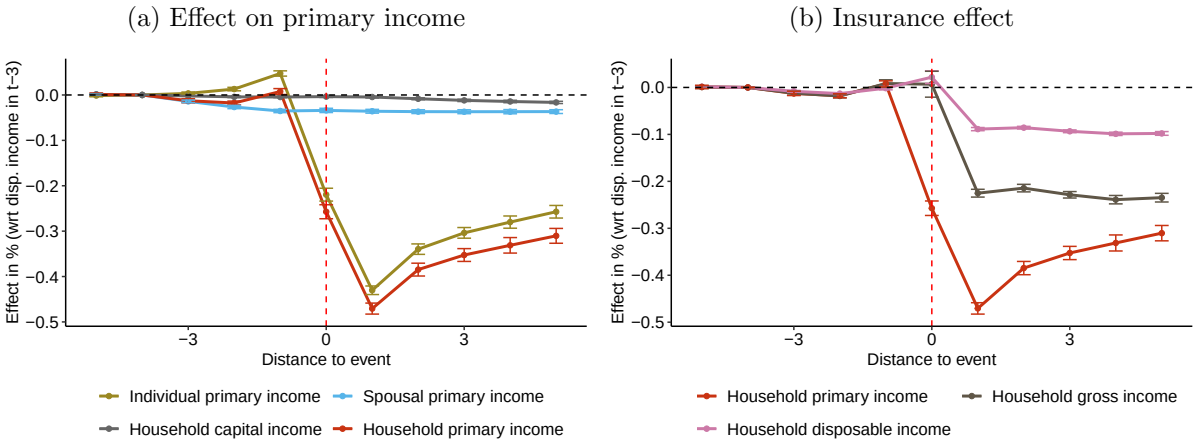
Job loss

Effect on primary income Figure 2a present the direct effect of the job loss. We observe a large initial drop in the household primary income (-40% compared to pre-event disposable income in t+1) with a slow recovery over time, while remaining large at the end of the observation period (-30% after five years). When decomposing the overall effect on household income between the individual and spousal primary income, we observe that the negative effect on individual income is reinforced by spousal income, which also decreases with the event. This suggests that negative correlated effects dominate potential added-worker effects. As mentioned above, negative correlated effect can stem from different channels: a direct negative effect on spousal labour supply or a correlated effect of the event on the household composition (e.g divorce). Appendix Figure A.2 presents the estimated effect of life events on household composition. We indeed observe a negative effect of job loss on household size, showing that this event is correlated with couple separation, as it as been shown in the literature. When we neutralize this household composition effect by estimating the effect of job loss on a sub-sample of individuals with stable household composition around the event, we find a positive added-worker effect (see appendix Figure A.3). This suggests that the negative effect we find combines a negative composition effect and a positive labour supply effect, with the former dominating the later.

Insurance effect When comparing the effect on primary income to the final effect on disposable income (Figure 2b), we observe that the effect of job loss is significantly reduced by the tax and benefit system. On the short run, the effect on gross income is half as big as the effect on primary income. This illustrates the effect of social insurance, in particular unemployment insurance. As we move further from the event time, the gap between the estimated coefficient for primary and gross income decreases, as unemployment benefit rights exhaust and individual primary income increases. At the end of the period (t+5), there is still a significant effect of benefits, which is likely to be driven by residual unemployment benefits (from newly accumulated right because maximum duration is always below five years) or the use of alternative pathways such as disability benefits or welfare. The effect of the event on disposable income income is further reduced by the decrease in taxes, and is roughly stable over time, as is the effect on gross income, around -10% of the pre-event disposable income. Using those estimates, we compute the government insurance to job loss as defined in section 4.1, and find a relative (resp. absolute) insurance I^{rel} (resp I^{abs}) of 69% (resp. 21pp) in the long run (see Appendix Table A.2)

Comparison with the literature We focus on the following subset of the extensive literature studying the effect of job loss: Bertheau et al. (2023) for an international comparison of the effect on earnings, Cammeraat et al. (2023) for the focus on household response and added-worker effects, Stepner (2019) for the insurance effect of the tax and transfer system, and Halla et al. (2020) and Andersen et al. (2023) for recent extensive analyses encompassing those dimensions.

Figure 2: The effect of life events on income trajectories: job loss



NOTE: This Figure shows the estimated impact of the job loss on different components of individual and household income. Panel (a) decomposes the direct effect of the event on primary income into individual and spouse's primary income. Panel (b) presents the government insurance against job loss by comparing its effect on primary, gross and disposable income. All coefficients are calculated by rescaling the income-specific estimates (δ_τ in equation (1)) by the average disposable income in the years preceding the event.

The estimated effect on earning trajectories exhibits the same pattern as documented in other countries, with a sharp drop at the event time that is followed by a recovery but with persistent and large long term drop in earnings. With a long run drop of 30% in individual earnings (cf. Figure A.6), the impact we measure seems to be relatively high compared to what is found in other countries (Bertheau et al. 2023).[12] Our results are also consistent with the literature with respect to the *added-worker* effect, or spousal labour supply response to job loss. We find a small negative effect on spousal income, when recent papers find a small positive or insignificant added-worker effect. However, when we restrict the estimation to individual with stable household structure, as done e.g in Cammeraat et al. (2023) and Andersen et al. (2023), we also find evidence of such added-worker effect. The estimated reduction in the spouse's labour supply effect we obtain is then driven by couples' separation at the same time as the job loss event. This is in line with Halla et al. (2020), who find a small increase (+0.5 percentage points) in the probability of divorce following a job displacement. Finally, in terms on insurance provided by the tax and transfer system, we find a large difference between the effect of job loss on pre-tax and post-tax income, that is comparable in magnitude to what is found by Andersen et al. (2023) in Denmark, and bigger than what Stepner (2019) and Halla et al. (2020) respectively find for the US and Austria. This is consistent with the relative generosity of social insurance in each country. The Dutch system, through both unemployment insurance and alternative public scheme such as welfare benefits, provides substantial insurance against employment risk.

[12]Note that (Bertheau et al. 2023) uses a different definition of job loss based on mass lay offs. This may primarily select individuals with significant labour market attachment, for which are can expect job loss to have milder effect on earnings trajectories.

Disability

Effect on primary income Figure 3a presents the direct effect of a disability shock on household primary income. First, we observe a very large drop in primary income in the short run (-60% in t+1 compared to pre-event disposable income). Second, we observe that the effect is persistent, and remains very strong at the end of the period (-50% in t+5). Third, it appears that the drop in income begins two years before the event. This can be explained by the fact that most individuals need to spend two years in sickness leave before they are eligible to disability benefits, and that it usually comes with a wage reduction (see section 2). When decomposing between individual and spousal primary income, we observe a large drop in spousal primary income that amplifies the drop in individual income. Similarly to job loss, this negative effect seems to be driven by simultaneous couple separation (appendix Figure A.2).

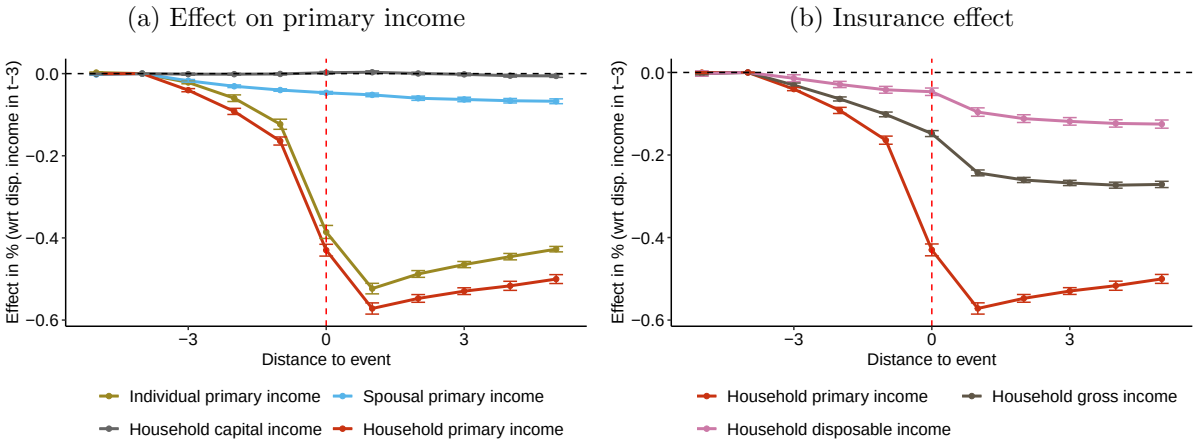
Insurance effect In terms of insurance effect (Figure 3b), we find a much smaller drop in gross income compared to primary income (-25% vs. -50% in t+5). This is probably due to the high and long-lasting replacement rates provided by the disability insurance system. The overall effect on disposable is further reduced to -15% through the decrease in taxes paid on gross income. The total government insurance provided in the long run (in t+5) is equal to 75% in relative term (I^{rel}) and 38pp in absolute value (I^{abs}).

Comparison with the literature Although there is an extensive the literature on disability insurance, there is limited literature directly describing the effect of disability claiming on income trajectories. Paper either study the role of disability benefits in insuring individuals against health shocks in general (cf. next paragraph below), or the negative impact of disability benefits on (individual and spousal) labour supply through moral hazard (see e.g Autor et al. (2019) and Bernasconi et al. (2024) for a recent paper on Dutch data). The most comparable paper is Meyer & Mok (2019), which analyses the effect of (self-declared) disability on various outcomes. They find that individuals with disability face a substantial drop in individual earnings (-25% on average, up to -80% for severe limitations). They also find that the tax and transfer system as a whole largely dampens the effect of disability on post-tax income. The negative effect on spousal labour supply we find is consistent with the general finding in the literature that added worker effect are more important when access to public insurance is limited (Autor et al. 2019, Bernasconi et al. 2024). Given the important replacement rates in the Netherlands, it is expected to have limited added workers effect overall, and negative average spousal labour supply through the combination of contemporaneous couple separation or decreased spousal supply due to care to (or leisure complementarity with) the disabled spouse.

Health shocks

Effect on primary income The impact of the health shock on individual income trajectories is not as pronounced as for the other life events we consider. We observe a progressive decline in individual income, which is accentuated at the time of the event, but can also be observed

Figure 3: The effect of life events on income trajectories: disability



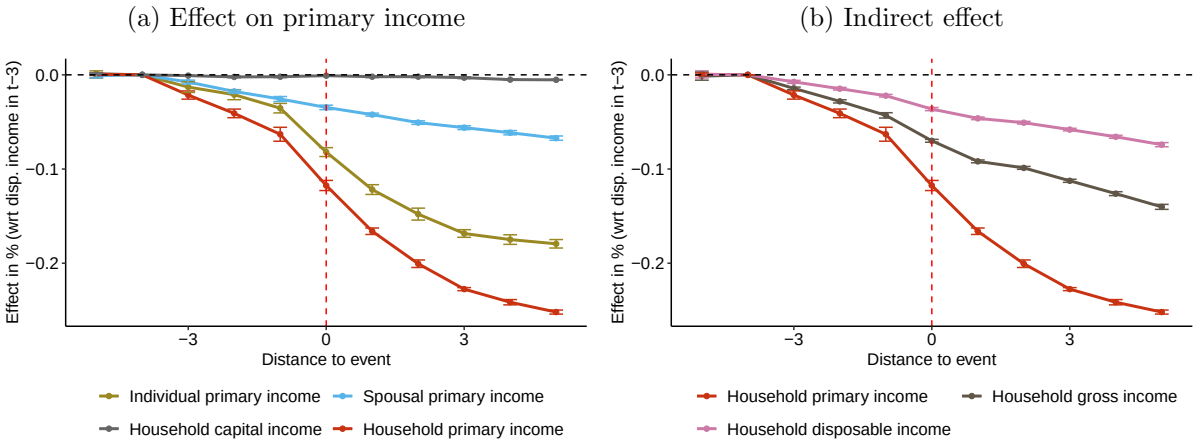
NOTE: This Figure shows the estimated impact of disability on different components of individual and household income. Panel (a) decomposes the direct effect of the event on primary income into individual and spouse's primary income. Panel (b) presents the government insurance against disability by comparing its effect on primary, gross and disposable income. All coefficients are calculated by rescaling the income-specific estimates (δ_τ in equation (1)) by the average disposable income in the years preceding the event.

before and after the event. The limited effect we observe may also be due to our definition of a health shock (see previous section), which may not capture disruptive events with a large and immediate impact on income trajectories. Another explanation lies in employer-provided health insurance: for workers, the reduction in hours and hence income is fully compensated in the first year and 70% in the second year (see section 2) of the illness. As a result, health shocks i) for employed individuals and ii) with relatively short-term effects are mostly covered by employer insurance. As this insurance is recorded in the data as wage continuation, it does not lead to a reduction in primary income.

In addition to the drop in individual income, we also observe a significant drop in the labor supply of the spouse. This could be partly explained by contemporaneous changes in household structure, as suggested by the slight decrease in the number of individuals in the household around the event (Figure A.2). However, we still find a negative effect when focusing on a population with a stable household composition (Figure A.3). This could be explained either by correlated events between spouses (both spouses are affected by a health shock) or by a negative effect of the shock on the spouse's labour supply, e.g. due to additional care needs for family members.

Insurance effect Public benefits and taxes largely reduce the direct impact of the health shock on household income, with the reduction from around 35% to around 5% of pre-event disposable income when going from primary income to disposable income. The insurance comes mainly from the transfer side and is likely to be driven by a significant proportion of individuals being eligible for disability benefits following a major health shock. In terms of the insurance measure, we find a relative insurance I^{rel} of 71% and an absolute insurance I^{abs} of 17pp five years after the event.

Figure 4: The effect of life events on income trajectories: health



NOTE: This Figure shows the estimated impact of health shock on different components of individual and household income. Panel (a) decomposes the direct effect of the event on primary income into individual and spouse's primary income. Panel (b) presents the government insurance against health shock by comparing its effect on primary, gross and disposable income. All coefficients are calculated by rescaling the income-specific estimates (δ_τ in equation (1)) by the average disposable income in the years preceding the event.

Comparison with the literature There is a large literature that studies the impact of health shocks on income trajectories. We focus on the following limited but illustrative sample of this literature: García-Gómez et al. (2013) for the Netherlands, Dobkin et al. (2018) for the US and Fadlon & Nielsen (2021) for Denmark. These papers all use different definitions of health shocks, which are arguably less predictable and more exogenous, such as hospitalisation for acute health events. They all observe a sharp, substantial and permanent drop in individual earnings, which is more pronounced in the US and Denmark. In both the Netherlands and Denmark, however, the decline in total household income is very limited, due to the wide access to public insurance against health shocks (universal health insurance and generous disability insurance for long-term health impairments). In line with this extensive public insurance, household insurance through spousal labour supply is not observed in either case. As we do, García-Gómez et al. (2013) even find a negative effect, which they attribute to the additional care and household responsibilities of the healthy spouse. Conversely and consistently, Dobkin et al. (2018) find limited income insurance against health shocks and some evidence of an additional worker effect in the US context.

Couple separation

Effect on primary income The effect of couple dissolution on individuals' primary income trajectories is primarily determined by the income pooling hypothesis underlying our analysis. When household composition changes, the mechanical effect on household primary income can be attributed to two main components. The first is the loss of previously shared spousal income. When the spouse leaves, the household no longer benefits from his or her income, which had previously contributed to the household's collective resources. The second component is the gain of previously shared individual income, for symmetrical reasons. The individual no longer

needs to share his or her income.In addition to these two components, households may have children. Income is shared between all members of the household and, after couple separation, the number of members depends on child custody arrangements. Overall, the change in household income after separation reflects the extent of an individual's contribution to the household's total income before separation. Specifically, there is no change in normalised household income if the individual's contribution to total household income before separation is proportional to the ratio of consumption units in the household after separation compared to before. Beyond this mechanical effect, individual income may also be affected by behavioural responses, such as changes in labour supply following separation. In addition, individuals may decide to remarry and thus benefit from the income pooling of a new spouse.

Figure 5a presents the estimated combined effect of the different margins. The large drop in spousal income is largely compensated by the increase in individual income, yet the overall effect remains sizable (-25% of pre-event disposable income) and stable over time. We provide additional insights regarding the underlying mechanism in appendix Figures A.2 and A.4. The first one presents the evolution of the household composition following the divorce and shows that a significant share of divorcees remains in a couple or find a new partner in the years following the divorce. The second one presents the equivalent of Figure 5 without any normalisation in the income variables. We observe that, on average, there is no individual labour supply response after divorce. In section 5.3 we show that this lack of labour supply effect hides substantial asymmetric effects by gender. In terms of dynamics, we observe a slight decrease in the effect of the event over time, driven by the increase in spousal income, through repartnering.

Insurance effect The initial drop in primary income is significantly reduced by the tax and benefits system, from 22% to 10% in t+5 (Figure 5b). Roughly 40% of the effect is driven by increased benefits, and the rest by a reduction in taxes following the drop in gross income. It corresponds to a total insurance of 57% in relative terms (I^{rel}) and 13pp in absolute terms (I^{abs}). Additional benefits are likely to come from spousal alimony and other transfers individuals may become eligible to as single (or single parents), such as welfare.

Comparison with the literature To the best of our knowledge, only two papers have examined the effect of couple separation on income using an approach similar to ours: Bonnet et al. (2021) and Hogendoorn (2022). Although they do not provide an estimate for the whole population, they highlight the fact that the main driver of variation in household income after divorce is the extent of the individual's contribution to the household's total income prior to separation. Women whose average contribution to household income is lower than that of their spouse experience a drop in primary household income, while for their male counterparts it's a jump. The tax and transfer system can either mitigate or amplify the impact of the shock, depending on the individual's initial contribution to total household income (e.g. receipt or payment of alimony, progressivity of the tax system). As shown in Appendix Figure A.7, which presents the same results as Figure 5a distinguished by gender, our findings are consistent with the literature.

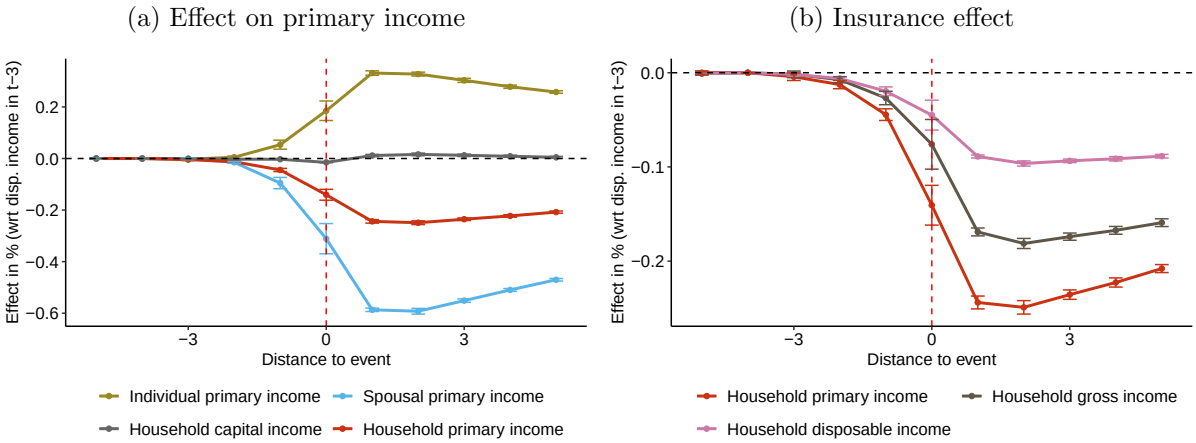
Widowhood

Effect on primary income The pattern observed for the direct effects of widowhood is qualitatively comparable to that obtained for couple separation, with the following three notable differences. First, the effects on individual and spouse's primary income are much less symmetric than in the case of divorce, with a much stronger effect of the loss of spouse's primary income leading to a large drop in household primary income (-40% in t+1). This is due to the fact that widowhood mainly affects women (in about 70% of cases, see Figure A.1), for whom the loss of spousal income is more significant. Second, individuals and especially women are less likely to remarry after widowhood than after divorce, as shown in Figure A.2. Third, in the case of widowhood, the increase in individual income generated by the reduction in household size is partly offset by a reduction in individual labour supply after the death of the spouse (see Figure A.4, which shows the effect without normalisation by household size). In terms of dynamics, we observe a slight decrease in the effect of the event over time, as the increase in spousal income (through repartnering) dominates the decrease in individual income (through reduced labour supply).

Insurance effect The large drop in primary income following widowhood is largely compensated by the tax and transfer system. In the long run, we observe a drop in disposable income of around 10% compared to an initial drop in primary income of 40%. This corresponds to a total insurance of 76% in relative terms (I^{rel}) and 28pp in absolute terms (I^{abs}). Most of the insurance is provided by benefits, which are likely to be driven by two main sources: the eligibility to social welfare and the access to survival benefits.

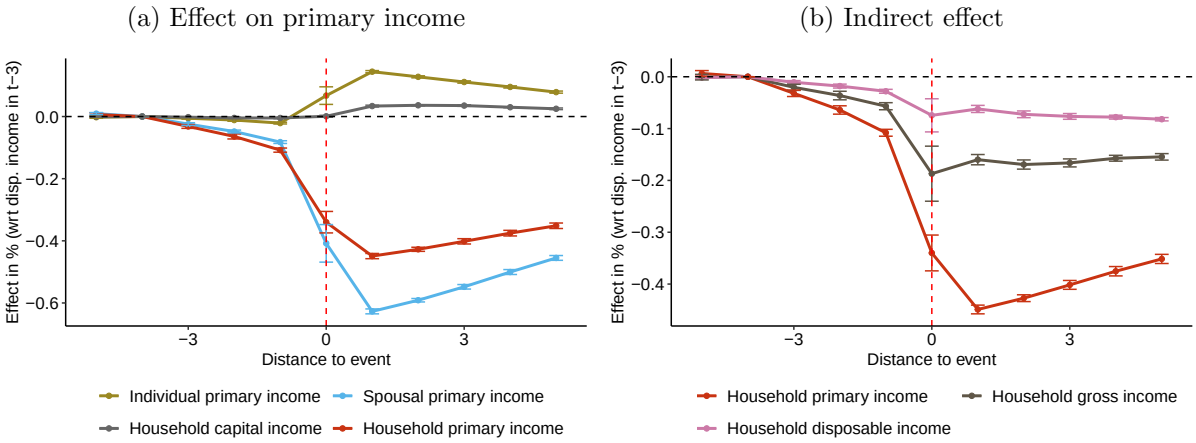
Comparison with the literature The only paper that examines the effect of the death of a spouse on income is Fadlon & Nielsen (2021). The authors focus on the labour supply response to a fatal health shock and, in contrast to us, find a positive effect. However, they suggest that the average increase in labour supply is driven by survivors who are less covered by social benefits. Combined with Rabaté & Tréguier (2024)'s finding that reducing access to survivor benefits increases female labour supply after the death of a spouse, and given that a significant share of our sample benefits from survivor insurance, our overall assessment of the effect of spousal death on earnings may be explained by the generosity of the welfare state, which is significantly higher in the Netherlands than in the United States.

Figure 5: The effect of life events on income trajectories: couple separation



NOTE: This Figure shows the estimated impact of separation on different components of individual and household income. Panel (a) decomposes the direct effect of the event on primary income into individual and spouse's primary income. Panel (b) presents the government insurance against separation by comparing its effect on primary, gross and disposable income. All coefficients are calculated by rescaling the income-specific estimates (δ_τ in equation (1)) by the average disposable income in the years preceding the event.

Figure 6: The effect of life events on income trajectories: widowhood



NOTE: This Figure shows the estimated impact of widowhood on different components of individual and household income. Panel (a) decomposes the direct effect of the event on primary income into individual and spouse's primary income. Panel (b) presents the government insurance against widowhood by comparing its effect on primary, gross and disposable income. All coefficients are calculated by rescaling the income-specific estimates (δ_τ in equation (1)) by the average disposable income in the years preceding the event.

5.2 Comparison between events

We now turn to the heart of our analysis, the comparison between life events. Figure 7 puts on the same scale the effect of events on primary and disposable household income already presented in Figures 2-6. It appears that the effect on primary income varies a lot across the different adverse life events we consider. On the long run, we observe a 30 percentage point gap between the events with the most (disability, -50%) and the least (divorce, -20%) important effect. The gap is even larger in the short run (-55% for disability vs. -15% for health). This shows that

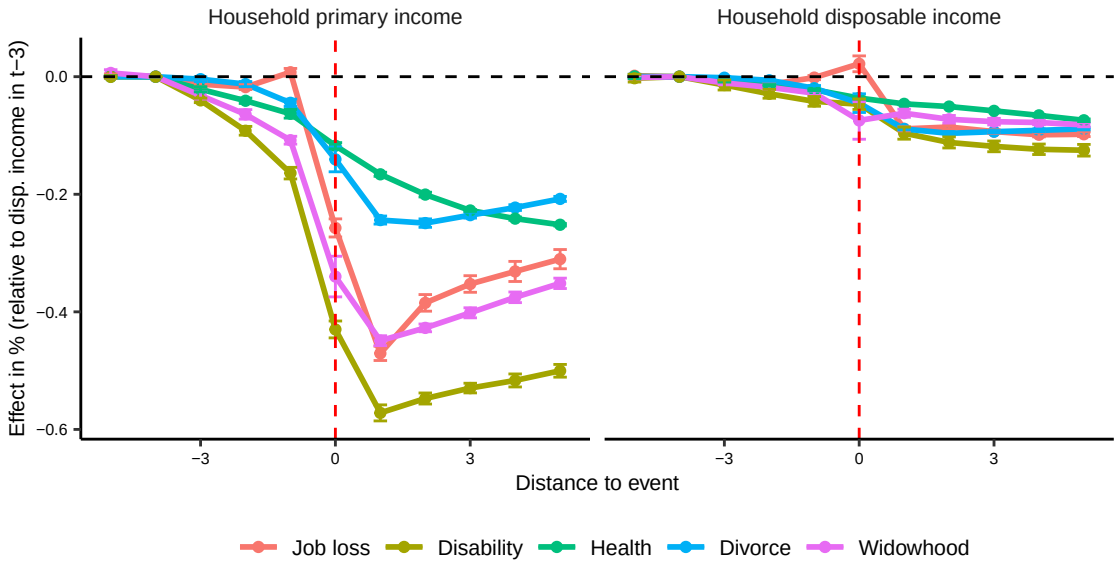
the events we consider differently impact income trajectories, both in terms of magnitude and dynamics. As already observed when analyzing all events separately, the effect on disposable income is much smaller than the effect on primary income, illustrating the role of government insurance in limiting the impact of adverse events on income trajectories through the tax and benefits system. By putting all events on the same scale and comparing their effects on primary and disposable income, Figure 7 sheds light on an additional and important result: the range of estimates we obtain for disposable income (from -12% for disability to -7% for health shock in the long run) is much narrower than for primary income. This suggests that the tax and benefits system reduces the differences between events by providing relatively more insurance when the direct effect of event is relatively more important.

This interpretation is confirmed by Figure 8, which isolates the estimated effects for primary, gross and disposable household income, for all events in the short (t+1) and long run (t+5). Between events, we observe that the wide range of direct effect on primary income is largely reduced by benefits and taxes, leading to homogeneous effect in terms of disposable income and limiting the drop in income to around 10% of pre-event level. Within events, we also observe that, even when the direct effect significantly decreases over time (for job loss, disability and widowhood), the effect on disposable income remains stable. This is mostly driven by the fact that benefits decrease when primary income increases.

Both between events and within an event over time, the amount of insurance provided by the tax and transfer system is then positively correlated with the severity of the event - or negatively correlated with its direct impact on primary income. This correlation is illustrated in Figure 9, which plots the level of relative and absolute insurance (see section 4.1 for their definition and interpretation) against the direct effect of the event on primary income. There is a clear positive correlation between the level of insurance and the size of the initial impact of the event. The relationship is even almost linear when considering the absolute definition I^{abs}, which is consistent with the fact that the estimated effect on disposable income is homogeneous across time and events, around -10%.

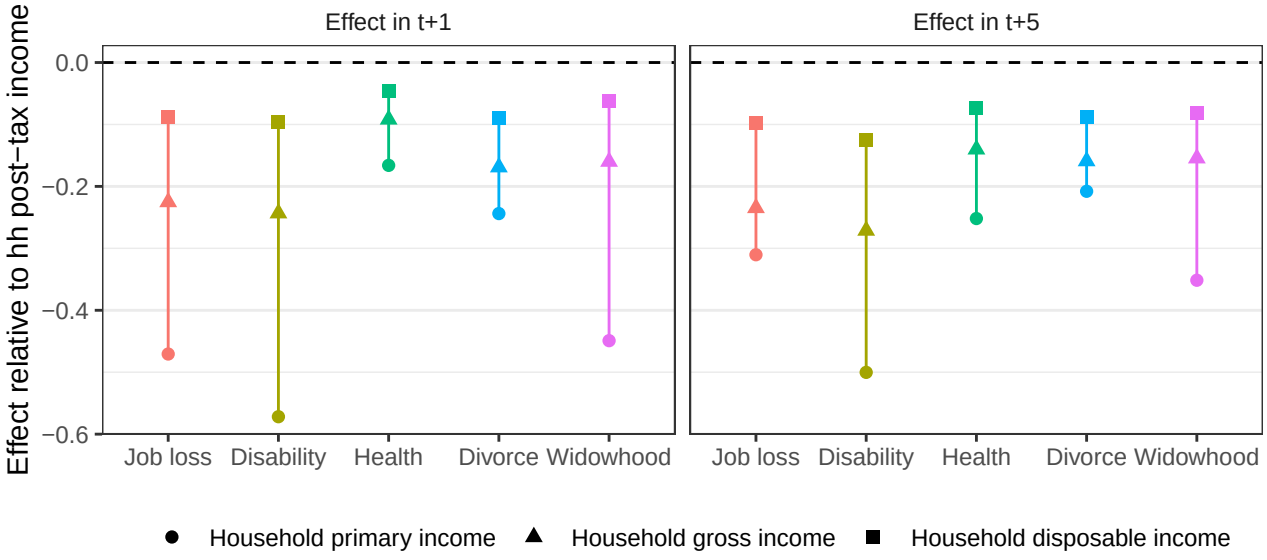
Note that the positive relationship we observe between the direct and insurance effects of an adverse event can be interpreted in two ways. First, it can illustrate the consumption smoothing objective of public insurance, which implies a positive relationship between the initial drop in income and the transfers received. Second, it can also be driven by the negative effect of the insurance itself on labour supply through income or substitution effects: the higher the insurance against a shock, the higher the moral hazard and the higher the associated drop in earnings.

Figure 7: Effect of life events on primary and disposable income



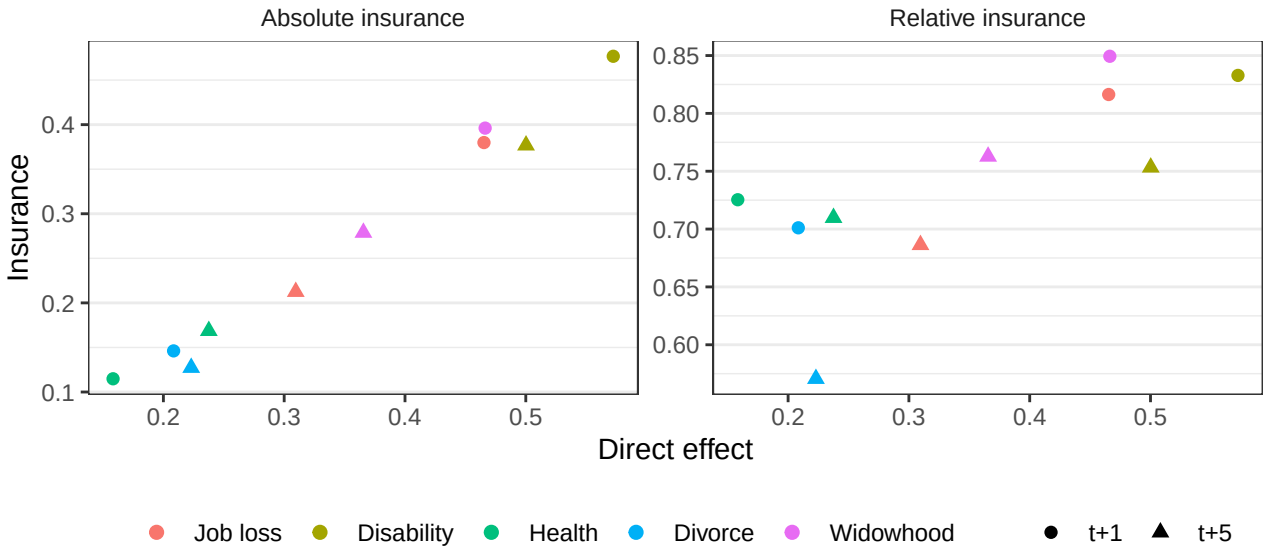
NOTE: This Figure present the effect of different life events on household primary income (left panel) and disposable income (right panel). This corresponds to the results presented in Figures 2b to 6b put on the same scale.

Figure 8: Summary of direct and insurance effects



NOTE: This Figure presents the effect of our five life events on primary household income (round shape), gross household income (triangle shape) and disposable income (square shape). The effect is measure from the estimated coefficient of equation 1 for those different outcomes, rescaled by the baseline pre-event household disposable income.

Figure 9: Insurance vs direct effect



NOTE: This Figure presents the absolute (left panel) and relative (right panel) insurance against life events provided by the tax and transfer system (see section 4.1), as a function of the direct effect of the event on primary income. For each event, we measure insurance at two points in time: one and five years after the event-time.

5.3 Heterogeneity

We analyze the heterogeneity in the direct and insurance effects of adverse life-events. We consider the following dimensions and associated categories, defined four years before the date of the event: age (by ten years group), gender (men/women), position in the household (single, main earner, secondary earner), income group (quartile of labour income by age and gender) and migration background (native, first and second generation). We estimate equation (1) separately for each sub-category. Appendix Figure B.1 presents the average primary income by event for the treatment and control groups, for each subcategories of the groups we consider. We verify that the identifying parallel trend assumption seems to hold separately for the different estimation sub-samples we consider. We present the results of the estimated coefficients for event t+5 for primary household income and disposable household income in Figures 10 and Figure 11 for individual and household events respectively.

Direct effect

We first consider the heterogeneity in terms of direct effect of adverse life events, that is given by the estimated effect on primary household income. Overall, we observe substantial variation between categories: the within events variations in direct effects are almost as important as between events variations. For individual events the following patterns can be observed. The direct effect of events is relatively larger for richer individuals (e.g. for disability -60% for Q4 vs. -22% for Q1). This can be explained by the fact that they have more stable jobs and lose relatively more when adverse events occur. Richer individuals may also earn a larger share of household income, implying a larger impact of the individual event on household primary income. This mechanism also explains why the direct effect is much smaller for the secondary earner in a couple (and for women): they are insured against the loss of their own income by the other resources available in the household. In terms of age, we find that the effect on primary income increases with age for job loss and disability, but we find an opposite gradient for health (e.g. 40% decrease for the 20-30 group compared to 20% for the 50-60 group). The gradient for disability and job loss can be explained by the correlation between age and income. The inverted gradient by age can be explained by the fact that health shocks as we measure them (large increases in health expenditure) are likely to be more severe and consequential at younger ages.

For household events (divorce and widowhood) we observe that the direct effect is much larger for secondary earners, women and low income individuals. We even observe a positive direct effect of divorce for men. This is due to the fact that the main driver of the effect of such events is the end of resource pooling within the household. Individuals with a higher (or lower) share of household income are net contributors (or beneficiaries) to resource pooling before the event and therefore lose relatively less (or more) when it ends. These groups also show very different individual labour supply responses, as shown in Figure A.11, which shows the estimated effect on individual labour income without normalising for household size. For divorce, we find a positive labour supply response for women and secondary earners and a

symmetric negative response for men and primary earners. This is consistent with income effects following the positive or negative change in living standards after the end of the union. We observe a similar pattern for widowhood, with a much larger drop in individual earnings for men and main earners than for women and secondary earners.

Insurance effect

The insurance provided to different categories is given by the gap between the estimated effect on primary and disposable household income in Figures 10 and 11. We highlight three main findings from this comprehensive set of results

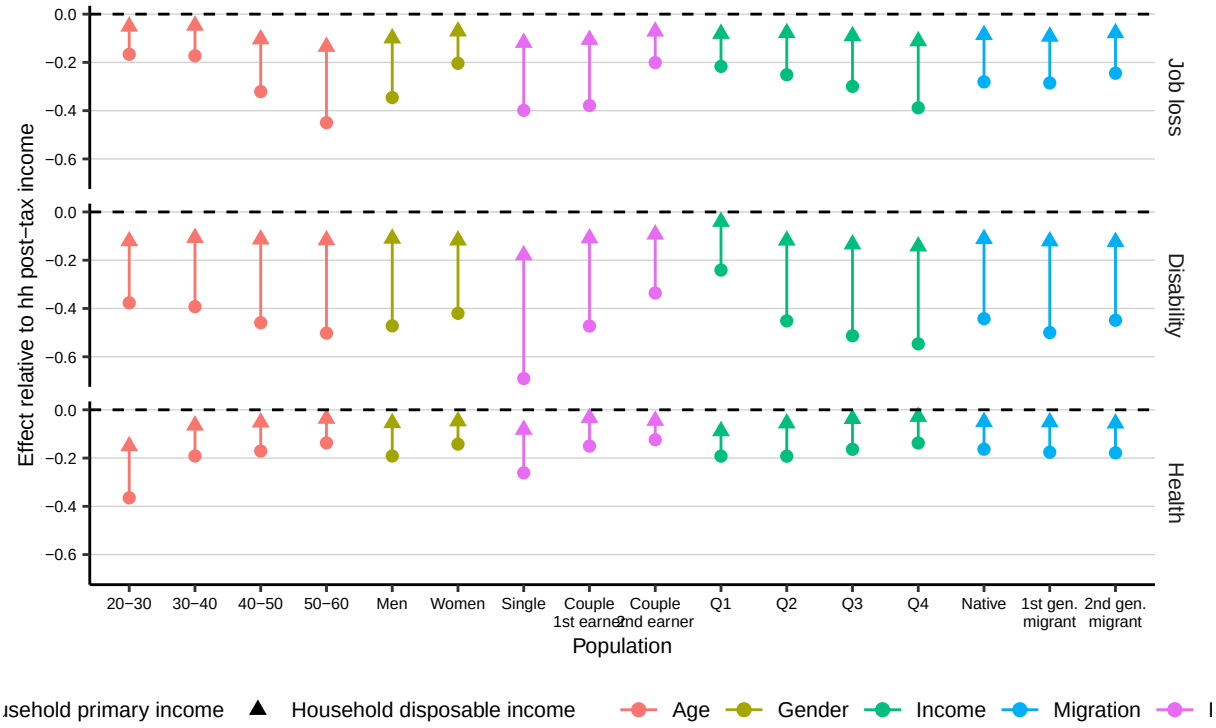
First, we observe that state insurance largely compensates for the gradients found for the direct effects of events. For individual events, individuals with higher incomes (in absolute terms and relative to household income) receive relatively more insurance. This may be due to the fact that the two main components of insurance against these shocks (taxes and social security) are roughly proportional to income. For household events, individuals with lower incomes (in absolute terms and relative to household income before the event) receive relatively more insurance. Indeed, these groups are more likely to receive the benefits associated with these events (social assistance, spousal support and survival benefits), and the reduction in taxes is more important for individuals who lose a high earning spouse.

Second, and this follows directly from the previous point, there is much less variations in the estimated effect of events for disposable income than for primary income. For all groups and events, the estimated effect on disposable income lays between -20% and +5%, with many of the estimates around the -10% level. We therefore exhibit the same pattern within event and between groups as what we found between events: there is a positive correlation between the severity of the shock and the public insurance. This is illustrated in Figure 12 which presents the absolute value of insurance I^{abs} (computed in t+1 and t+5), as a function of the direct effect of events on primary income.[13] We observe a strikingly linear relation between the severity of the income shock to the household and the insurance provided by the tax and benefits system. Even extreme points in terms of direct event (positive effect of divorce for men and large short term effect of disability for single) seem follow this relation. This suggests that the taxes and benefits systems smooth consumption (as proxied by disposable income) relatively well over time, across events and different categories of the population.

Finally, in spite of the positive relation we observe between direct and insurance effects for the different categories we consider, we observe that in some cases the eventual effect of the shock on disposable income remains significantly high. Using an arbitrary level of -20%, corresponding to the lower bound of the effect on disposable income we obtain, we can identify the following populations that are poorly insured to specific events: women, secondary earners and low income in the case of divorce, young individuals in the case of health shocks, single household in the case of disability, and older workers in the case of job loss.

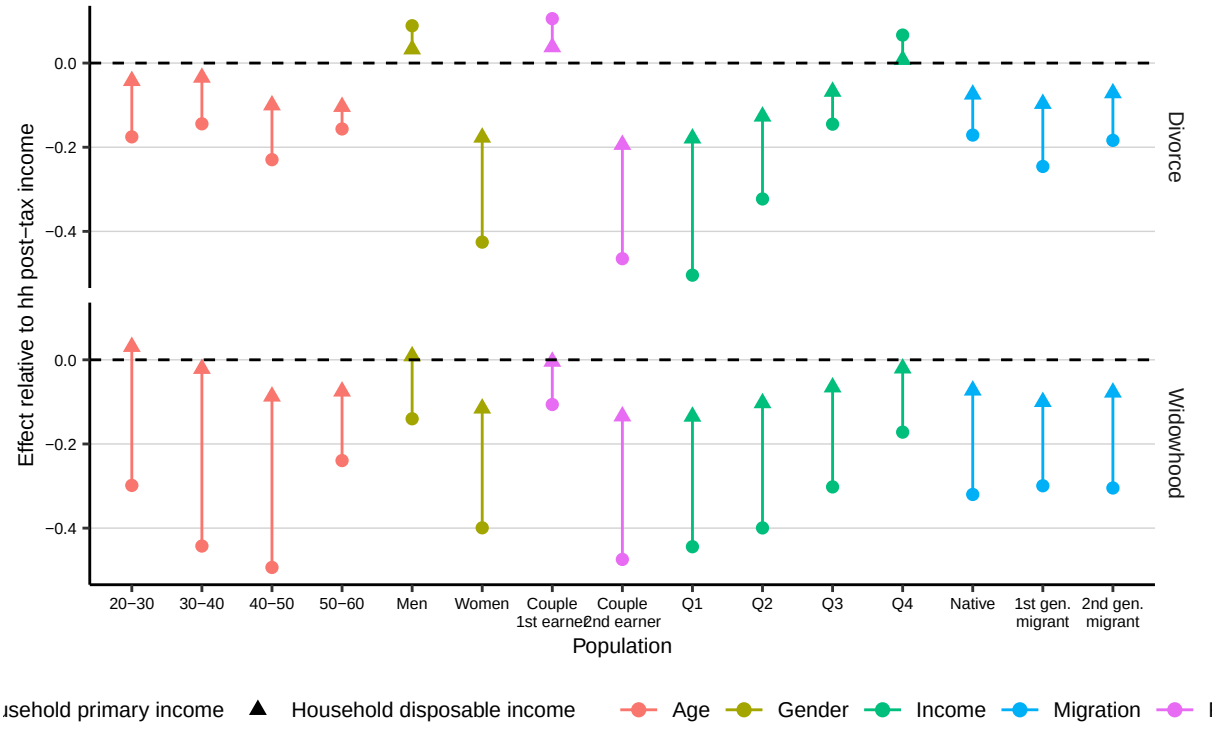
[13]The relative value of insurance I^{rel} is less easy to interpret with the very small or even positive estimated effect on primary or disposable income that we obtain for some groups.

Figure 10: Effect by subgroups: individual events



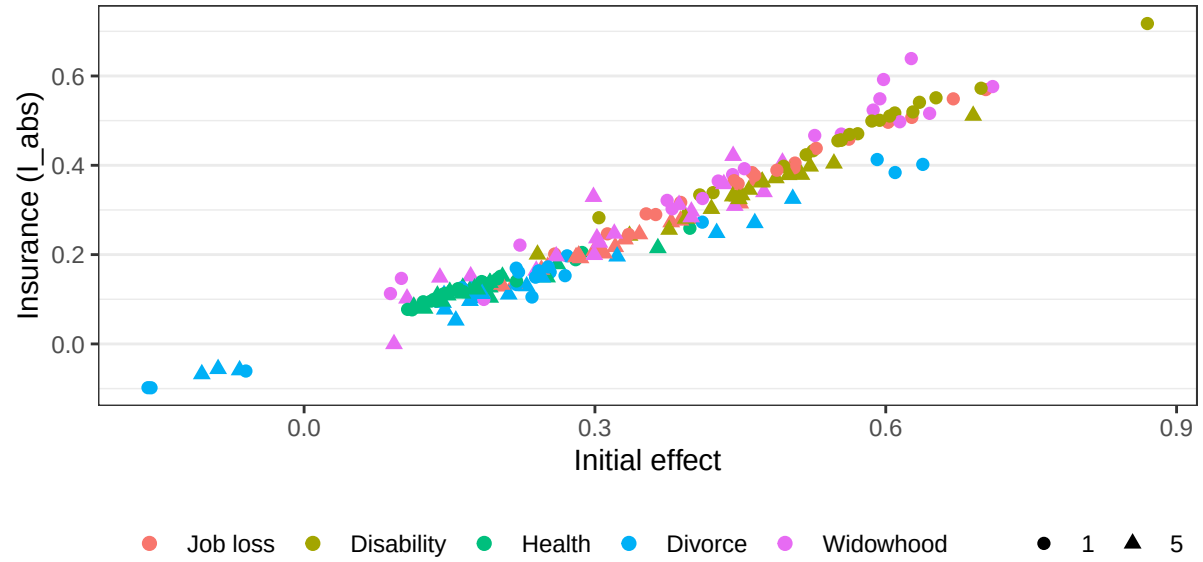
NOTE: This Figure presents the effect of individual events (employment, health and disability) on primary household income (round shape), disposable household income (triangle shape). The effect is measure from the estimated coefficient of equation 1 for those different outcomes, rescaled by the baseline pre-event household disposable income.

Figure 11: Effect by subgroups: household events



NOTE: NOTE: This Figure presents the effect of household events (divorce and widowhood) on primary household income (round shape), disposable household income (triangle shape). The effect is measure from the estimated coefficient of equation 1 for those different outcomes, rescaled by the baseline pre-event household disposable income.

Figure 12: Heterogeneity: insurance (I^{abs}) vs direct effect



NOTE: This Figure presents the absolute insurance against life events provided by the tax and transfer system (see section 4.1), as a function of the direct effect of the event on primary income. For each event, we measure insurance at two points in time (in t+1 and t+5) and for all the subgroups of the population used in Figures 10 and 11 .

6 Conclusion

This paper studies and compares the effect of different adverse life events – job loss, disability and health shocks, divorce and spousal death – on individuals' income trajectories. For all events, public insurance plays a crucial role in reducing their impact on individuals' income trajectories, through both a decrease in taxes paid and the increase in benefits received. We also find that the importance of government insurance increases with the initial severity of the event, both across events, and within events over time and between subcategories of the population. We however identify specific categories of the population that are relatively less protected against adverse life events, for example, young people facing a large health shock or divorced individuals who earn less than their spouse.

Our results have important implications for the design of public insurance against adverse life events. First, we show that the whole tax and transfer system - rather than event-specific schemes such as disability, unemployment, or survivors' insurance - needs to be accounted for when studying insurance to income shocks. Second, our analyses show a clear positive and even linear relationship between the initial severity of the event and the insurance provided by the tax and transfer system. This linear relationship is the consequence of the fact that, across events and population subgroups, adverse life events ultimately lead to a ten percent reduction in disposable income. This 10% drop is not an explicit objective of the Dutch tax and transfer system, but rather a surprising consistency in the insurance provided to different populations for different shocks. It is the result of the complex interaction between the direct negative effect of adverse event on individuals' labour supply, the insurance they receive against this shock from different entities – household, family and government – and the effect of insurance itself on labour supply. More research is required to assess the relative importance of each channel, and the extent to which it varies across individuals and types of events.

The results presented in this paper could be extended in two other directions. First, we could further decompose the insurance provided for a given event to see the extent to which different types of transfers (e.g. social insurance and welfare) interact. Second and finally, the correlation between different life events and their implications for inequality and redistribution is an interesting avenue for future research. We have shown the importance of event correlations in the case of divorce and health or employment shocks. The analytical framework developed in this paper paves the way for a more thorough analysis of the correlation between adverse life events and their consequences.

References

Andersen, A. L., Jensen, A. S., Johannesen, N., Kreiner, C. T., Leth-Petersen, S. & Sheridan, A. (2023), 'How do households respond to job loss? lessons from multiple high-frequency datasets', *American Economic Journal: Applied Economics* **15**(4), 1–29.

Arbeidsinspectie (2023), Onderzoeksrapport niet-gebruik van de toeslagenwet, Technical report, Arbeidsinspectie.

Autor, D., Kostøl, A., Mogstad, M. & Setzler, B. (2019), 'Disability benefits, consumption insurance, and household labor supply', *American Economic Review* **109**(7), 2613–2654.

Berkhout, E., Bosch, N. & Koot, P. (2018), Gebruik (en niet-gebruik) van toeslagen in nederland, Technical report, Centraal Planbureau.

Bernasconi, M., Kantarcı, T., van Soest, A. & van Sonsbeek, J.-M. (2024), 'The added worker effect: Evidence from a disability insurance reform', *Review of Economics of the Household* pp. 1–42.

Bertheau, A., Acabbi, E. M., Barceló, C., Gulyas, A., Lombardi, S. & Saggio, R. (2023), 'The unequal consequences of job loss across countries', *American Economic Review: Insights* **5**(3), 393–408.

Bonnet, C., Garbinti, B. & Solaz, A. (2021), 'The flip side of marital specialization: the gendered effect of divorce on living standards and labor supply', *Journal of Population Economics* **34**, 515–573.

Borusyak, K., Jaravel, X. & Spiess, J. (2021), 'Revisiting event study designs: Robust and efficient estimation', *arXiv preprint arXiv:2108.12419* .

Bruil, A., Van Essen, C., Leenders, W., Lejour, A., Möhlmann, J. & Rabaté, S. (2022), 'Inequality and redistribution in the netherlands'.

Cammeraat, E., Hekkelman, B., Kastelein, P. & Vissers, S. (2024), 'Predictability and (co-)incidence of labor and health shocks', *CPB Discussion paper* .

Cammeraat, E., Jongen, E. & Koning, P. (2023), 'The added-worker effect in the netherlands before and during the great recession', *Review of Economics of the Household* **21**(1), 217–243.

Cengiz, D., Dube, A., Lindner, A. & Zipperer, B. (2019), 'The effect of minimum wages on low-wage jobs', *The Quarterly Journal of Economics* **134**(3), 1405–1454.

Chetty, R. (2006), 'A general formula for the optimal level of social insurance', *Journal of Public Economics* **90**(10-11), 1879–1901.

de Boer, H.-W. & Jongen, E. (2023), 'Optimal income support for lone parents in the netherlands: are we there yet?', *The Journal of Economic Inequality* **21**(3), 573–589.

de Boer, H.-W., Jongen, E. & Koot, P. (2023), 'Too much of a good thing? using tax incentives to stimulate dual-earner couples'.

De Chaisemartin, C. & d'Haultfoeuille, X. (2020), 'Two-way fixed effects estimators with heterogeneous treatment effects', *American Economic Review* **110**(9), 2964–2996.

De Chaisemartin, C. & d'Haultfoeuille, X. (2023), 'Two-way fixed effects and differences-in-differences with heterogeneous treatment effects: A survey', *The Econometrics Journal* **26**(3), C1–C30.

de Groot, N. & van der Klaauw, B. (2019), 'The effects of reducing the entitlement period to unemployment insurance benefits', *Labour Economics* **57**, 195–208.
URL: *https://www.sciencedirect.com/science/article/pii/S0927537119300107*

De Nardi, M., Fella, G., Knoef, M., Paz-Pardo, G. & Van Ooijen, R. (2021), 'Family and government insurance: Wage, earnings, and income risks in the netherlands and the us', *Journal of Public Economics* **193**, 104327.

Deelen, A., De Graaf-Zijl, M. & Van den Berge, W. (2018), 'Labour market effects of job displacement for prime-age and older workers', *IZA Journal of Labor Economics* **7**.

DiPrete, T. A. & Eirich, G. M. (2006), 'Cumulative advantage as a mechanism for inequality: A review of theoretical and empirical developments', *Annu. Rev. Sociol.* **32**, 271–297.

Dobkin, C., Finkelstein, A., Kluender, R. & Notowidigdo, M. J. (2018), 'The economic consequences of hospital admissions', *American Economic Review* **108**(2), 308–352.

Dubois, H. & Ludwinek, A. (2015), Access to social benefits: Reducing non-take-up, Technical report, Eurofound.

Fadlon, I. & Nielsen, T. H. (2021), 'Family labor supply responses to severe health shocks: Evidence from danish administrative records', *American Economic Journal: Applied Economics* **13**(3), 1–30.

Garcia-Gomez, P., Koning, P., O'Donnell, O. & Riumalló-Herl, C. (2023), 'Selective exercise of discretion in disability insurance awards', *Journal of Policy Analysis and Management* **n/a**(n/a).

García-Gómez, P., Van Kippersluis, H., O'Donnell, O. & Van Doorslaer, E. (2013), 'Long-term and spillover effects of health shocks on employment and income', *Journal of Human Resources* **48**(4), 873–909.

Guvenen, F., Karahan, F., Ozkan, S. & Song, J. (2021), 'What do data on millions of us workers reveal about lifecycle earnings dynamics?', *Econometrica* **89**(5), 2303–2339.

Halla, M., Schmieder, J. & Weber, A. (2020), 'Job displacement, family dynamics, and spousal labor supply', *American Economic Journal: Applied Economics* **12**(4), 253–287.

Hardoy, I. & Schøne, P. (2014), 'Displacement and household adaptation: insured by the spouse or the state?', *Journal of Population Economics* **27**, 683–703.

Hogendoorn, B. (2022), 'Why do socioeconomic differences in women's living standards converge after union dissolution?', *European Journal of Population* **38**(3), 577–622.

Kabátek, J. (2018), 'Divorced in a flash: the effect of the administrative divorce option on marital stability in the netherlands'.

Kaplan, A. & Herbst, A. (2015), 'Stratified patterns of divorce: Earnings, education, and gender', *Demographic Research* **32**, 949–982.

Koning, P. & Lindeboom, M. (2015), 'The Rise and Fall of Disability Insurance Enrollment in the Netherlands', *Journal of Economic Perspectives* **29**(2), 151–72.
URL: *http://www.aeaweb.org/articles?id=10.1257/jep.29.2.151*

Meyer, B. D. & Mok, W. K. (2019), 'Disability, earnings, income and consumption', *Journal of Public Economics* **171**, 51–69.

Rabaté, S. & Rellstab, S. (2022), 'What determines the child penalty in the netherlands? the role of policy and norms', *De Economist* **170**(2), 195–229.

Rabaté, S. & Tréguier, J. (2024), 'Labour supply and survivor insurance in the netherlands', *Labour Economics* **88**, 102527.

Stepner, M. (2019), 'The insurance value of redistributive taxes and transfers', *Unpublished manuscript* .

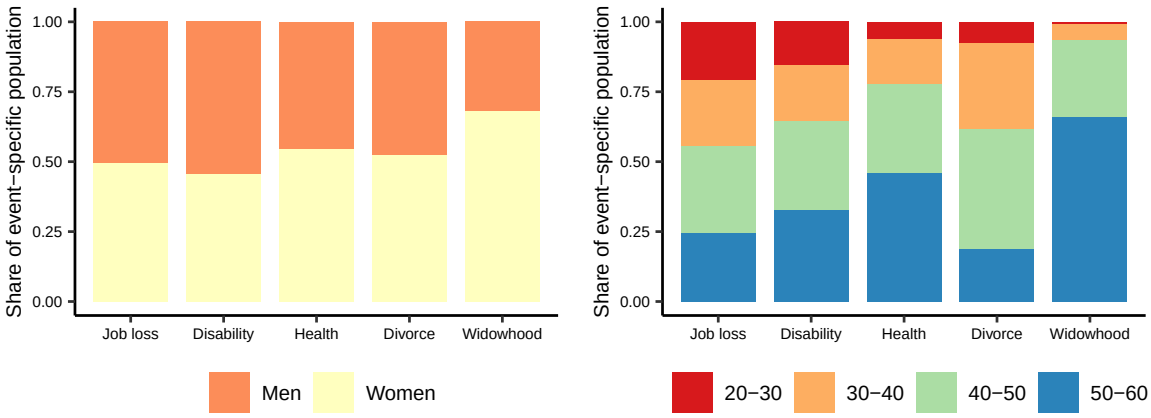
Sun, L. & Abraham, S. (2020), 'Estimating dynamic treatment effects in event studies with heterogeneous treatment effects', *Journal of Econometrics* .

A Additional Figures and Tables

Figure A.1: Incidence of life-events by subgroups

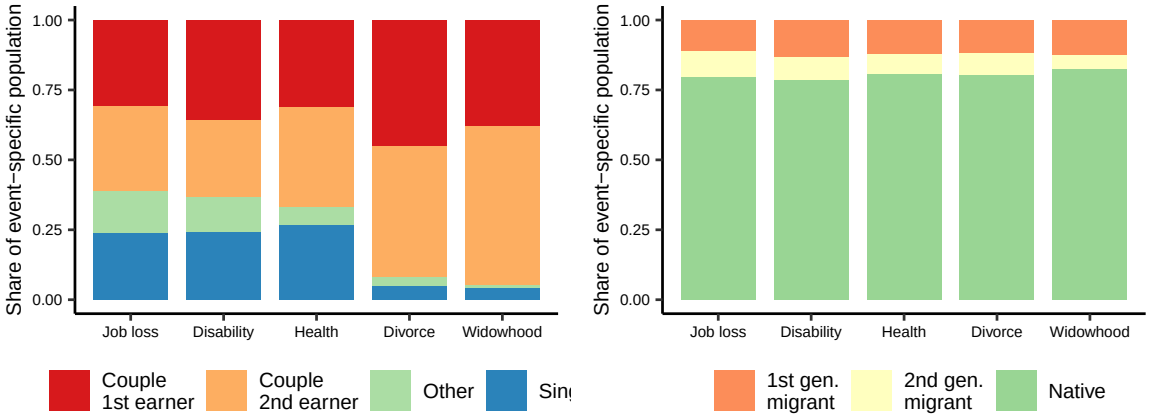
(a) By gender

(b) By age



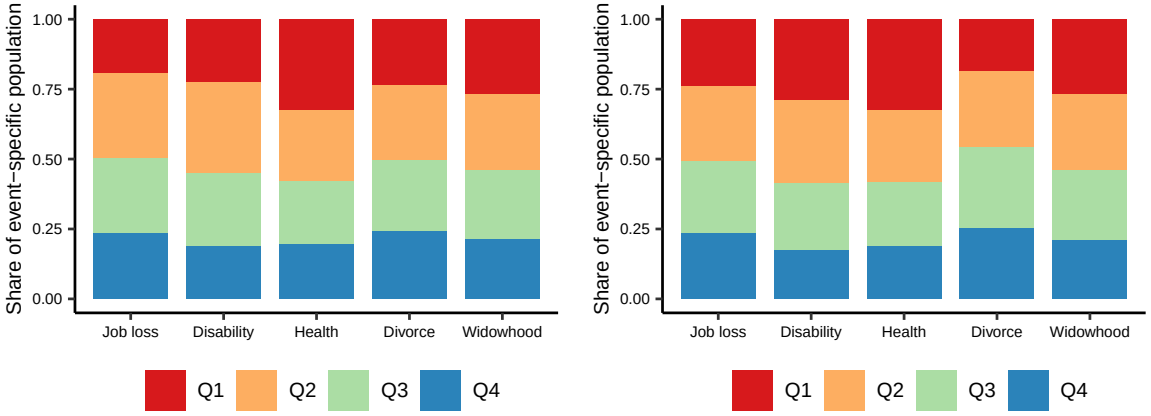
(c) By household type

(d) By migration background



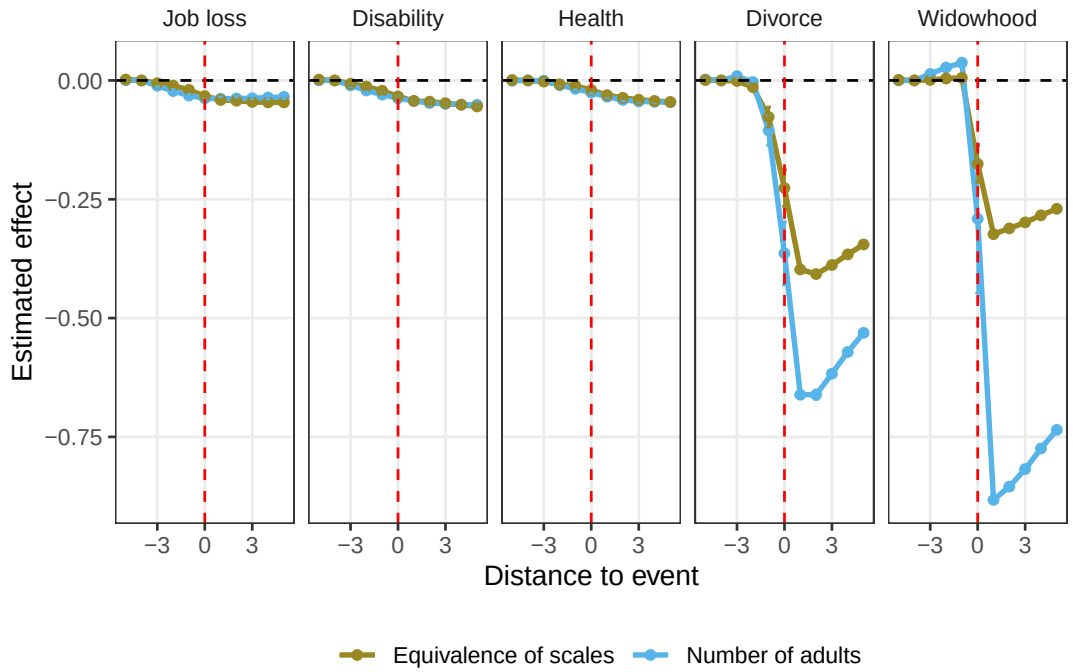
(e) By individual income

(f) By household income



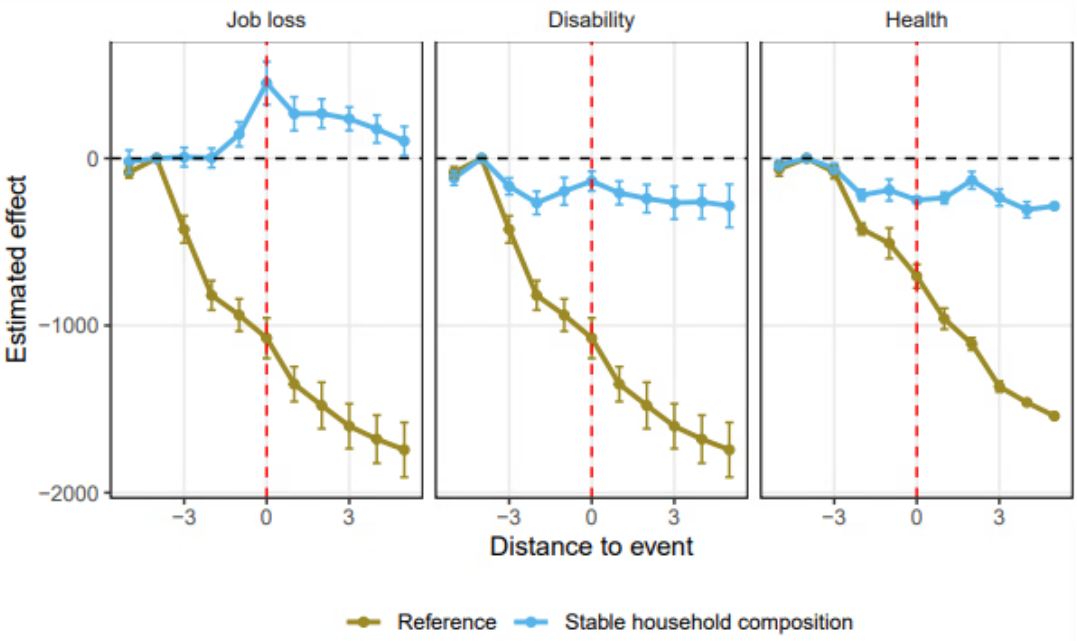
Note: This Figure presents the distribution of incidence of adverse life-events according to different socio-economic characteristics: gender (panel A), age by ten years groups (panel B), household type regarding the couple composition (panel C), migration background (panel D)

Figure A.2: Effect of life-event on household composition



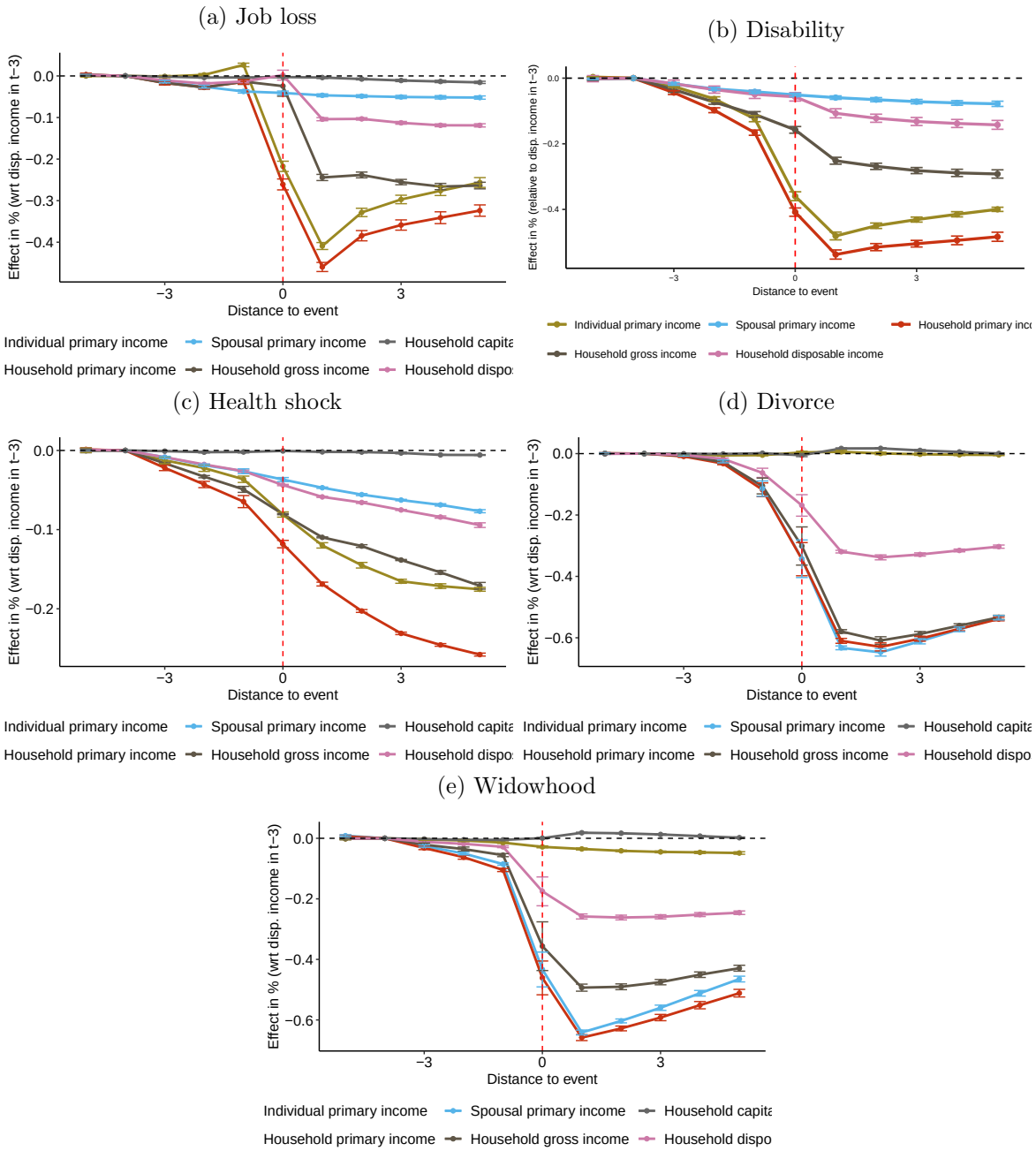
NOTE: This Figure presents the effect of different life events on the household composition of impacted individuals, measured through three different indicators: the CBS equivalence of scale (yellow line), the total number of adults (blue line) and individuals (red line) in the household.

Figure A.3: Added worker effect with stable household composition



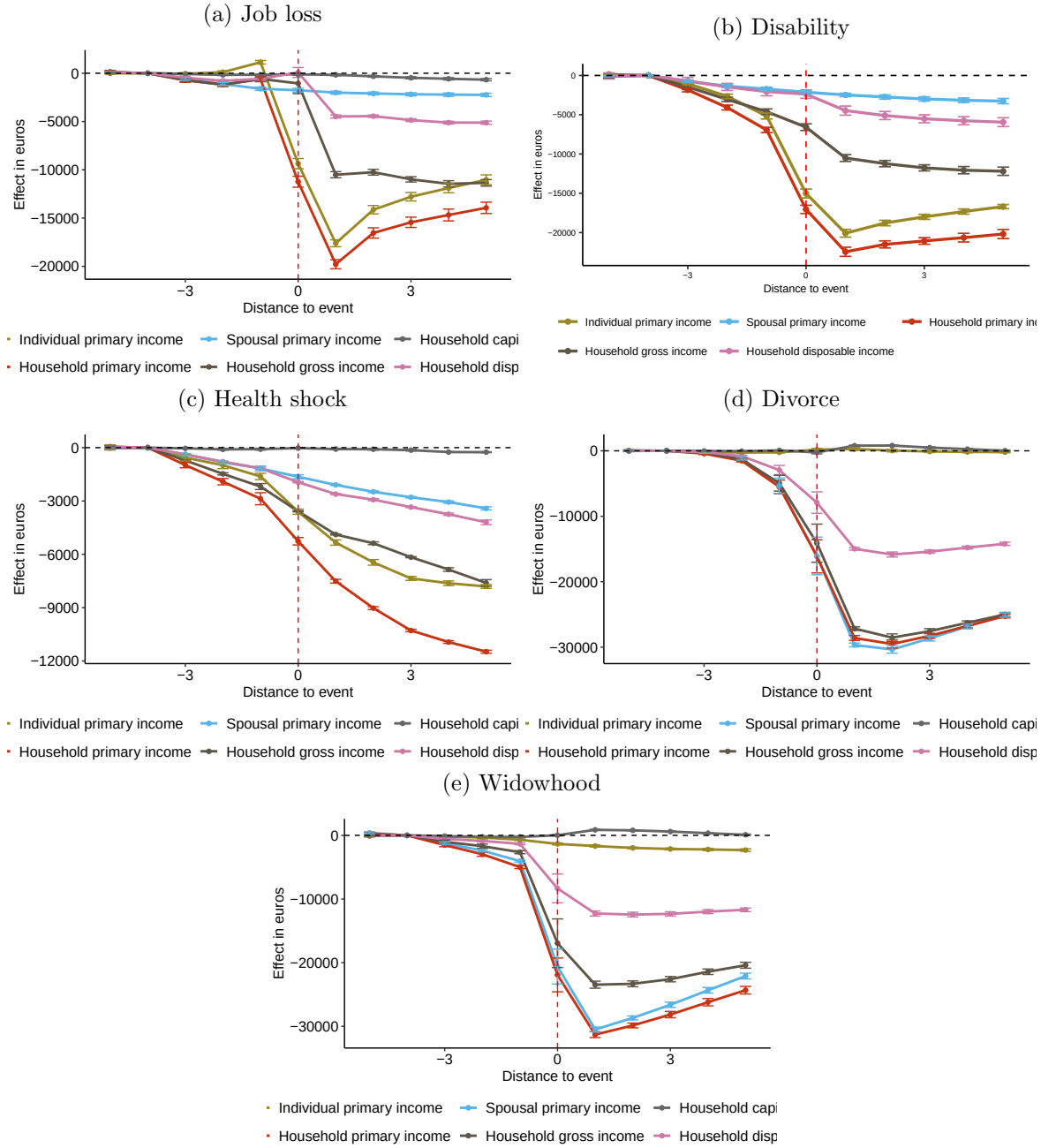
NOTE: This Figure presents the effect of individual life events on spousal labour supply, for two different types of estimation sample. The reference one corresponds to the main estimation sample used in Figures 2a, Figures 3a and Figures 4a. The

Figure A.4: The effect of life events on income trajectories: without normalisation



NOTE: This Figure shows the estimated impact of the different life-events on different income concepts without normalizing the amounts by household size. All coefficients are calculated by rescaling the income-specific estimates (δ_τ in equation (1)) by the average disposable income in the years preceding the event.

Figure A.5: The effect of life events on income trajectories, in constant euros

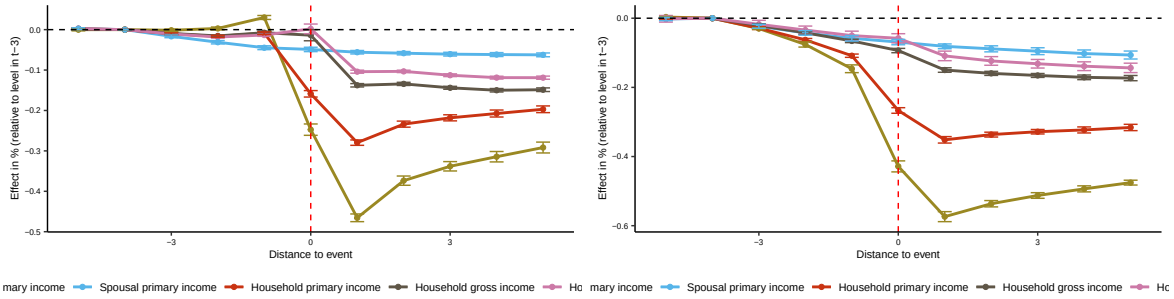


NOTE: This Figure shows the estimated impact of the different life-events on different income concepts without rescaling all estimates by the average disposable income in the years preceding the event. It corresponds to the raw estimates of δ_τ from equation (1) in euros .

Figure A.6: The effect of life events on income trajectories, relative to pre-event levels

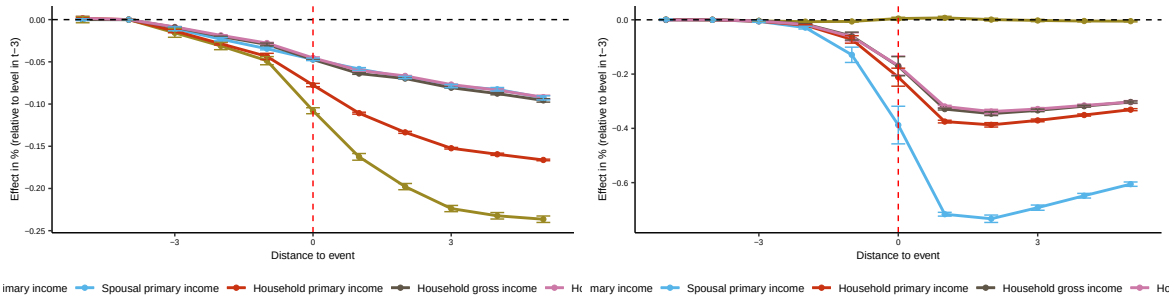
(a) Job loss

(b) Disability

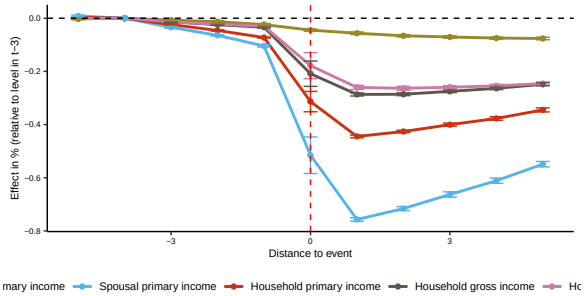


(c) Health shock

(d) Divorce

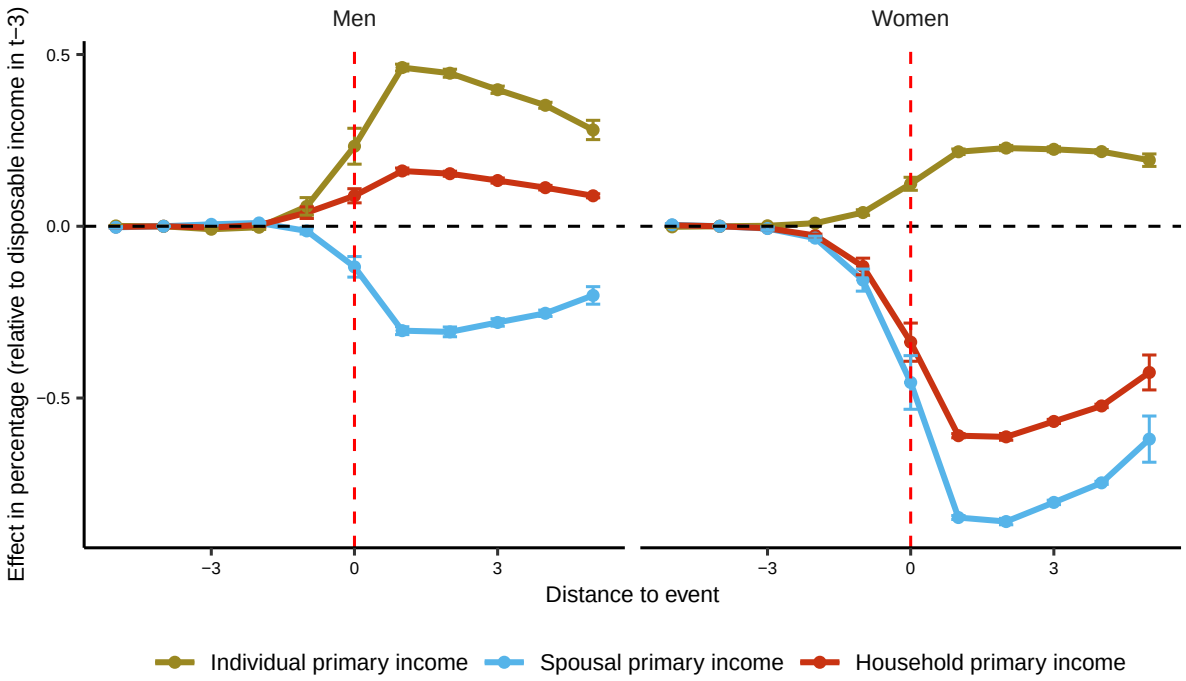


(e) Widowhood



NOTE: This Figure shows the estimated impact of the different life-events on different income concepts while rescaling by the income-specific baseline (average in the years before event) instead of the average disposable income in the years preceding the event.

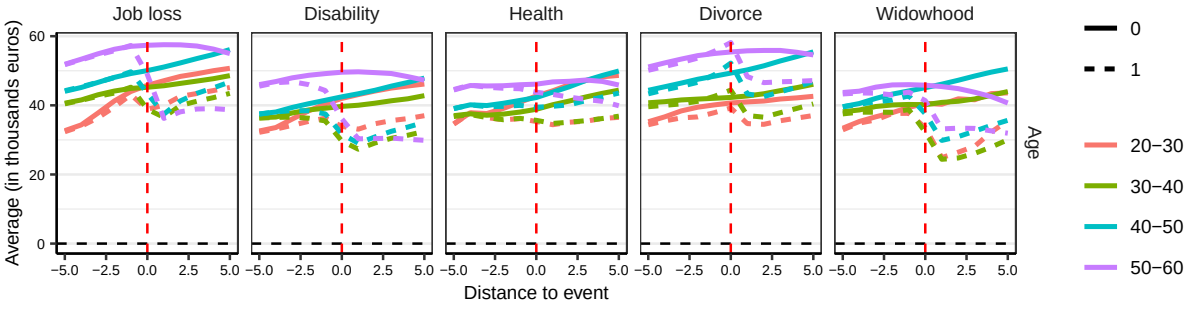
Figure A.7: The effect of divorce on income trajectories, by gender



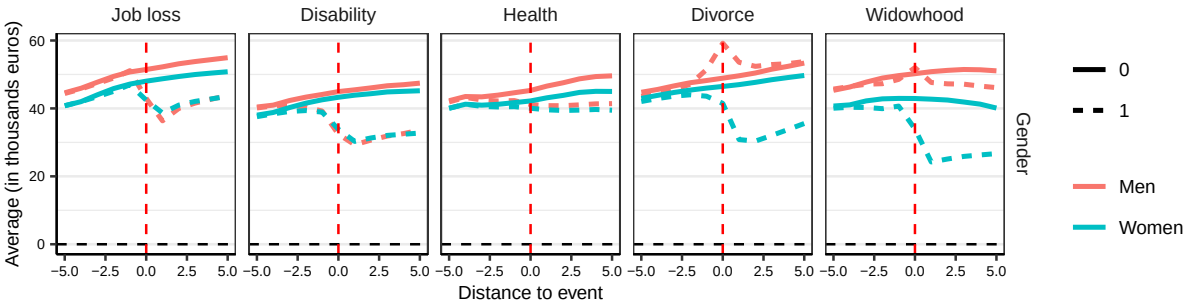
Note: This Figure shows the estimated impact of separation on different components of individual and household income primary income, separately for men and women. event. See Figure 5 for details.

Figure A.8: Average by event, for each sub-categories

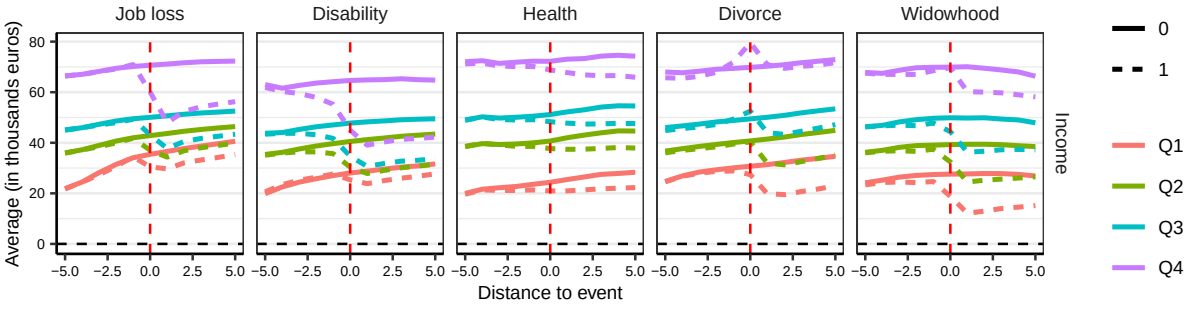
(a) By age group



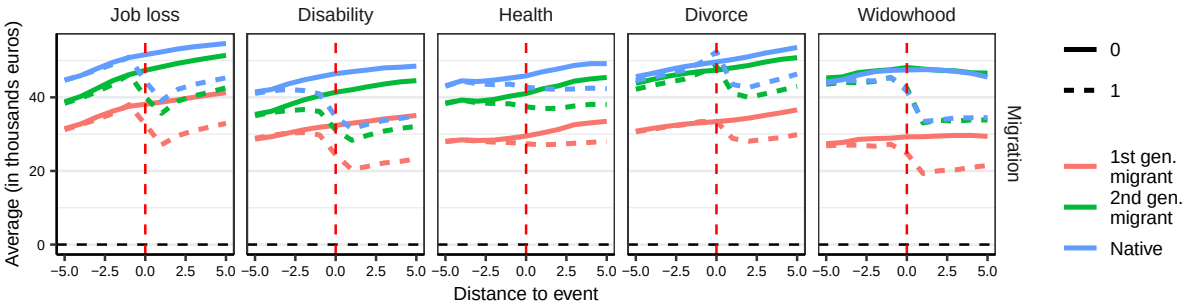
(b) By gender



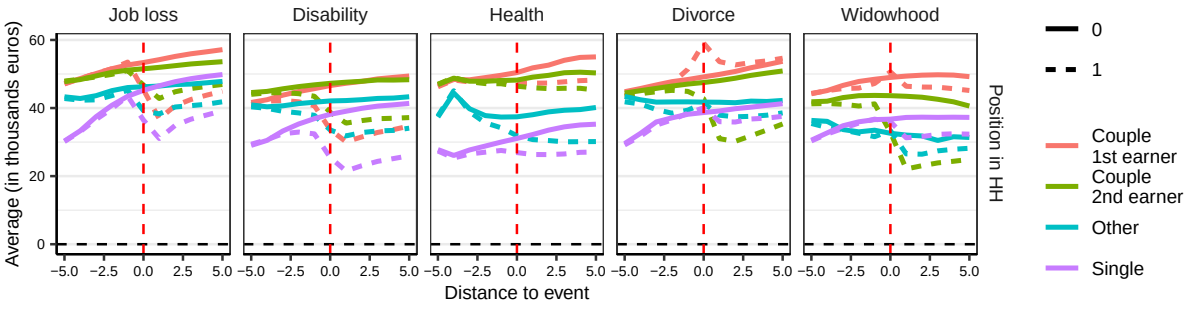
(c) By income group



(d) By migration background



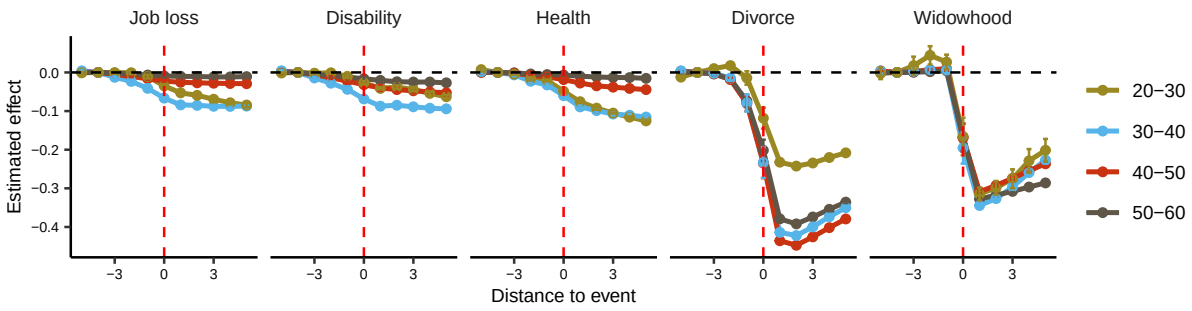
(e) By household position



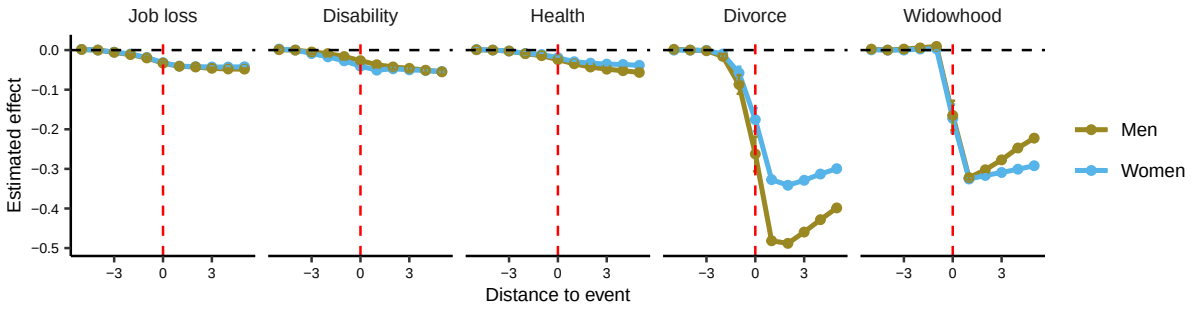
Note: This Figure presents the raw average for household primary income by event date, separately for the control and treatment groups constructed for each life-events, for each subgroup of the population.

Figure A.9: Effect of life event on household-size, for each sub-categories

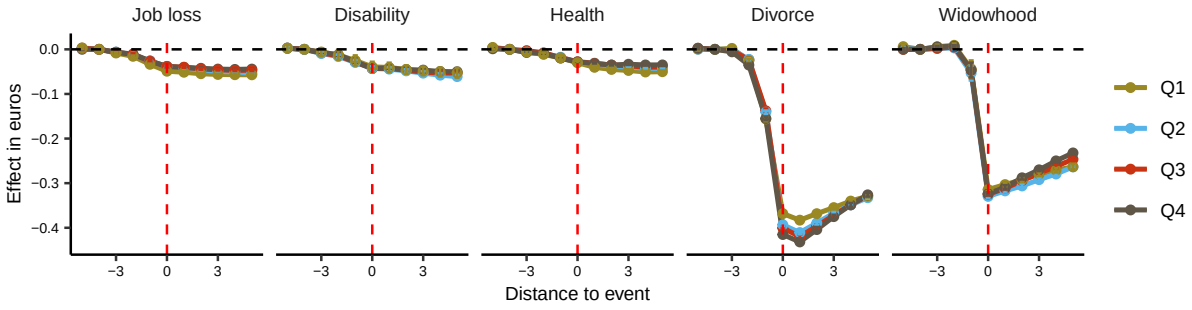
(a) By age group



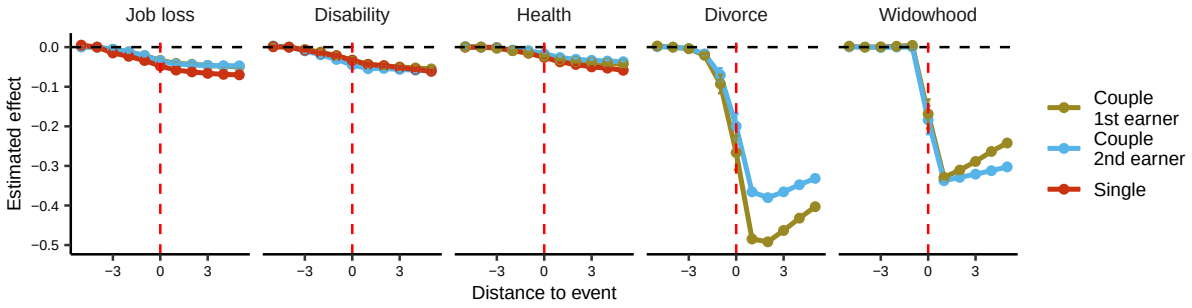
(b) By gender



(c) By income group

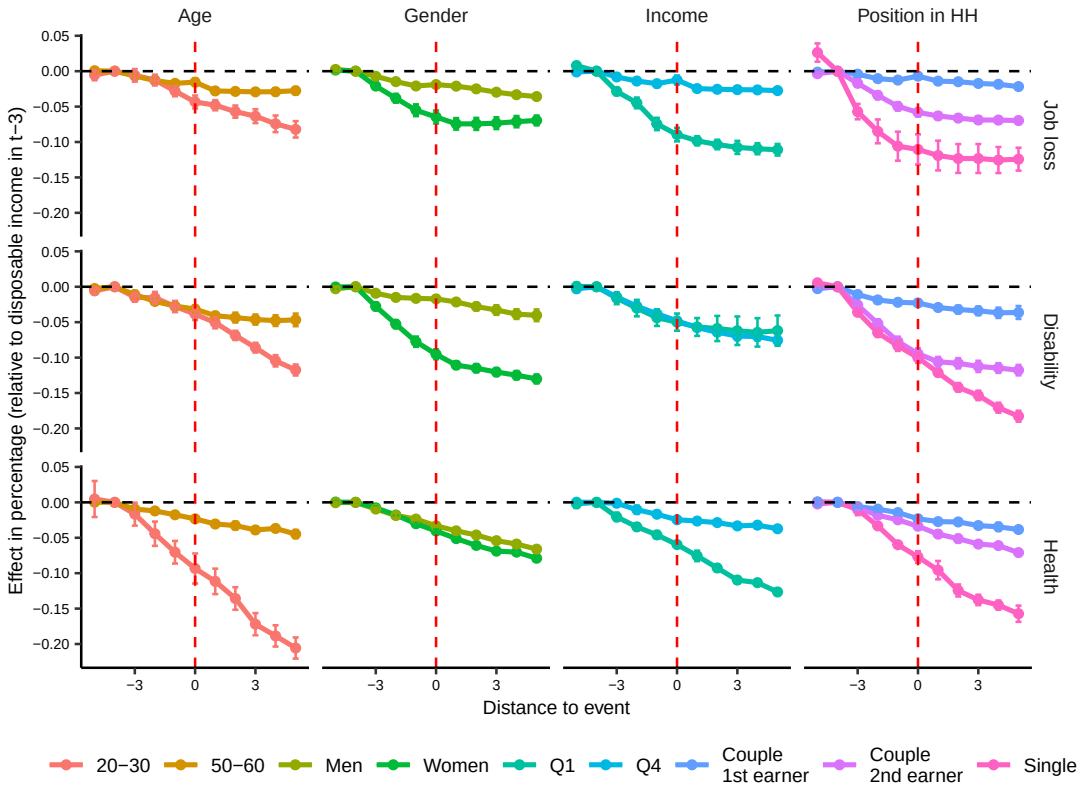


(d) By household position



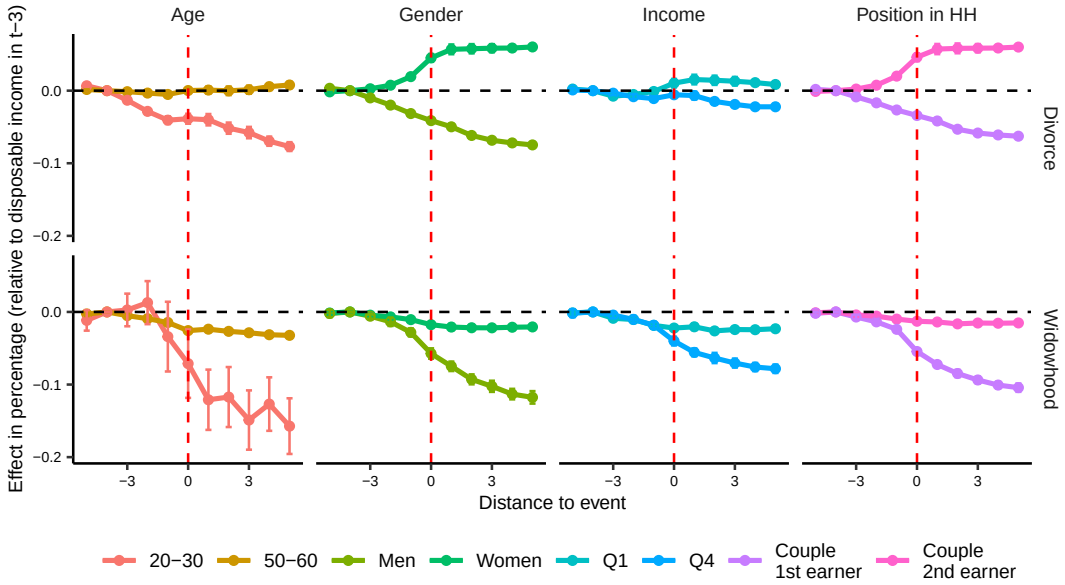
NOTE: This Figure presents the effect of different life events on the household composition of impacted individuals, for each subgroup of the population.

Figure A.10: Added worker effect: effect by sub-categories



NOTE: This Figure presents the effect of different life events on spousal primary income, for each subgroup of the population.

Figure A.11: Individual labour supply response: effect by sub-categories



NOTE: This Figure presents the effect of different life events on individual primary income, for each subgroup of the population.

Table A.1: Descriptive statistics for the different estimation samples

Life event	Job loss		Disability		Health		Separation		Widowhood	
Control/Treatment group	C	T	C	T	C	T	C	T	C	T
Demographic variables										
Age	38.57	38.54	40.98	40.75	44.84	44.43	39.82	39.76	48.77	48.77
Household size	1.60	1.58	1.60	1.59	1.58	1.56	1.74	1.73	1.68	1.66
Income										
Share employed	0.97	0.96	0.90	0.94	0.80	0.77	0.88	0.89	0.79	0.77
Earnings	26281.98	26563.74	23980.18	22886.36	22006.90	21355.57	23577.03	23766.80	19682.55	19871.16
Spousal earnings	20961.76	20662.04	18513.39	17910.87	20186.14	20299.91	23808.31	23173.72	24794.51	23121.83
Primary income	45855.68	45610.56	41324.02	39556.97	42177.99	41414.66	45516.97	44743.72	43755.56	42417.11
Gross income	49264.75	49045.21	45794.42	44341.54	48263.77	48476.03	49073.21	48656.74	50111.39	50410.86
Disposable income	28040.85	27494.65	26571.56	26112.27	27907.24	27907.07	27805.83	27557.63	28663.71	28966.66
Nb of obs	5174400.00	5248000.00	2141550.00	2110640.00	716435.00	661655.00	1983270.00	1993575.00	329485.00	329345.00

NOTE: This table presents general descriptive statistics for the different estimation samples used in the analysis. C_g and T_g respectively refers to the control and treatment group (see section 4.2 for a description of the construction of the treatment and matched control group).

Table A.2: Summary Table for direct and insurance effect of events

Life event	Job loss		Disability		Health		Separation		Widowhood	
Time horizon	t+1	t+5	t+1	t+5	t+1	t+5	t+1	t+5	t+1	t+5
Estimated effect										
Primary income	-12375.00	-8232.00	-14756.00	-12894.00	-4448.00	-6675.00	-5571.00	-5960.00	-13212.00	-10357.00
Gross income	-5839.00	-6209.00	-6277.00	-6948.00	-2421.00	-3638.00	-3341.00	-4637.00	-4996.00	-4737.00
Household income	-2273.00	-2582.00	-2467.00	-3181.00	-1222.00	-1937.00	-1665.00	-2559.00	-1990.00	-2457.00
Relative effect										
Primary income	-0.09	-0.10	-0.10	-0.12	-0.04	-0.07	-0.06	-0.10	-0.07	-0.09
Gross income	-0.22	-0.23	-0.24	-0.27	-0.09	-0.13	-0.13	-0.17	-0.18	-0.17
Household income	-0.47	-0.31	-0.57	-0.50	-0.16	-0.24	-0.21	-0.22	-0.47	-0.37
Implied insurance										
Absolute insurance	0.38	0.21	0.48	0.38	0.11	0.17	0.15	0.13	0.40	0.28
Relative insurance	0.82	0.69	0.83	0.75	0.73	0.71	0.70	0.57	0.85	0.76

NOTE: This Table presents the number underlying results shown in Figures 8 and 9. For each event and two different time horizons (t+1 and t+5), we the estimated effect of the event on primary, gross and disposable household income. We show the point estimates from the estimation of equation (1), the rescaled estimates by the reference pre-event household disposable income, and the implied relative and absolute insurance derived from them (see section 4.1).

B Sensitivity analyses

B.1 Sensitivity to event definition

In this appendix, we test the sensitivity our our results to alternative definitions of events. We focus on the events whose definition is less straightforward, namely divorce, job loss and health shocks

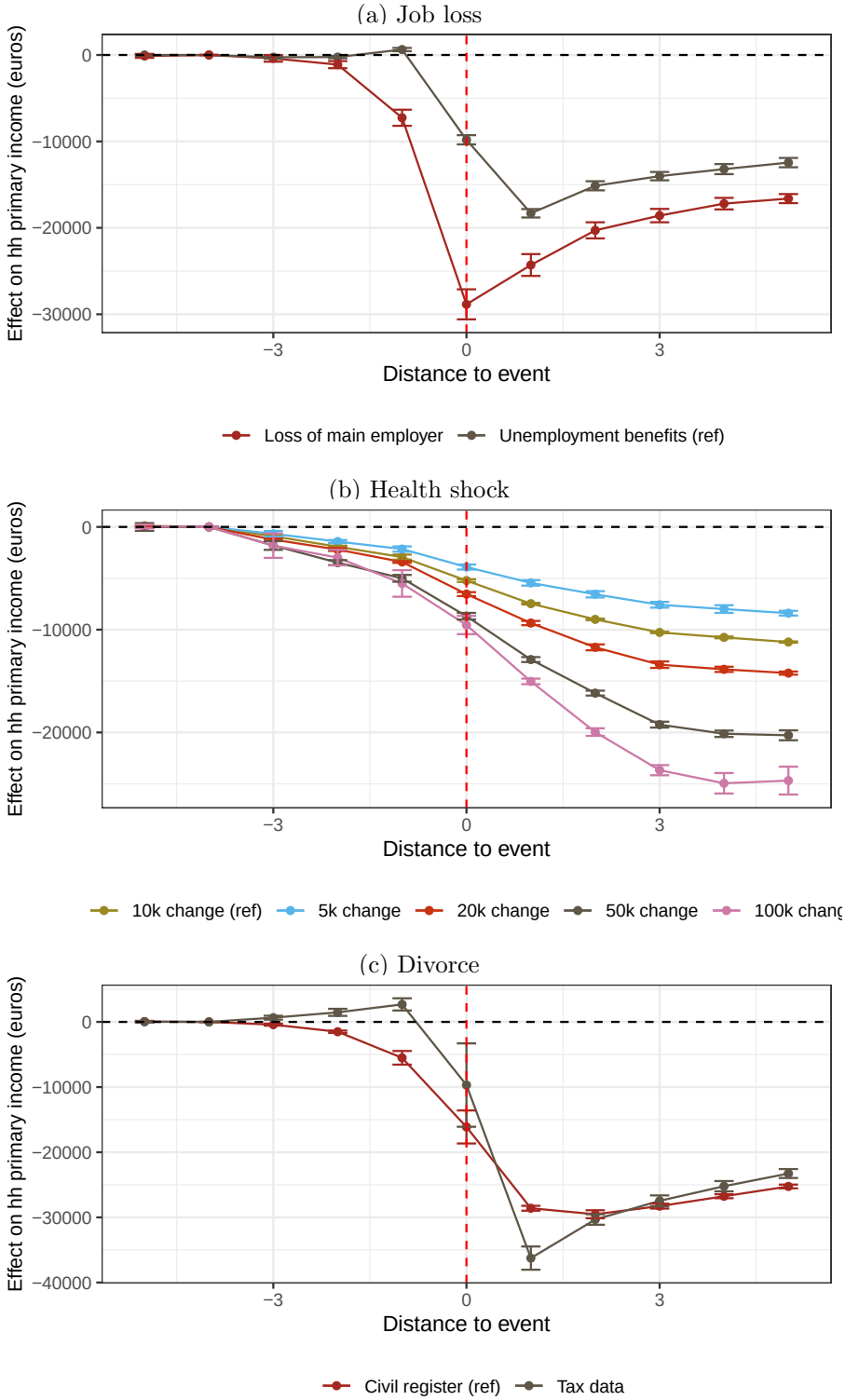
Alternative definition of job loss

As mentioned in section 3, our definition of job loss based on the take-up of unemployment benefits suffers from two main limitations. First, we do not capture people who lose their jobs and do not receive unemployment benefits - because they find another job, are ineligible, or are eligible and do not claim. A second problem is that we may be capturing job losses in very unstable employment trajectories, which may not per se be the disruptive adverse life events we want to study. For this reason, we consider an alternative definition of job loss based on the one used in Andersen et al. (2023): the termination of a long-term employment relationship (two years) followed by a significant drop in labour earnings. Such a definition includes some individuals who do not pass through unemployment insurance and focuses on more disruptive events. A conceptual limitation of this alternative definition is that it is based directly on the outcome we want to study, namely the drop in individual earnings following the shock. For this reason, we do not use it in our main specification. Figure B.1a compares the estimated effect of job loss under these alternative definitions. They show the same pattern, namely a large drop in primary income at the time of the event, followed by a small recovery and a persistent negative effect in the long run. There are two main differences between the definitions. First, the estimated drop is slightly more pronounced with our alternative definition, reflecting the fact that it focuses on more consequential events. Second, the drop in income is sharper at t = 0 with our alternative definition, which is directly related to our definition based on a drop in income at the time of the event.

Alternative definition of health shock

In the rest of the paper, we identify health shocks in the years for which we observe a 10,000 euro increase in health expenditure from one year to the next. Given the arbitrariness of such a definition, we test the sensitivity of our results to alternative thresholds for the increase in health expenditure, ranging from 5,000 to 100,000 euros. We show in figure B.1b the estimated effect of the health shock under these different definitions. It appears that the effect of the health shock on income trajectories increases almost linearly with the increase in expenditure from 5k to 50k and seems to stabilise beyond this point.

Figure B.1: Estimated effect of adverse life event: sensitivity to alternative events definitions



NOTE: This Figure shows the estimated impact of life events on primary income, for alternative definition of job loss (Panel (a)), health shocks (Panel (b) and divorce (Panel (c). See text for details on the definitions used.

Alternative definition of divorce

Our main definition of divorce is a legal one. However, as the timing of a legal divorce may differ from the actual separation and may overlook cohabitation arrangements, we also consider an alternative definition of couple separation derived from tax data. Specifically, we define a couple as separated if one partner changes their tax status from 'couple' to 'single' between two consecutive years. Figure B.1c suggests that couples often decide to separate several months before the legal process is finalised. The negative 'anticipation effect' observed when using the civil register definition is not present when using the tax data definition. Reassuringly, the long-term results remain similar regardless of the definition used to identify the separation shock.

B.2 Sensitivity to household size normalization

In the results of the main part of the paper, all income measures are rescaled by household size to account for changes in household composition (see section 4.1). In this appendix we present the sensitivity of our results to alternative approaches. We focus on one individual life event (job loss) and one household life event (divorce). The results are similar for the other three events.

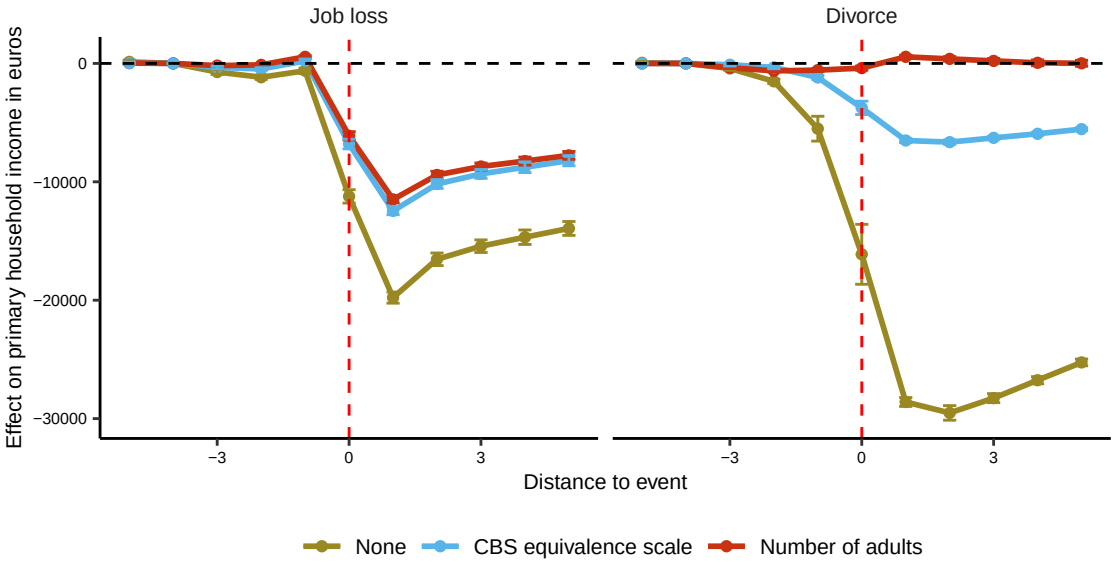
As previously presented in the appendix Figure A.2, life events also affect the structure of the household. This is obviously the case for divorce and widowhood, but it can also be observed for individual events that can occur at the same time as a change in family structure. At the time of the event, we can therefore observe a change in both the numerator (income from the tax declaration) and the denominator (household size). Figure B.2 shows the sensitivity of our results to different normalisation approaches: without any normalisation or with the number of adults instead of the equivalence of scales coefficients as the denominator.

For individual events (here job loss), we observe that the results are only marginally sensitive to the choice of normalisation. We observe that the overall effect on income trajectories is smaller when household size is taken into account, because the number of household units decreases at the time of the events, which means that the total income of the household is divided among fewer individuals. The type of normalisation used (scale equivalence or number of adults) does not seem to matter.

For household events (here divorce), the normalisation assumptions are more crucial. First, there is a difference in the size of the drop in income, which is much smaller when normalisation is used. This is due to the fact that the large decrease in household income without normalisation is largely compensated by the decrease in the denominator. Second, there is a difference in the observed dynamics of the effect around the event. Without normalisation, we observe an anticipation effect of divorce as household income falls before the time of the event. With normalisation, we do not observe such an anticipation effect and even observe a peak in income at t=0. The anticipation effect we observe without normalisation is due to the fact that there may be a discrepancy between the date of divorce and the actual separation of the couple. As can be seen in figure A.2, the decline in household size starts before the event as we measure it.

This effect is not visible with normalisation because the fall in household income is compensated by the fall in household size. The spike we observe at t=0 with normalisation is due to the fact that household composition (and hence size) is measured at the end of the year. We then apply a denominator that is lower than the actual denominator in the case of divorce, which causes a spike in income.

Figure B.2: Sensitivity to matching household size normalization



NOTE: This Figure shows the estimated impact of life events on primary income, for different normalization of income. The reference used in the paper (*CBS equivalence scale*, in blue) is compared to a normalization by the number of adult and no normalization.

B.3 Sensitivity to estimation method

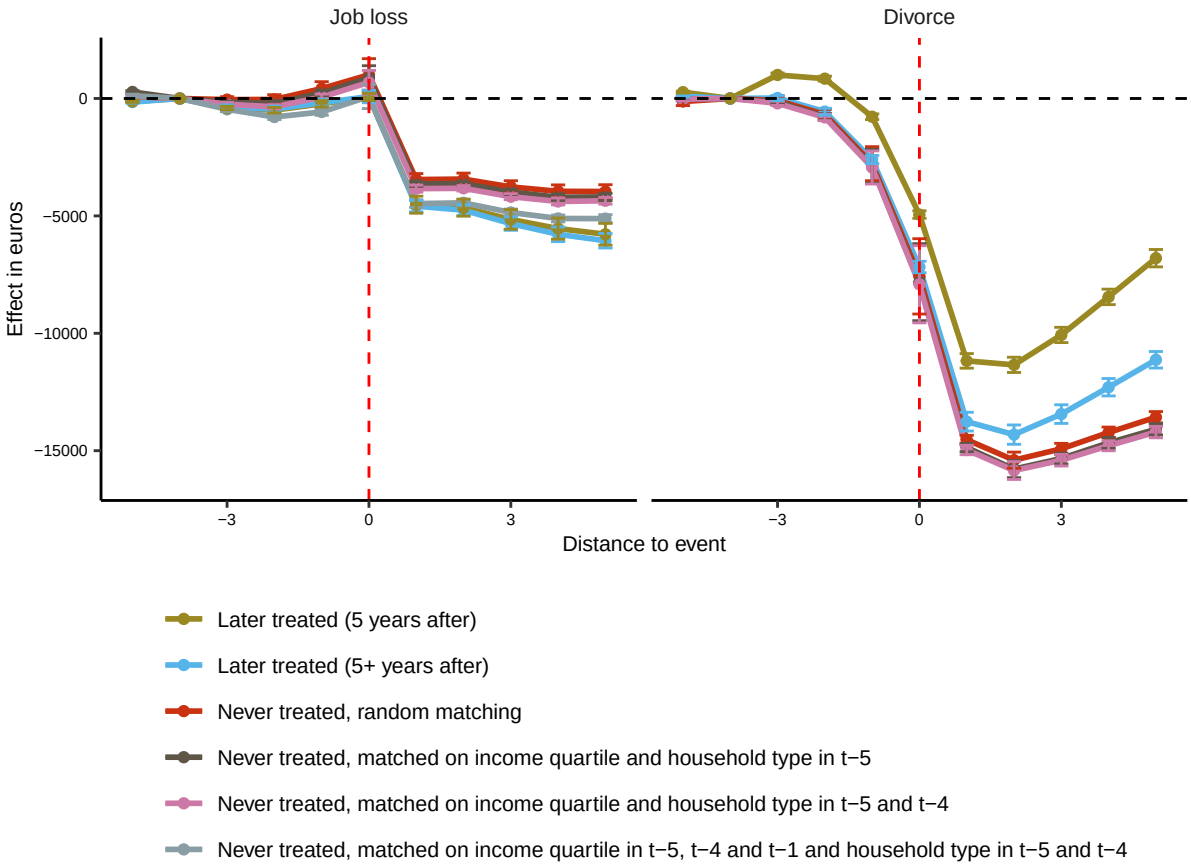
Sensitivity to matching specifications To test the extent to which the matching variables allow us to control for selection into the event, we run two further matching specifications. In the first, we match only on gender and age. In the second, we match on migration background and household type and income level in year $a-5$ if the treated group is treated in year a. Recall that in our main specification we control for household type and income in both year $a-5$ and year $a-4$, so that we control for the dynamics of household composition and income in addition to its level. The results are shown in figure B.3, lines labelled "Never treated". They show very similar patterns and comparable magnitudes from one specification to the other. However, matching on pre-event income levels, and even more so on two periods, reduces the gap between treated and controls before the event, so we are likely to control for selection into the event in our main analyses.

Sensitivity to alternative specifications We test another specification in which selection into the event is captured by defining the pool of control individuals. We construct our control

group with later treated individuals. We run two later-treated estimations. In the first, the control group consists of individuals who were treated in year $a+5$ if the treated group is treated in year a. In the second, the control group consists of individuals who were treated in year $a+5$ or later. If individuals who are selected into the treatment have common characteristics that are different from those who aren't, using later-treated individuals as a control group allows us to neutralise the selection effect. And the identification assumption holds in particular in the case of exogeneity of the timing of the event. We also restrict the treated and control groups to the same gender and age.

Figure B.3, lines labelled "Later treated", shows the results. Overall, the two later-treated specifications show roughly the same pattern and magnitude as the matching estimation. For job loss, the control and treated groups have more similar pre-shock income histories in the later-treated estimation. This is consistent with the fact that individuals who experience a job loss at some point in their life have closer income dynamics than those who never do. For divorce, later treated individuals differ from treated individuals in terms of their pre-divorce income dynamics. Low-income individuals face a higher risk of divorce (Kaplan & Herbst 2015), so they may end their union earlier. Put differently, it may be that the timing of the event is not randomly distributed along the income distribution, so the later-treated are not a valid control group in our analysis. All of these findings are more pronounced for the later-treated control group, defined as individuals treated in year $a+5$, since the rest of those treated in year $a+5$ or later could be described as not yet treated or a mix of later-treated and never-treated if the sample window had been shorter.

Figure B.3: Sensitivity to specification



NOTE: This Figures presents the estimated effect of life events on primary income for different specification. The specification used in the main results of the paper corresponds to the last one (grey curve). See text for details on the alternative specification estimated.

C Data

In this Appendix, we present details on the data sources we use in the empirical analysis. Table C.1 lists all the sources we use, and we subsequently provide more detailed information about each dataset. Information about the administrative on the micro datasets can be found on the CBS website (only available in Dutch).[14]

gbapersoontab[15]

This dataset contains demographic background data, such as gender, year of birth, and migration history, for the entire Dutch population who have been registered in the Basic Register of Persons (BRP) since 1 October 1994.

gbaoverlijdentab[16]

This dataset includes the date of death of all persons who were registered in the Basic Register of Persons (BRP) at the time of death since 1 October 1994. It also includes the date of death of non-residents who were once residents of the Netherlands after 1 October 1994, and whose death information is available in the Register of Non-Residents (RNI). The dataset is primarily sourced from the municipal registries (Gemeentelijke Basisadministratie Persoonsgegevens, GBA).

polisbus[17] **and spolisbus**[18]

This database covers all jobs in the Netherlands from 2006 onward, providing information on each employment spell. For each record, it includes details about the individual (such as wage, hours worked, and contributions) and the employer (such as sector and collective agreement).

integraal persoonlijk inkomen (IPI)[19]

The IPI data provide information on individual annualized income for the full universe of the Dutch population. Files originate from tax authorities and are available for the 2003–2010 period. From 2011 onward, they are replaced by INPATAB, due to revision of income statistics 2017. They include all labor income and capital income, as well as government transfers (e.g., UI, DI, pensions), and other transfers and income.

integraal huishoudens inkomen (IHI)[20]

The IHI data provide information on annualized income for the full universe of Dutch households. Files originate from tax authorities and are available for the 2003–2010 period. From

[14] Link to the CBS microdata information website.
[15] Link to gbapersoontab documentation in Dutch.
[16] Link to gbaoverlijdentab documentation in Dutch.
[17] Link to polis documentation in Dutch.
[18] Link to spolis documentation in Dutch.
[19] Link to ipi documentation in Dutch
[20] Link to ihi documentation in Dutch

2011 onward, they are replaced by INHATAB, due to revision of income statistics 2017. They include all labor income and capital income, as well as government transfers (e.g., UI, DI, pensions), and other transfers and income.

inpatab[21]

The inpatab data provide information on individual annualized income for the full universe of the Dutch population. Files originate from tax authorities and are available from 2011 onward. They include all labor income and capital income, as well as government transfers (e.g., UI, DI, pensions), and other transfers and income.

inhatab[22]

The inhatab data provide information on annualized income for the full universe of Dutch households. Files originate from tax authorities and are available from 2011 onward. They include all labor income and capital income, as well as government transfers (e.g., UI, DI, pensions), and other transfers and income.

vehtab[23]

The vehtab data provide information about the wealth of the full universe of the Dutch household. It is available from year 2006, and contains on a yearly basis the value of asset and debt owned, for different types of wealth (e.g financial assets, business assets, housing). The vehtab data do not cover all wealth in the national accounts, as pension wealth is not included. Depending on the type of wealth, the value is either observed (from tax data) or computed by Statistic Netherlands.

secm datasets[24]

The secm datasets provide detailed information on various types of monthly income received since 1999: employment wage (SECMWERKNDGAMNBEDRABUS), profit (SECMZLFMNDBEDRAGBUS), other activities (SECMOVACTMNDBEDRAGBUS), unemployment benefits (SECMWERKLMNDBEDRAGBUS), disability benefits (SECMZIEKTAOMNDBEDRAGBUS), other benefits (SECMSOCVOORZOVMNDBEDRAGBUS) welfare benefits (SECMBIJSTMNDBEDRAGBUS) and pension income (SECMPENSIOENMNDBEDRAGBUS).

These datasets are compiled by Statistic Netherlands using various administrative data sources, including taxes, social security, and pension funds. The initial format of the dataset is spell data, which provides information on the start and end dates of each income source, as well as the associated monthly amount. For each change in an individual's monthly income, a new line is added to the dataset. The secmbus dataset consolidates the different sources into

[21] Link to inpatab documentation in Dutch
[22] Link to inhatab documentation in Dutch
[23] Link to vehtab documentation in Dutch
[24] Link to secm documentation in Dutch.

a single dataset that contains the main source of income and the associated amount for each spell.

ZVWZORGKOSTENTAB[25]

This dataset records the health care expenditures in current euros incurred within the basic (mandatory) health insurance. Each observation corresponds to the health care expenditures incurred by one individual. The costs are those actually reimbursed by the health insurance companies. Data are available from 2009. If a type of care becomes reimbursed (or is removed from the list of reimbursed care) from one year to the other, its use will show in the data of one year but not in the data from the other year.

Table C.1: Datasets used

Content	**Name of dataset**	**Years**
Date of birth and gender	GBAPERSOONTAB	2023
Death	GBAOVERLIJDENTAB=	2023
Civil status and date	GBABURGERLIJKESTAATBUS	2023
Households characteristics	GBAHUISHOUDENSBUS (V1)	2023
Linkage parent-child	KINDOUDERTAB (V1)	2023
Tax data		
Household tax data	IHI: Integraal huishoudens inkomen	2003-2010
Individual tax data	IPI: Integraal persoonlijk inkomen	2003-2010
Household tax data	INHATAB	2011-2022
Individual tax data	INPATAB	2011-2022
Individual income		
Unemployment benefits	SECMWERKLMNDBEDRAGBUS	2022
Disability and sickness benefits	SECMZIEKTAOMNDBEDRAGBUS	2022
Health data		
Health care expenditures	ZVWZORGKOSTENTAB	2009-2021

NOTE: SSB stands for *Sociaal Statistisch Bestand* (Social Statistical Database).
SOURCE: CBS microdata catalogue.

[25]Link to zvwzorgkostentab documentation in Dutch